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Convergence and Inequality : the case of Western Balkan countries

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This paper analyses the convergence process of inequality in income among five Balkan countries in the 1989-2005 period. This study is carried out in comparison with the situation in the European Union of 27 countries. The originality of our approach is to consider the convergence of country contributions to the international income inequality. The model allows simultaneously to test the convergence process of income and inequality. The results indicate a real convergence process between Balkan countries, while persistence is detected between European Union countries. However, the development gap between Balkans and European Union remains important.

Keywords : Convergence ; Inequality ; Panel Data ; Balkan countries; European Union.
JEL Classification : C23, O40, O52.

INTRODUCTION

During the Brussels reunion 'Union – Western Balkans' in December 2003, the Ministers of Foreign Affairs of the European Union (EU) reaffirmed that the future of the five Balkan countries Albania, Bosnia-Herzegovina, Croatia, Macedonia and Serbia-Montenegro lies in the EU. In order to prepare their adhesion to the EU, the process of "stabilization and association" constitutes the principal instrument of the European policies with respect to those countries.[1] In fact, the European future for Western Balkan countries depends on their ability to carry out reforms in the political, economic and social domains and to fulfill the pre-defined accession criteria. The development of institutions appears as one of the pre-conditions for the accession, to the point where the differences in income levels are attributed by certain studies to the weaknesses and differences in the institutions (see Acemoglu *et al*., 2001). However, we can wonder whether the integration depends entirely on the success of reforms undertaken by the candidate countries or on the willingness of the EU to set off a timely and successful integration in regards of the country specificities.

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[1] Croatia submitted its application in June 2004 and started negotiations on accession in October 2005. Macedonia benefited from the 'candidate country' status in December 2005. Serbia and Bosnia-Herzegovina are currently negotiating the signing of SAAs (*Stabilization and Association Agreements*). Finally, Albania signed the SAA in February 2006.

Indeed, Europe encompasses very different and heterogeneous areas (by its territories, ethnic groups, demographics, etc.), with important gaps in development. Real convergence, which would allow for a reduction of economic inequalities between countries, remains a crucial question.[2] This is an issue not only for the present EU members, but also for the Union's enlargement eastwards. The enlargement process seems thus closely related to the concept of convergence. Consequently, testing the existence of real convergence may represent a significant contribution to the economic analysis of growth. It can also have important implications not only for national policies, but also for the European actions mainly channeled by cohesion and structural funds.

The majority of studies focusing on Europe show a very low income convergence process (see among others Dowrick and Nguyen, 1989 ; Barro and Sala-i-Martin, 1992 ; Mankiw *et al*., 1992 ; Temple, 1999). Thus, the objective of reducing disparities in Europe seems inaccessible. The relative permanence of inequalities questions the efficiency of European policies and the capacity of the European integration to ensure a real convergence between the EU countries. The principal contribution of this study consists in analyzing the present economic situation of the Balkan countries. In particular, we wish to check the existence of a real convergence process characterizing the Western Balkans. Such a study is important within the context of discussions on the future eastwards enlargement of the Union.

In this paper, we focus our analysis especially on the importance of income inequality (in GDP per capita) between the Balkan countries during the 1989-2005 period. The comparisons with the situation of EU-27 is also examined. The Theil measure (Theil, 1967) is used as an inequality indicator. It is defined as a sum of contributions of each country to the global inequality. We develop and estimate a simple model to test real convergence. The originality of our approach is based on modeling the *contributions of countries to the global income inequalities*. Thus, we highlight the relationship which may exist between income convergence (expressed by the notion of β-convergence) and inequality convergence.

Our results show evidence of real convergence between Balkan countries. The estimate speeds of income and inequality convergence are respectively at 2.8% and 2.7%. By contrast, persistence characterizes the 27 EU countries. However, the development gap between the Balkan countries and the EU remains very important and it widens considerably in last years. Indeed, the Balkans' GDP per capita declined from 40% of the EU-27 level in 1989 to 28% in 2005. In 1989-2005, the GDP per capita inequalities between Union and Balkan countries increased at a 2.9% average annual rate.

The paper is organized as follows. In Section 2, we present a brief overview of the literature on convergence. Section 3 is devoted to the methodology, the economic indicators and to modeling inequality convergence. Section 4 discuses the data and presents a descriptive analysis. Section 5 discusses the results of the estimation of the inequality

[2] The goal of economic and social cohesion aimed at reduction of disparities between the member countries is included in the Treaty of Maastricht.

convergence model. The last section concludes the study and underlines the possible directions for future research.

AN OVERVIEW OF THE LITERATURE ON CONVERGENCE

Real convergence means rapprochement of levels of economic welfare between countries. The most widely used indicator is real GDP per capita. The question of convergence remains at the center of economic growth theory, where different analyses rest upon a global production function. We can distinguish between two approaches in the literature: the neo-classical model and the endogenous growth one (see for a review Temple, 1999; Durlauf and Quah, 1999; Islam, 2003). These two approaches lead to different conclusions on the convergence process.

