



CONVERGENCE AND DIVERGENCE AMONG COUNTRIES

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ABSTRACT

This paper focuses on the study of the conditional convergence hypothesis among African countries that belonging to the West African Economic and Monetary Union (WAEMU), More precisely, this paper treats even the effect of convergence, stability and growth pact on the convergence dynamics, by considering control variables comprising: the share of investment in gross domestic product the enrollment and the opening ratio, the study showed that these variables contribute to the revival of economic growth in the region. We use two estimation technique: within and system generalized method of moment, for the period 2000-2012. Similarly we give special attention to two streams of conflicting thoughts. The first is based on the positive impact generated by the opening on convergence of income among nations, while the second is almost contradictory to the one defined above, this current is called divergence or inequality between countries.

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Contribution/ Originality

This study documents the relationship between the Pact of Convergence Growth Stability and Solidarity and the real convergence of a group of African countries. The empirical results showed that the adoption of the Pact is in favor of economic growth, according to two estimation methods, within and the GMM system.

1. INTRODUCTION

Convergence is a process of approximation of qualitative and quantitative characteristics, each country that is part of a trade group converges to its own growth path designed as the simple

average of the per capita GDP of convergent Group. The convergence hypothesis among nations has been the subject of intense controversy due to the diversity of analyzes that confirm in the cases and in others refute this hypothesis, hence the appearance of a second current of economists seeking to criticize the concept of trade liberalization for having intensely help reinforce disparities between countries.

Thus, contrary to the generally accepted idea, the opening may increase the factors of regional divergence, in the sense that the elimination of tariff barriers between nations promotes the consolidation of economic activities in the rich countries which could strengthen the phenomena of polarization and unequal growth, these phenomena will result in a marked tendency to divergence of economies. Accordingly, we will grant a special interest in two phenomena convergence and divergence of nations by presenting the main debates that occurred between economists following the confrontation between the theoretical and empirical studies on the subject.

1.1. Convergence or Divergence between Nations

The concept of convergence between countries in terms of GDP per capita is currently a common question of economic thinking, this convergence hypothesis is based on the neoclassical growth models. For these models the convergence will occur when a poor country tends to catch up with per capita income of the rich country in the long term. Indeed, it is through the opening that convergence process is initiated and eventually minimizes the disparities of income distribution between countries. This argument was later challenged by several economic studies.

The concept of convergence can be defined according to [Laffargue \(2003\)](#) in terms of production, per capita income or wage rates it may also be defined in terms of the country's position in the industrialization process. Thus, the 1820-1913 period was not characterized by a convergence South to the North since the South was a raw material supplier and it was not until 1950 that the country converged group has notably grown with China and part of Asia, converging countries have opened up to the world economy and have relatively high growth rates.

Convergence was ensured by the contribution of some factors called convergence forces attributed to factor mobility, goods and technology [Roco and Bainbridge \(2013\)](#). Concerning capital mobility we argue that the lower capitalization compared to the existing workforce reduced capital intensity in the least developed countries. Which reduces their productivity and decreases their standard of living in terms of gross domestic product. However, openness promotes the movement of capital in the more developed countries to other benefiting from the accumulation of capital, which stimulates domestic saving and ensures convergence, knowing that it is ensured only when the South have already a certain level of industrial development.

With the mobility of goods and in the framework of the neoclassical theory of international trade, the exchange of goods can offset capital mobility to ensure convergence between countries in terms of real remuneration of factors . From the outset, the perfect mobility of goods provided by trade openness is based on the specialization of countries, thus, each country specializes in intensive good factor that is better equipped, this specialization draws, therefore, relatively few

factors. Marginal productivity of factors vary so oppositely in the North and the South which leads to convergence.

Moreover, the mobility of technical and trade liberalization in the context of neoclassical models, is considered an accelerating element of convergence, indeed, technological innovation is designed as a public good available to all countries, rich of them allow the lagging countries to save their spending on research and development and benefit of their techniques.

Thus, the simulcast of the same technique in two unequally developed countries can help the least developed to achieve a technological leap, all these factors ensure the South catching up and thus promote convergence. Moreover, the neoclassical growth models argue that disparities in terms of per capita income levels tend to tighten, this result was proven for a group of nations by Ben David and Rahman (1996). Similarly Serranito (2013) concluded that since 2000 some developing countries converged toward the European per-capita income level.