The studies on convergence are widely based on the neo-classical theory of economic growth. In its initial formulation, all countries converge toward the same level of economic development, the agents have the same preferences and benefit from the same access to the technology, assumed to be identical for all countries. Technical change is exogenous and the random variations in initial technology are captured by an error term (Mankiw *et al*., 1992). Some extensions move from cross-section analysis to a panel data approach in order to relax the assumption of identical technologies and to take into account the technological differences (Islam, 1995), although these differences are assumed to be stationary. One of the strong assumptions of the neo-classical approach resides in the immediate diffusion of knowledge. Consequently, a country's opening will accelerate the process of convergence. Indeed, in the neo-classical model capital accumulation propels and drives growth. The mechanism behind this convergence is based on diminishing returns to capital. The countries with low capital stock and low income per capita will benefit from a better marginal productivity and a higher return to capital. This implies an increased accumulation of capital and a faster growth of poor countries as compared to rich ones. Thus, the models of neo-classical inspiration foresee a tendency to income convergence.[3]

On the contrary, the endogenous growth models do not assume that income convergence between poor and rich countries is a plausible result. They consider the possibility of different growth paths (see Grossman and Helpmen, 1991 ; Barro and Sala-i-Martin, 1995; Temple 1999). Returns to capital should not be diminishing (see Romer, 1986), and the impact of economic integration on convergence is ambiguous.[4] Thus, the approach proposed by Lucas (1988), in which human capital is the principal driving force of growth, shows that the exodus of competencies will act as a vehicle of divergence between countries. Additionally, R&D efforts are considered as the engine of growth and an explanatory factor for technological and economical permanent gaps between countries.

[3] Moreover, trade and international mobility of factors will act as mechanisms of income convergence, see Martin and Sanz (2003) ; Kutan and Yigit (2007).
[4] See Kutan and Yigit (2007) on this subject.

This theory thus assumes that the national accumulation of knowledge and technology is endogenous.

In the neo-classical model, policy has no impact on long-term growth rate since the poor countries grow faster than the rich ones. In contrast, in endogenous growth models, convergence is not certain and efficient policies can affect long-term growth by fostering technological innovation. Moreover, others versions of the endogenous model give an important place to the effects of knowledge spillovers (see Coe and Helpman, 1995). Then, through the technological diffusion, the convergence becomes a possible result. Furthermore, direct foreign investments and international trade are considered in the process of convergence as channels for technological externalities (Coe et Helpman, 1995).

The notion of β-convergence constitutes a link between the study of Barro and Sala-i-Martin (1991) on the convergence of economies and the neo-classical model of growth (Dunford, 1995 ; Bernard and Durlauf, 1995, 1996). According to this notion, convergence appears when the low-income economies grow faster than the high-income ones, which means that the poor countries tend to catch up the income level of rich countries (see Sala-i-Martin, 1994, 1996). Convergence in the β sense may be absolute or conditional to control variables such as the investment rate, technological change, human capital, industrial structure, stability policies, etc. The first concept implies that all countries converge toward the same equilibrium, while the second refers to a convergence toward different steady-states. De La Fuente (1997) presents a review of empirical literature on conditional convergence. The results obtained by the majority of studies show that the countries which invest most in physical and human capital, and which have a low rate of population growth tend to grow faster (see Dowrick and Nguyen, 1989 ; Barro and Sala-i-Martin, 1992).

Contrary to the traditional approach, this method does not allow for distinguishing different phases of convergence and divergence characterizing the study period. The most rigorous critic of the notion of β-convergence comes from the analysis of Quah (1993, 1996), who shows that it is compatible with both the increase and the decrease of inequalities. The latter is expressed by the notion of σ-convergence. The hypothesis of σ-convergence implies that income dispersion decreases within a sample of countries, while the concept of β-convergence underlines the mobility of income. In this way, σ-convergence implies β-convergence. The reciprocal is not always verified, β-convergence and σ-divergence might coexist.

In summary, convergence is a necessary condition for the economic and monetary integration process. With successive enlargements, convergence is delayed in its implementation. In fact, enlargement is accompanied by an important decrease of the average GDP per capita and an increase of disparities. Thus, the persistence of inequalities compromises the European integration process (beneficial for countries endowed with growth factors) and slows down the convergence. In the following sections, we highlight

the theoretical basis of interactions between income and inequality convergence and we examine the empirical applications to Balkan and EU-27 countries.

METHODOLOGY

Inequality Indicators

Several indicators can be used to measure inequalities (see Cowell and Jenkins, 1995 ; Cowell, 1995). The measure of Theil is a commonly used indicator (see Theil, 1967), as it presents the advantage of being additive and decomposable (see Shorrocks, 1984). Let y_{it} be the GDP per capita of country i ($i = 1,\ldots,n$) at time t ($t = 1,\ldots,T$). We can define the indicator of Theil as the sum of the contributions of each country to global income inequality. In particular, let d_{it} be the share of country i in a total of y_{it}, the contribution of each country to global inequality is defined by the following expression:

$$TC_{it} = d_{it} \ln(d_{it} n), \quad d_{it} = \frac{y_{it}}{n y_{\bullet t}} \quad \text{and} \quad y_{\bullet t} = \frac{1}{n} \sum_{i=1}^{n} y_{it} \ , \tag{1}$$

where ln is natural-logarithm. The Theil indicator is the sum of contributions of different countries to global inequalities :

$$Th_t = \sum_{i=1}^{n} TC_{it} \ , \qquad Th_t \in [0; \ln(n)] \ . \tag{2}$$

In a comparative study including several groups of countries, the decomposition property of the Theil indicator allows for the distinction 'between-groups' (Th_{tB}) and 'within-groups' (Th_{tW}) inequalities. The indicator of between-groups inequality is defined as the sum of contributions of each group to global inequality :

$$Th_{tB} = \sum_{j=1}^{m} BC_{jt} \ , \quad j = 1,\ldots,m \ , \tag{3}$$

where $BC_{jt} = d_{jt} \ln(d_{jt} n / n_j)$ is the contribution of group j, n_j is the number of countries in the group j, $n = n_1 + \cdots + n_m$. The component 'within-groups' is the difference between Th_t and Th_{tB}.

In our case, the decomposition of the Theil indicator into 'between' and 'within' components allows us to assess the importance of inequality between EU-27 and Balkan countries. This may have important implications for national and European policies. The predominance of inequalities 'within' should encourage the European authorities to conduct policies aimed at reducing inequalities between the countries of the Union. It acts in the case of the Balkans to coordinate their reform efforts for a successful integration. On the contrary, in the case of predominance of 'between' inequality, more global actions toward all Balkan countries might be more appropriate to reduce the development gap between UE and Balkans.

A simple test of Inequality Convergence

The Theil indicator Th_t captures the levels of global inequality at any time *t*. However, these levels can hide important processes of convergence/divergence between countries. The movements of contributions TC_{it} reflect these different processes. A real convergence is a situation characterized by a decrease of contributions of rich countries (initially positive) and an increase of poor countries contributions (initially negative). A theoretical equilibrium situation will be characterized by a stationary state in which the contributions are null and the indicator of Theil Th_t tends toward 0.

In order to test the process of convergence/divergence of contributions to inequality between countries, we consider the theoretical framework on the convergence of economies (Barro and Sala-i-Martin, 1995).[5] Our extensions aim to establish a link between the income convergence (captured by β-convergence) and the contributions to inequality convergence. In particular, we start with the equation of the income convergence in its 'minimal' version (De la Fuente, 2002) defined relatively to the average level [6]:

$$\ln(y_{it} / y_{\bullet t}) = \beta \ln(y_{it-1} / y_{\bullet t-1}) \ , \tag{4}$$

where y_{it} and $y_{\bullet t}$ denote the GDP per capita of country *i* and its average level at time *t*, respectively. The condition $\beta < 1$ implies a convergence of countries toward the same steady-state. Equation (4) yields a simple test of the absolute convergence. The advantage of this specification is that it permits, on the one hand, to estimate β without controlling variables determining the equilibrium state. In fact, the difference between the (log) income levels and its average level allows the elimination of the factors assumed constant over time, but also the specific temporal effects. On the other hand, we can link it with our notion of inequality convergence. In particular, by incorporating equation (4) into (1), we can define the contribution to inequalities of a country under the following form :

$$TC_{it} = \frac{y_{it}}{ny_{\bullet t}} \ln\left(\frac{y_{it}}{y_{\bullet t}}\right) = \frac{y_{it}}{ny_{\bullet t}} \left[\beta \ln\left(\frac{y_{it-1}}{y_{\bullet t-1}}\right)\right] \ . \tag{5}$$

The last equation may be re-written by showing the level of contributions to inequalities at time (t-1) :

$$TC_{it} = \beta \, x_{it} \, TC_{it-1} = \alpha_{it} \, TC_{it-1} \ , \tag{6}$$

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[5] Ravallion (2003) had adopted a similar approach inspired by the test of convergence of inequalities developed by Bénabou (1996). However, the author considers the inequalities within-countries by observing the variation in time of the indicator of Gini. On the contrary, in this work we analyze the inequalities between-countries by observing the variation of contributions to inequalities instead of the indicator of Theil, by analogy to Gini index.

[6] For example, we may refer to Barro and Sala-i-Martin (1995) or to Islam (1995) for the analytical developments to derive the convergence equation starting from the production function.

where $x_{it} = \dfrac{y_{it} / y_{\bullet t}}{y_{it-1} / y_{\bullet t-1}}$ and $\alpha_{it} = \beta\, x_{it}$. Equation (6) represents a specification of the convergence of contributions to inequalities, where the parameter of convergence α_{it} is variable. It depends on the income convergence parameter β and on the relative income growth index x_{it}. The latter is a function of the income growth rate of country *i* at time *t*, denoted a_{it}, and of the average income growth rate, denoted b_t : $x_{it} = (1 + a_{it}) / (1 + b_t)$.

Equation (6) has important implications on the process of real convergence. Indeed, a real convergence characterized by a decrease of international inequalities assumes that on average $\alpha_{\bullet\bullet} < 1$. This condition implies that $x_{\bullet\bullet} < 1/\beta$. Three possible situations may be considered :

(***i***) Inequality convergence : income convergence ($\beta < 1$) implies that the poor countries have a higher growth rate than the rich ones. It follows that the individual average growth rate $a_{\bullet\bullet}$ is greater than the average income growth rate $b_{\bullet}$, so we expect that $x_{\bullet\bullet} > 1$. That results in $\alpha_{\bullet\bullet} > \beta$ and $\alpha_{\bullet\bullet} < x_{\bullet\bullet}$. In this way, a process of convergence of contributions to inequalities will be characterized by a situation where $\beta < \alpha_{\bullet\bullet} < 1$.