In this regard, convergence can be defined as a catch up. Two different contexts are presented in the sample of countries considered namely absolute convergence and conditional convergence. The adjustment mechanism is the beta convergence concept with a coefficient β that combines the growth rate and the level of per capita income, if the coefficient is significantly different from zero, the β -convergence is conditional.

In this case, countries with similar characteristics in terms of technology and population growth converge towards each other regardless of their initial situation, which was confirmed by Barro and Sala-I-Martin (1992) and Barro (2000). In this connection Murphy and Ukpolo (1999) were able to demonstrate a conditional convergence for African countries during the period 1960-1985.

However, convergence is absolute if all countries converge to the same level of long-term income, in this context, the convergence hypothesis implies that the less developed countries grow faster than developed, There will be a catch-up phenomenon of the poorest countries. In this context, Barro (2000) argued that the convergence is absolute when all countries have the same intrinsic characteristics with the exception of their capital capacity, especially in terms of revenue. In this context the per capita growth of the poorest countries tend to grow faster than rich countries, which is not possible.

Similarly, another measurement concept is used in the economic literature is that of sigma convergence, this coefficient reflects the decrease in the disparity in per capita income of a country considered sample. Sigma convergence is measured by an indicator of dispersion such as the variance of log income or production per person. Hence, sigma convergence is detected if there is a downward trend in the dispersion of the values of this variable in a group of countries.

Indeed, for a sample of countries where sigma decreases from the initial date and the final date, we accept the convergence hypothesis. Fisher econometric test checks if the variance of end period is significantly lower than that of the early period. The σ convergence test is defined as a group of economies converge in the sense of σ when the dispersion of GDP per capita decreases with time. This method was used by Dalgaard and Vastrup (2001).

Moreover, the concept of convergence can be defined from the persistent deviations of GDP per capita. In this context, the convergence hypothesis is verified when the deviation of log (GDP / capita) of the concerned countries cannot move away permanently from zero, it turns out that the method of time series econometrics is an essential tool for this approach.

However, [Quah \(1996\)](#) suggested that neither beta convergence or sigma convergence show pertinently the issue of convergence, he found an alternative approach to previous. Consequently, to understand the convergence Quah argued that it is more important to focus on the behavior of savings compared to each other. Indeed, the failure of the traditional model for the treatment of the issue of convergence has led to the emergence of other theories to analyze the dynamics of international distribution of per capita income and to detect the stratification of the world. From then on, a group of countries for which we accept the convergence hypothesis is called "convergence club".

In this context, [Quah \(1996\)](#) attempted to model the dynamics of income distribution at the international level, he highlighted the stratification of GDP per capita in two poles rich and poor. The author has posed two problematic, The first concerns on the economic structures to form a convergence club and the second focuses on the nature of the clubs formed: rich/rich, poor/poor or rich/poor.

The study of Quah was based on structural economic and political variables that determine the membership of a country at a convergence club, these variables often cover the initial conditions of the economy as the initial stock of physical capital or human capital and social and institutional capacities that develop new technologies, that develop new technologies, proliferate positive externalities and to guard against internal and external disturbances such as the opening of the world economy and political credibility.

Indeed, initially the literature on convergence was characterized by a unified model from a stationary equilibrium as was the case with the study of [Barro and Sala-I-Martin \(1992\)](#). Later, this empirical vision has been replaced by another that considers the convergence as a process of multiple equilibria where there are two or more convergence club according to studies of [Durlauf and Johnson \(1995\)](#). At the beginning, the notion of convergence club was introduced by [Baumol \(1986\)](#) it meant a concept of global economic polarization into several groups.

[Serranito and Guetat \(2007\)](#) have rejected the beta-convergence hypothesis during their study period from 1960 to 2000, however the model estimation on sub periods leads to the conclusion that there may be a beta-convergence movement only from the second half of the nineties, nevertheless, the convergence process does not affect all countries. The authors distinguished two convergence clubs within the first countries converge to the same level of income that the countries of southern Europe, while in the second income level is much lower. In this framework the countries trying to catch up to European levels are Turkey and to a lesser extent Tunisia.