(***ii***) Persistence of inequality : if on average the rich and the poor countries have the same growth rates ($a_{\bullet\bullet} \cong b_{\bullet}$ and $x_{\bullet\bullet} \cong 1$), the weak income convergence process among countries does not entail any change in the structure of contributions. Consequently, $\alpha_{\bullet\bullet} \cong \beta$ and the two parameters will tend toward 1.

(***iii***) Divergence : the divergence process ($\beta > 1$) implies that the mean of individual growth rates is lower than the average income growth rate, $a_{\bullet\bullet} < b_{\bullet}$. This is the consequence of a higher growth of rich countries. The result is that $\alpha_{\bullet\bullet} < \beta$ and $\alpha_{\bullet\bullet} > x_{\bullet\bullet}$. Nevertheless, the process of convergence of contributions to inequalities is not ensured as the high growth of rich countries will drive a rise of their contributions. Correlatively the contributions of the poor countries drop. In consequence, we can expect that $\alpha_{\bullet\bullet} > 1$.

Taking heterogeneity into account

The specification of inequality convergence (6) rests upon a hypothesis of the absolute convergence model (4) according to which countries are approaching the same equilibrium level. The concept of conditional convergence supposes the control of factors which differentiate countries. We can consider two approaches. The first consists in introducing explanatory variables in the equation of income convergence (4). However, at the international level, the choice of explanatory variables is severely limited by the availability of data for all countries and over the entire period of study. Furthermore, the determinants of inequalities represent another crucial issue (see Barro, 2000). The majority of studies on these determinants consider variants of the Kuznets curve. However, Li *et al.*, (1998)

conclude that the Kuznets curve remains satisfactory in a cross-section approach compared to time series study.

The second approach stems from the criticism of specifications (4) and (6) which assume that the countries approach the steady-state at the same speed. Yet, from a theoretical point of view (see Mankiw *et al.*, 1992 ; Islam, 1995), the parameter of convergence β is a function of several factors. In fact, it depends on the return to scale coefficient, the capital depreciation rate, the technical progress rate and population growth. The return to scale parameter may itself be composed of the capital coefficient in the production function and a coefficient which captures the spillover effects (or human capital). The hypothesis according to which the economies' behavior is homogeneous (the same value of β for all countries) supposes that the aforesaid factors are constant over time or are assumed to be the same for all countries.

In practice, the heterogeneity of behavior may be taken into account by adding specific individual and/or temporal effects in equation (6). Even if the econometric practice shows that this approach remains sufficient, it may, however, prove to be inadequate in several situations. So, the idea is to introduce heterogeneity at the convergence parameter which becomes variable across countries β_i.[7] Consequently, two situations may be analyzed, whether the heterogeneity is assumed fixed or random (see Hsiao, 1986). In the first situation, we can estimate the model for each individual (if the temporal dimension allows to do it) or make β_i dependent of other country-specific variables. In the second situation, β_i is assumed to be random and may be specified as $\beta_i = \beta + \xi_i$ where β is an average level and ξ_i is a random variable expressing the national specificities. As our objective in this study is to examine the interactions between income and inequality convergence, we will limit ourselves to this second approach.

DATA AND EMPIRICAL INDICATORS

Our empirical investigations examine the evolution of GDP per capita over the period 1989-2005 of five Balkan countries. We shall also endeavor to show the situation of the Balkans compared to EU-27. Data used are extracted from the statistical database GGDC (Groningen Growth and Development Center).[8] The series of GDP are expressed in PPPs (Purchasing Power Parities) in US dollars with constant prices 1990. The use of data in PPPs is more adapted to international comparisons and to studies on growth and convergence of economies (see Maddison, 2001, 2005).

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[7] We may also consider that the parameter of convergence varies in time. This hypothesis remains interesting in an analysis where the temporal dimension is sufficiently large to apprehend correctly the possible structural changes.

[8] Data source : The Conference Board and Groningen Growth and Development Centre, Total Economy Database, January 2007, http://www.ggdc.net.

Economic Indicators

Table 1 presents the economic indicators for the five Balkan countries. We note that the disparities between countries are fairly visible. In 1989, 112 points in percent separated the income per capita level then the highest in Croatia (162%) from the lowest in Albania (50%). In 2005, the gap was 104 in percent between Croatia and Serbia-Montenegro. We can also observe that only Bosnia-Herzegovina and Croatia presented GDP per capita levels largely superior to the average of Balkan countries in 2005.

The per capita GDP dynamics can be understood by examining the relative growth index. For all Balkan countries, average income grew at the annual rate of 0.27%. This is lower than the average rate of individual growth which is at 0.61%. The relative growth index is therefore at 1.003 ($1.0061/1.0027 \cong 1.003$), that is a 0.3% per year increase in the 1989-2005 period. However, if we analyze the situation of the different countries, we find unequal income growth rates. In fact, with 4.4% increase in GDP per capita, Bosnia-Herzegovina catches up its delay compared to Croatia: 79 points separated the two countries in 1989, while the gap was only 36 points in 2005. Thus, Bosnia-Herzegovina presents the highest relative growth index in the observed period. Albania ranks second in terms of income growth (2.7% on average) and relative growth index (1.027 on average). In contrast, the lowest decrease in GDP per capita was observed in Serbia-Montenegro (-3.1% on average) and, to a lesser extent, in Macedonia (-1.4% on average).

Table 1 : GDP per capita of Balkan countries, 1989-2005

Country	1989	2005	Average growth rate in %	Relative growth index
Albania	50	72	2.7	1.027
Bosnia and Herzegovina	83	129	4.4	1.034
Croatia	162	165	0.4	1.002
Macedonia	90	73	-1.4	0.989
Serbia and Montenegro	115	61	-3.1	0.964
All countries	100	100	0.27	1.003

Note : GDP per capita in PPPs (Purchasing Power Parities) 1990 US$.
Source : Calculation by the authors according to GGDC Database.

If we look at the situation of Balkan countries relative to the EU-27 (Table 2), the average GDP per capita level remains lower than 50% of the EU level. The relative GDP per capita decreased by 1.9% per year over the 1989-2005 period. Hence, the average level declined from 40% to 28%. In 2005, with 36% and 46% of the EU-27 level respectively, Bosnia- Herzegovina and Croatia are at the bottom of the list of EU-27 countries. In particular, GDP per capita of Croatia is located in 2005 between that of Bulgaria (42%) and Poland (49%) while Bosnia-Herzegovina is between Romania (23%) and Bulgaria.

Table 2 : GDP per capita of Balkan countries, ratios to the EU-27 level, 1989-2005

Country	1989	2005	Average growth rate in %
Albania	20	20	0.7
Bosnia and Herzegovina	33	36	2.1
Croatia	64	46	-1.8
Macedonia	36	20	-3.4
Serbia and Montenegro	46	17	-5.2
All countries	40	28	-1.9

Note : GDP per capita in PPPs (Purchasing Power Parities) 1990 US$.
Source : Calculation by the authors according to GGDC Database.

Table 3 presents a synthesis of GDP per capita growth indicators for Balkan and EU-27 countries. The average individual growth rate of income is at 2.04% per year for EU-27 and remains close to average income growth rate (2.08% per year). That results in a relative growth index almost equal to 1 (0.999). With growth levels less important for the Balkans, relative growth index is greater than 1 (1.003). These results already give us an indication of real convergence. In fact, as we have seen in the previous section, a relative growth index close to 1 is an indicator of persistence (the EU-27 case). A value of index higher than 1 suggests a real convergence of GDP per capita (Balkan countries case).

Table 3: Indicators of GDP per capita growth, 1989-2005

	EU-27	Balkans
Individual growth (average rate in %) – $a_{\bullet\bullet}$	2.04	0.61
Global growth (average rate in %) – $b_{\bullet}$	2.08	0.27
Relative growth index – $x_{\bullet\bullet}$	0.999	1.003

Note : GDP per capita in PPPs (Purchasing Power Parities) 1990 US$.
Source : Calculation by the authors according to GGDC Database

Inequality Indicators

If we examine the evolution of GDP per capita inequality among Balkan countries (see Table 4, Figure 1), we see a slight upward tendency, an average increase of 0.8% per year. In the 1989-2005 period, the Theil index had gone from 0.068 to 0.078. However, we note significant movement in the country contributions to international inequality. On the one hand Bosnia- Herzegovina distinguishes itself clearly with a strong increase of its contribution, an average increase of 7.6% per year. Consequently, the initial negative contribution of this country (-0.031) is now positive (0.065). Albania ranks second with an increase of its contribution at 6% on average; however, its contribution remains negative. On the other hand, the strongest decrease was recorded in Serbia-Montenegro (-6.8% on average) and to a lesser extent in Macedonia (-2.1% on average). Finally, the contribution

to inequality of Croatia remained fairly stable, suggesting a slight increase of 0.5% on average in the 1989-2005 period.

In comparison to the Balkan countries, the inequalities among the EU-27 countries have increased by 1% on average. However, we observe a slight downward tendency, started in 1993 (see Figure 1). From the perspective of EU enlarged to the five Balkan countries, we find that inequality levels are more considerable (see Table 4 and Figure 1). The Theil indices are at 0.109 in 1989 and 0.142 in 2005, indicating an increase of 1.7% per year. Inequalities *within* are largely predominant with shares over 60%. However, we notice that the component *between* has increased the most: 2.9% on average. Hence, the share of Between-inequality has gone from 33% in 1989 to 39% in 2005.

Table 4 : Income Inequality Indicators of Balkan countries, 1989-2005

	Inequality contribution of GDP per capita		
Country	1989	2005	Average growth rate in %
Albania	-0.069	-0.047	6.0
Bosnia and Herzegovina	-0.031	0.065	7.6
Croatia	0.155	0.166	0.5
Macedonia	-0.019	-0.047	-2.1
Serbia and Montenegro	0.031	-0.060	-6.8
		Theil index	
Balkans	0.068	0.078	0.8
EU-27	0.074	0.086	1.0
	Decomposition of total Theil index (EU-27 and Balkans)		
Inequality Between (share in %)	0.036 (33)	0.056 (39)	2.9
Inequality Within (share in %)	0.073 (67)	0.086 (61)	1.0
Theil Total	0.109	0.142	1.7

Note : GDP per capita in PPPs (Purchasing Power Parities) 1990 US$.
Source : Calculation by the authors according to GGDC Database.