Other work on the catch of southern countries fail to highlight a systematic trend of convergence, this school of thought is interested in the phenomenon of divergence arguing that the exchange which does not benefit all our countries cause huge disparities. Thus, given the increase

in inequality recorded over the last decade, economic theory has reproduced another almost contradictory phenomenon in its characteristics to that of convergence, called divergence or international inequality.

The divergence is supported by a number of economists who lean towards the existence of a huge disparity between nations on the basis of empirical evidence on the subject. Indeed, [Maddison \(1995\)](#) showed a remarkable disparity between countries since 1820, with the exception of a convergence of North America, Western Europe and Asia East after 1950.

Later [Pritchett \(1997\)](#) suggested that the modern economy is characterized by a difference of life and productivity levels between developed countries and developing countries arguing that the debate on global income distribution has always suffered from a lack of representativeness of the samples studied due to the lack of reliable historical data for the majority of the least developed countries.

Similarly, [Benzidoun \(2004\)](#) say, after studying the evolution of inequality between countries for thirty years, the lack of systematic upgrading of rich countries by other poor. This divergence is because the majority of countries at both ends of the distribution remained so, and countries belonging to the intermediate group in 1960 were divided to join the group of rich countries or poorer.

Meanwhile, the conditional convergence approach has received huge objections. Criticism of conditional convergence are both methodological, statistical and conceptual in the sense that there may be such nonlinearities in existing technologies in each country, this characteristic was concealed by the traditional approach which implicitly assumes a common linear specification in all economies.

Indeed, debates on the economic evolution of developing countries and existence of the catching up has reached into new dimensions due to the globalization of economies, several empirical studies are opposed in this level. We present in the following the different opinions on this subject.

1.2. Empirical Debate on the Relationship Opening-Income Convergence

The concept of convergence between countries has its origins in neoclassical models of economic growth that defend the positive impact of free trade on growth and on the convergence of countries' performance. Indeed, although the positive effect seems to be acquired by many, we highlight that there is a large empirical debate, which is sometimes confused for anti-globalization.

Thus, the new theories of international trade followed by those of endogenous growth seeks to restore the debate on the link between trade liberalization and income convergence, these theories have clearly stated the risk of divergence in growth rates due to the commitment of countries to trade agreements. Indeed, defending the convergence theory does not mean to challenge some divergence during defined periods between the very rich and the poorest countries.

However, other studies suggest that economic development at the international level is shown by a convergence given that most countries have improved during the twentieth century as has

proved Jones (1997). So in order to demonstrate the concept of convergence, the author decided to use the gross domestic product per worker and not per capita as a measure of a country's income since it takes into account the production off the market that is quite important in developing countries. Through this methodology, the author found an improvement in the global distribution of income between 1960 and 1988. Jones (1997) defended the convergence thesis, without addressing the question focused on the effects of globalization.

In contrast, Williamson (1997) has affirmed the positive correlation between openness and convergence by comparing studies for the period 1870-1913 and the recent period relating to globalization, he estimated that convergence was held during the second period leading to increased internal inequality in rich countries and a decline in poor countries in accordance with the theory of international trade "Heckscher-Ohlin - Samuelson."

Similarly, for a study of the OECD countries, Coe and Helpman (1995) proved the productive contribution of Research and Development stranger next to a domestic research and development, Similarly, Ben David (1993; 1996) and Sachs and Warner (1995) confirmed these results by presenting a positive link between trade and income convergence.

Sachs and Warner (1995) suggested that open economies exhibit a clear trend towards economic convergence, the convergence club is not other than the club of economies associated to each other by global trade. From the outset, the authors have tried to classify each country according to its open or closed to the world economy on the basis of five different criteria: Coverage of non-tariff barriers, Tariff rates, effect of the movement of black market on the exchange rates, Socialist or capitalist global economic system and the extent of state intervention in the export sector.

Bernard and Jones (1996) have shown evidence that the opening diverges incomes across countries claiming that the principle of comparative advantage gives primacy to the diversification of the exchanged goods, there will, in the result, no reason to anticipate the similarity of production technology nor the convergence of factor prices over time.

Besides, Rodriguez and Rodrick (1999) do not support the results presented by Ben David (1993) showing that the exclusion of Germany from the sample of European countries used by Ben David leads to the conclusion that most liberalization episodes since the nineteenth century do not correspond to periods of convergence or divergence between nations, these authors challenge, in fact, the link between openness and convergence supposed by Ben David for the countries of the European Free Trade Association.