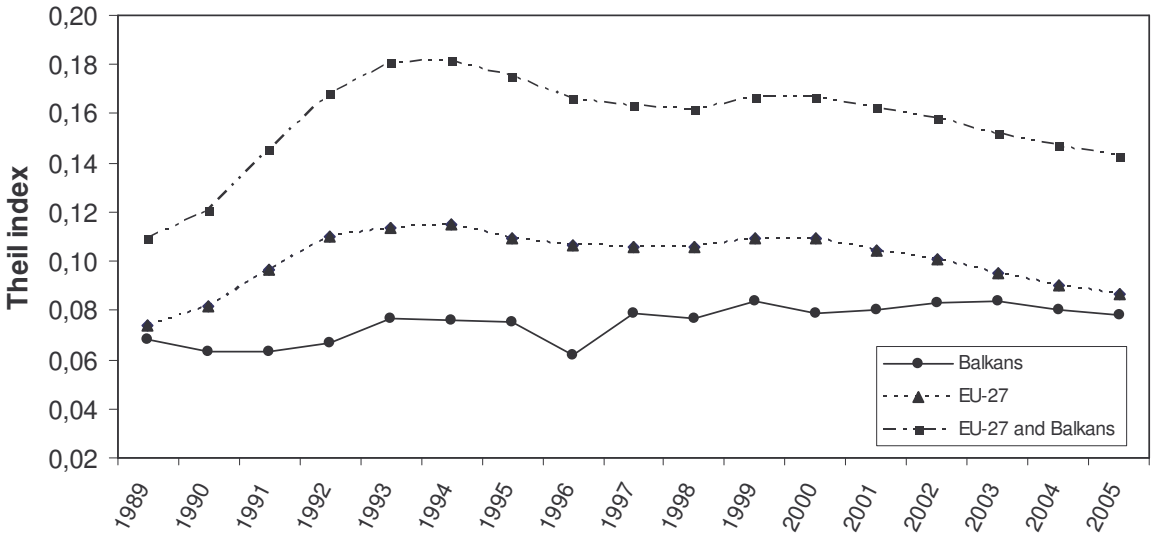

Figure 1. Income Inequality, 1989-2005.

ESTIMATION RESULTS FOR THE INEQUALITY CONVERGENCE MODEL

Estimation method

The equation (6) of inequality convergence can be re-written as follows:

$$TC_{it} = \beta Z_{it} + u_{it} \ , \qquad (7)$$

where $Z_{it} = x_{it} TC_{it-1}$ and x_{it} is the relative growth index. The error term u_{it} is composed of a country-specific effect μ_i and of an independently identically distributed random term ε_{it}, with mean zero and variance σ_ε^2. Under this form, the country heterogeneity is taken into account through adjunction of the country-specific effect. The equation does not contain any constant term because theoretically, in the long term, the equilibrium is characterized by a stationary state where contributions are at zero.

The estimation method should take into account the possible endogeneity occurring through the explanatory variable Z_{it} in order to provide estimators with best properties. If Z_{it} is correlated with the country-specific effect μ_i, the *within* estimator is obtained by applying OLS (Ordinary Least Squares) to the specification in terms of deviation from the country means. In this case, the effects are treated as fixed. In contrast, if the effects μ_i are treated as random and not correlated with the explanatory variables, the GLS (Generalized Least Squares) estimator is the most efficient linear estimator (see Baltagi, 2001). The Hausman statistics, based on difference between two estimators allows to test the hypothesis of independence among the effects and the explanatory variables of the model (see Hausman, 1978). However, due to the presence of endogenous lagged variables, *within* and GLS methods do not lead to efficient estimates as long as the dimension (individual or temporal) is finite. One of the solutions is to use the IV (Instrumental Variables) method. In particular, in presence of country-specific effects, it is possible to obtain more efficient estimators (see Sevestre and Trognon, 1995, pp.133-136) using the GIV (Generalized Instrumental Variables) method. At first, the procedure consists in deducting an estimation of variances σ_μ^2 and σ_ε^2. Second, we apply OLS on the transformed data $TC_{it} - \hat{\phi} TC_{i\bullet}$ and $Z_{it} - \hat{\phi} Z_{i\bullet}$, with $\hat{\phi} = 1 - \sqrt{\hat{\theta}^2}$ and $\hat{\theta}^2 = \hat{\sigma}_\varepsilon^2 [\hat{\sigma}_\varepsilon^2 + T\hat{\sigma}_\mu^2]^{-1}$ and using Z_{it-1} as instrument (or its transformation in the same way, $Z_{it-1} - \hat{\phi} Z_{i\bullet-1}$).

For the variable coefficient model, the specification for estimation is as follows:

$$TC_{it} = \beta_i Z_{it} + u_{it} \ . \qquad (8)$$

The previous estimators (*within*, GLS and VI) are not consistent (see Pesaran and Smith, 1995 ; Pesaran *et al.*, 1995). If we suppose that the countries behavior are fixed, Pesaran *et al.*, (1995) show that the simple arithmetic mean of individual estimations provides a consistent estimator of $\beta_\bullet$ if *N* and *T* tend toward the infinity. However, because individual estimations risk being implausible when the temporal dimension is low, we can rely on the Stein-rule shrinkage estimator regarded as more robust (see Maddala and Hu, 1995). The

estimator is defined as a weighted average of individual estimators and of the estimation obtained from the pooled regression. The weight depend on a term expressing the degrees of freedom and the Fisher statistic for testing the homogeneity of behaviors, i.e. the null hypothesis of the equality of β_i (cf. Judge and Bock, 1978, pp 190-195). When β_i are treated as random, $\beta_i = \beta + \xi_i$ where ξ_i is an error term which captures country specificities. The estimator of β is a GLS estimator defined as a weighted average of individual estimators (see Hsiao, 1986 ; pp. 130-134). As β_i is random, only β and σ_ξ^2 are estimated. However, we can derive a prediction for the individual parameters β_i based on a procedure developed by Lee and Griffiths (1979).

Estimation results

Table 5 presents estimation results of the specification (7). Columns (a) and (c) present OLS estimations. Columns (b) and (d) refer to GIV estimators, and our comments will be related to these. Results obtained for the EU-27 countries show a persistence of contributions to international inequality. The parameter of income convergence is close to 1. Convergence speed λ computed from the relationship $\beta = e^{-\lambda}$ is almost zero. As the relative growth index for EU-27 is close to 1 ($x_{\bullet\bullet} \cong 1$), the parameter of convergence of contributions to inequality is $\hat{\alpha}_{\bullet\bullet} \cong \hat{\beta} \cong 1$. In contrast, the results for Balkan countries show evidence for income and inequality convergence. Estimated speeds are at 2.8% for income convergence and 2.7% for contributions convergence to inequality. Thus, these results confirm a process of real convergence among Balkan countries.

Table 5 : Estimation results of inequality convergence model, 1989-2005

	EU-27		Balkan countries	
Dependent variable TC_{it}	(a)	(b)	(c)	(d)
$\hat{\beta}$ -convergence	1.002**	1.001**	0.992**	0.972**
	(0.003)	(0.005)	(0.017)	(0.026)
Speed of convergence	-0.2%	-0.1%	0.8%	2.8%
$\hat{\alpha}_{\bullet\bullet}$ - convergence	1.002	1.000	0.993	0.974
Speed of inequality convergence	-0.2%	0.0%	0.7%	2.7%
SEE	0.001	0.001	0.017	0.017
Observations	432	405	80	75

Note : (a) and (c) OLS (Ordinary least squares) estimations. (b) and (d) GVI (Generalized Instrumental variables) estimations. Numbers in parentheses are standard errors. (*) and (**) represent statistical significance at 5% and 1% level, respectively. SEE: Sum of estimated errors.

As $\hat{\alpha}_{it} = \hat{\beta}\, x_{it}$, we can observe the evolution of convergence speed of contributions to inequality, subject to evolution of the relative growth index (see Figure 2). We therefore notice that the contribution convergence speed ($-\ln(\hat{\alpha}_{\bullet t})$) tends toward the level of income

convergence speed ($-\ln(\hat{\beta})$). Indeed, in the long term, the stationary state represents a situation where the growth rate of average individual income, a_{LT}, is equivalent to the growth rate of average income, b_{LT}. It then follows that the relative growth index will tend toward 1 ($x_{LT} \to 1$). Thus, in the stationary state, the two convergence speeds will coincide $\alpha_{LT} \to \beta$. Figure 2 shows that the speed of convergence of contributions to inequalities in the Balkans tends toward 2.8% while that in EU-27 tends toward the level of 0.0%.

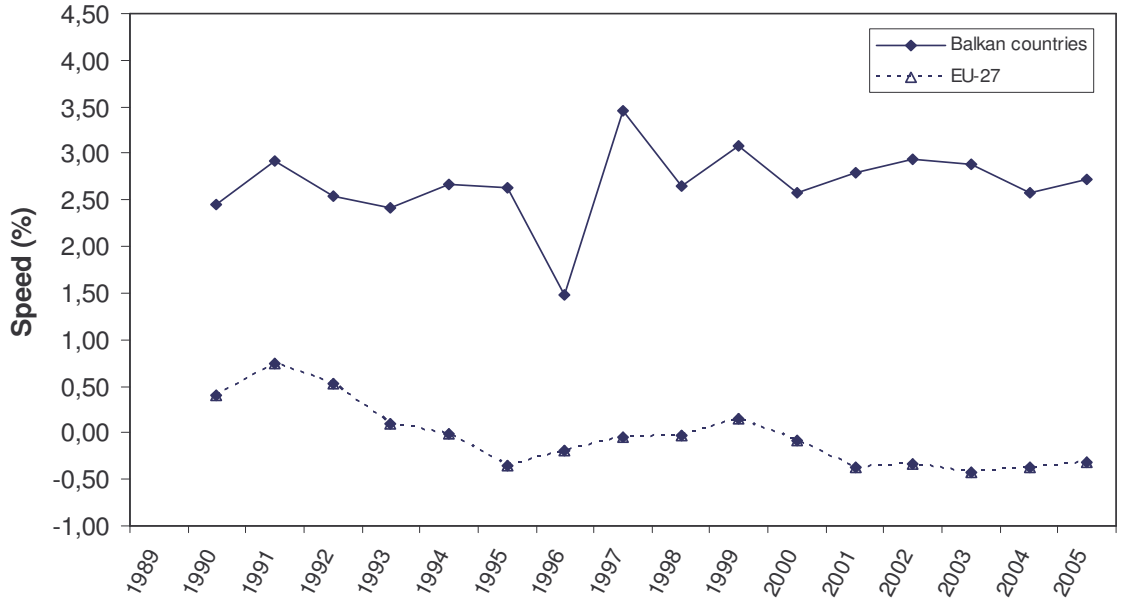

Figure 2. Speed of Inequality Convergence, 1989-2005.