In addition, at the global level Rodriguez and Rodrick (1999) took the example of Latin American countries that have seen a convergence of their income during the period of substitution of imports, then a divergence from the late 80s, a time when these countries have opted for economic liberalization.

In contrast, by paying more attention to the role of increased trade flows, Ben David (1996) states that the probability of convergence hypothesis verification is much higher for groups of countries that commercialize with each other than in groups formed randomly or based on the non-

commercial criteria. In addition to this research, [Ben David and Rahman \(1996\)](#) evaluated two mechanisms promoting the absolute convergence between countries, the first is based on the convergence of capital intensity ratios and the second on the technological levels. On this basis, they find that groups of countries formed according to a reciprocal exchange are distinguished from others by the convergence of total factor productivity, not of their ratios capital work.

Ben David is the same view that [Williamson \(1997\)](#) who noticed a strengthening of the convergence process and an acceleration of economic growth due to globalization. Nevertheless, these results were contested by [Slaughter \(1998\)](#) which sought to identify the contribution of trade as the difference estimated between variation in convergence rate, pre and post liberalization between the two groups of countries. In fact, according to this author, none of the four cases of liberalization (EEC, EFTA, EEC-EFTA, UNITED STATES-CANADA) valid convergence hypothesis. The author has instead revealed a negative relationship between openness and convergence, this is in fact an argument for the divergence of economies. The results presented by Slaughter corroborate those of [Frankel and Rose \(1998\)](#) and [Canova and Dellas \(1993\)](#) showing that trade openness increases the differences between countries and does not reduce them.

In response to this work, [Taylor \(1999\)](#) provides a neoclassical model with open economy based on the migration of capital and labor to challenge the work already cited and prove the convergence of a series of country. On the same basis, [Ben David and Kimli \(2000\)](#) prove again the coincidence between the intensification of international trade and the increase in intra-group convergence.

Later [Hallett and Piscitelli \(2002\)](#) identify the conditions of onset of convergence phenomenon, these are actually small economies and not well integrated that converge, but others that are more stable and integrated into the global economy diverge. Similarly, by focusing on the Asian countries for a period of 1960-2000, [Park \(2003\)](#) proved that during most years, a divergence has increased between countries and only that in the last period that convergence has occurred.

In this regard, the research opposing. The debate on the relationship Convergence-divergence of the country following the opening has grown and is growing steadily, in effect against anti-globalization [Epistien et al. \(2003\)](#) have shown that the convergence increases with the opening especially for OECD countries over the period 1870-1992. In this context, [Welsch and Bonn \(2006\)](#) meet the research of [Hein and Trug \(2005\)](#) which states that the per capita income in the countries of the European Union has seen a divergence. To do this, the authors argue that the concept of convergence / divergence corresponds to the decrease / increase in income distribution inequality. The study showed that the dispersion tends to increase between 1980 and 1995 and reduced thereafter.

In contrast, a study in China by [Pedroni and Yao \(2006\)](#) showed that the long-term effect of economic openness is a divergence of economies, in the sense that regional income diverged in China at the same time that the country has opened these economies for a large international business. [Akanni \(2003\)](#) studies economic convergence in developing countries, members of an integration, the author stated that convergence is not assured and timeliness of growth effects are

extremely long, more than a few decades. Indeed, there are many studies that show the negative impact of globalization, particularly in terms of increasing disparities and divergence among nations.

The empirical study in this paper will focus on real convergence between a number of African countries which have formed a West African Economic and Monetary Union (WAEMU).

1.3. Study of Real Convergence

The objective of this paper is to study the real convergence between the member countries of the West African Economic and Monetary Union in order to achieve this objective we used the Within and the system GMM estimation to the following equation :

$$y_{it} = (1+\beta) y_{i,t-1} + \alpha x_{i,t} + \mu_i + \varphi_t + \varepsilon_{i,t}$$

with y_{it} is the log of real gross domestic product per capita of country i at time t , $x_{i,t}$ includes the share of investment in GDP, the opening ratio measured by the share of exports and imports in GDP and the enrollment rate at primary level, μ_i is the specific effect of countries allowing that allow to control other growth determinants not taken into account in $x_{i,t}$, φ_t is the specific effect at the study period, $\varepsilon_{i,t}$ is the error term.