Table 6 presents the estimation results for the specification (8) under the hypothesis of heterogeneity of β_i. In comparison to previous results, we find that the convergence speed is now slightly higher for EU-27: 0.7% for income convergence speed and 1.2% for convergence speed of inequality contributions. In the case of Balkan countries, the speed is now slightly lower: between 1.9% and 2.1% for income convergence speed, and between 1.6% and 1.8% for inequality convergence speed. These results may suggest heterogeneity of behavior, more visible in the EU-27 than in Balkan countries. However, test results under the hypothesis of homogeneity lead to accept the hypothesis of homogenous behavior. Chi-square statistics (see Hsiao, 1986) are at 35.5 for EU-27 and 1.49 for Balkan countries. At 5% level of significance, these values are lower than the theoretical values 38.89, for 26 degrees of freedom, and than 9.49, for 4 degrees of freedom. In conclusion, we cannot reject the hypothesis of homogeneity.[9]

[9] Although, one can wonder about the validity of such a result and especially the choice of 5% level of significance. These levels are often criticized and more still in the context of a pre-test (see Maddala, 1995).

Table 6 : Estimation Results of variable coefficient model, 1989-2005

Estimation	$\hat{\beta}_{\bullet}$ -convergence		$\hat{\alpha}_{\bullet\bullet}$ - convergence		Homogeneity-test
	Random-Coefficient	Stein	Random-Coefficient	Stein	Chi-square statistics
Balkan countries	0.981	0.979	0.984	0.982	1.49
(Speed in %)	(1.9)	(2.1)	(1.6)	(1.8)	
EU-27	0.993	0.988	0.993	0.988	35.5
(Speed in %)	(0.7)	(1.2)	(0.7)	(1.2)	

Note : Homogeneity-test : for 5% significance level, chi-square critical value of 38.89 with 26 degrees of freedom for EU-27, and of 9.49 with 4 degrees of freedom for Balkan countries.

CONCLUDING REMARKS

In this study, we have presented a first attempt to model the inequality convergence process of GDP per capita. The originality of our approach is to consider the convergence of country contributions to global inequality as compared to the classical approach of income convergence. In particular, the model allows for catching both the phenomena of income and inequality convergence. Our empirical inquiries were based on five Balkan countries, that we also compared with the EU-27 situation in the 1989-2005 period.

The results show a tendency toward convergence of Balkan country contributions to global inequality. This statement is less clear-cut if we observe the situation in EU-27 where persistence was detected. The consideration of individual heterogeneity corroborates these results. However, statistical tests do not confirm the hypothesis of heterogeneity of behavior.

Our findings represent a contribution to convergence studies of economies. Our approach can be placed in the domain of analysis of international inequalities as well as of efficiency of European policies. Indeed, in the framework of European economic integration, one of the European Commission's objectives is to equalize incomes among different member States. However, as we underlined at the beginning of this paper, the European convergence process has considerably slowed since the 80s. Our results confirm this convergence slowdown in the case of the EU enlarged to 27 countries. In contrast, the results show a real convergence process among Balkan countries. However, although this development has helped reducing the disparities among Balkans, the development gap relative to the EU remains significant and has grown deeper in the observed period. Between 1989 and 2005, the relative average income of Balkan countries has dropped from 40% to 28% of the EU level. Consequently, in the perspective of EU enlargement eastwards, the European policies need to take this reality into account. The EU should support additional actions favorable to the development of the Balkan region, without deepening the disparities among countries. For example, it acts of defining and realising common strategic development objectives of the Balkans. In the context of a faster integration of the Balkan region into EU, the process of economic and institutional reforms, and the promotion of mutual regional cooperation should be coordinated and better harmonised.

With respect to our approach, numerous directions could be considered both at the theoretical and the empirical levels. It could be interesting to study more deeply the relationship which may exist between income and inequality convergence. The causality between the two phenomena is a crucial question: does the strong convergence create more inequality or do significant inequalities represent a handicap to convergence ? This question remains at the heart of studies on growth and inequalities (see Bénabou, 1996 ; Aghion *et al.*, 1999 ; Barro, 2000 ; Forbes, 2000). From an empirical perspective, it could be interesting to incorporate determinants of inequalities in the model. Among these, it could be judicious to consider the variables used in the study of conditional convergence. Levine and Renelt (1992) list no less than 15 variables used in the literature on growth. However, they conclude that the convergence relationship keeps its robustness with investment and initial value of income, while other variables loose their significance (e.g., population growth, monetary and fiscal variables, etc.). Finally, technological heterogeneity did not receive much attention in the empirical literature on economic convergence. This question is currently regaining importance in the EU. European policies, through structural funds, have supported the less developed countries with the aim of reducing income disparities. Currently, with the creation of the European Research and Innovation Area (Lisbon Summit in 2000), European policies increasingly support technological and research development.

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