Considering $n_{i,t}$ the number of criteria of convergence respected by country i at time t and its relationship with the logarithm of lagged GDP per capita, the equation to be estimated is:

$$y_{it} = (1+\beta) y_{i,t-1} + \Omega n_{i,t} + \gamma n_{i,t} y_{i,t-1} + \alpha x_{i,t} + \mu_i + \varphi_t + \varepsilon_{i,t}$$

The different estimates made within and system generalized method of moment GMM system for the preceding two equations and during the period 2000-2012 are shown in the following table:

Table-1. Econometric Results

Variables	(1)	(2)	(3)	(4)	(5)	(6)
$y_{i,t-1}$	0.828 (-0.069)	0.825 (0.0721)	0.701 (0.117)	0.963 (0.0248)	0.98 (0.0012)	0.98 (0.006)
$n_{i,t}$		0.0173 (0.0303)	-0.0279 (0.0368)		0.0572 (0.0202)	0.0301 (0.0114)
$n_{i,t}y_{i,t-1}$		-0.00219 (0.0039)	0.00497 (0.0053)		-0.0071 (0.0021)	-0.0019 (0.0013)
IN			0.0787 (0.0791)			0.121 (0.0511)
OP			0.111 (0.0564)			0.017 (0.0294)
SC			0.031 (0.021)			0.012 (0.011)
Const	0.969 (0.397)	0.962 (0.414)	0.1629 (0.6593)	0.208 (0.1503)		
R-squared	0.802	0.815	0.848			
Fisher test	4.93	5.02	5.11			
Wald test				0.00	0.00	0.00
AR(2)				0.41	0.40	0.44
Sargan test				0.44	0.83	0.96

Estimates (1), (2) and (3) are performed using the Within technique, in order to test the conditional convergence hypothesis and the effect of Convergence, Stability, Growth, and Solidarity Pact on convergence dynamics by integrating or not the control variables. The values in parentheses represent robust standard errors. While estimates (4), (5) and (6) are obtained by GMM system related to [Blundell and Bond \(1998\)](#), it is an estimate of a system of equation in both first-differences and levels, where the instrument used in the levels equations are lagged first- difference of the series. Thus, the system GMM estimator combines the equations in first- differences with the equations in levels.

We note that the convergence coefficient is negative and statistically significant in the within estimator in this context $1 + \beta = 0.828$, the convergence coefficient will be $0.828 - 1 = -0.172$, that coefficient has increased with the introduction of control variables, it is of the order of -0.3, similarly, the estimate (3) has reversed the sign of the coefficient number of criteria met by interaction with the logarithm of the lagged GDP, this coefficient is not significant in estimation (2), nor with the introduction of the control variables with the estimate (3). Through estimation Within, the CSGS effect on the dynamics of convergence is not significant, this effect becomes significant with system GMM estimator.

By focusing on the control variables, we notice that the opening rate variable positively affects economic growth, which is the same for the enrollment variable highlighting the importance of human capital in promoting growth of countries. The estimate also shows a positive effect of the investment on economic growth of the region.

2. CONCLUSION

The impact of trade liberalization on the dispersion of living standards between countries aroused obvious interest among theorists of international trade and inequality. In this respect, opinions differ between those who see the opening as a catch-up opportunity in developing countries and others who see integration as a strengthening of disparities between countries. This paper analyzes the two perspectives with particular attention to the concept of convergence and divergence between countries.

The econometric study aims to clarify the relationship between Pact of Convergence, Stability, Growth, and Solidarity and the real convergence of countries belonging to the West African Economic and Monetary Union (WAEMU), we rely on two estimation techniques: within and system generalized method of moment. The study showed that the pact has contributed to real convergence of countries. As a control variable we introduced the open rates, school enrollment and the share of investment in GDP, these variables positively affect the promotion of growth in the region.

2.1. Implications Policies and Recommendations

The Convergence, Stability, Growth, and Solidarity Pact has led to real convergence in the West African Economic and Monetary Union. The convergence criteria are relevant, thus the

promotion of regional integration is conducive to economic growth. It follows that the actions of economic policy in the context of the pact are efficient, except that this efficiency is accomplished by severe multilateral monitoring system. Therefore, we recommend strengthening multilateral surveillance process in the West African Economic and Monetary Union, likewise a sanction application is recommended in case of non compliance with the criteria.

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