

The economic dimension in regional division in Morocco: analysis of the convergence of regions

La dimension économique dans le découpage régional au Maroc : analyse de la convergence des régions

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Abstract

This article will diagnose the extent to which the latest regional division in Morocco can allow for better convergence along with economic of regions. To do this, we used econometric modeling based on the σ -convergence test and β -convergence estimation. The study period considered is between 2004 and 2019 partitioned over 3 sub-periods of 5 years each. This allowed for 36 observations for absolute beta-convergence and for conditional beta-convergence. The test used is the Hausman test which grants us to test the presence or absence of a correlation between the specific effects and the explanatory variables of the model. The main results of this modeling are (i) the unconditional σ -convergence and beta- convergence do not prove the existence of convergence but rather divergence between regions, (ii) the conditional β -convergence was able to demonstrate convergence between regions. This can be explained by the fact that conditional β -convergence is only a necessary but not a sufficient condition to achieve the decrease in dispersion between regions in the sense of σ -convergence, (iii) the analysis shows that the regional division does not favor a convergence between regions and thus delays a sustainable economic takeoff of regions.

Keywords: *regional wealth, regional economic, convergence, territorial disparities, economic models, β -convergence, σ -convergence.*

Introduction and Issues

The economic dimension is of supreme importance in regional development and territorial promotion. This importance was emphasized by the New Development Model (NDM)¹, which gave huge priority to the role of the territory and considered it as a strategic hub of its implementation. Organic Law 111-14² on the region adopted in Morocco has dedicated economic development to the region, giving it precedence in the development of regional development plans (RDPs) and regional land use plans (SRAT). This regional dynamic stems from the strategic objectives of advanced regionalization as defined in the Moroccan State's broad political and socio-economic guidelines.

The economic issue has been an exclusive competence in relation to regions in the various divisions adopted by the public authorities since the 1971 division giving rise to seven economic regions, this was followed by 1996, which created 16 regions until the last division in 2015, reducing the number of regions to 12. At the same time, the economic component has been of paramount concern to global public policy. However, despite the progress made in terms of territorial organization, interregional inequalities in economic growth and territorial development persist. This calls into question the process of convergence of the regions because it has been found that disparities are increasing and development disparities between the regions are widening further.

In fact, the problem of economic convergence has been the subject of numerous theoretical and empirical studies which have tried to characterize and measure this notion. There are methods of measuring the convergence of regions resulting from territorial divisions. Within this framework, the economic literature distinguishes essentially two major concepts of convergence: β -convergence, which is concerned with the existence of a convergence mechanism, and σ -convergence, based on the evolution of the dispersion of per capita GDP of different economies over time. These concepts reflect the rapprochement of regions towards the same growth path (Swan, 1956 and Solow, 1956) or the same reference value. These two concepts, introduced by Barro and Sala-i-Martin (1990), refer to the measure of convergence. The aim of this paper, devoted to the study of "the economic dimension in Morocco's regional division: analysis of regional convergence", is to analyze THIS regional division ON THE

¹ Special Commission on the Development Model (CSMD). (2021). general report, the new development model, releasing energies and regaining trust to accelerate the march of progress and prosperity for all.

² Dahir N°1-15-83 of 20 Ramadan 1436 (July 7, 2015) promulgating organic law N°111-14 of regions, <http://www.sgg.gov.ma/>

BASIS OF the measurement of regional economic convergence through the estimation of beta-convergence and sigma-convergence.

More specifically, this article will focus on the extent to which the latest regional division would allow for greater convergence and economic integration between regions. This would contribute to the achievement of a real structural transformation of the regional economy and a reduction in disparities between regions. The methodological approach adopted is based on an analysis of the economic convergence of the regions using the beta-convergence estimation model and sigma-convergence for the 12 regions.

In addition to the introductory section, the rest of this research is structured in four parts. A presentation of the theoretical framework of convergence measurement, highlighting the interest of this approach in the economic development of regions (1); a review of the empirical literature on β -convergence and σ -convergence (2); the methodology adopted (3); and finally, a presentation of the results of our approach focused on convergence and economic growth based on the latest regional breakdown (4).

1. Theoretical background and state of the art

1.1. Overview of the theoretical and empirical literature on economic growth

The theme of regional economic convergence has occupied an important place in the literature devoted to the development of the country or regions over the past decade. The objective is to know whether the economies of the regions tend to converge over time towards the same level of income or production per capita. In the context of the last regional breakdown in 2015, it is necessary to know whether regional and territorial disparities are reducing. In other words, the aim is to find out if there is a catch-up mechanism allowing a regional economy to reach the per capita income level of a more developed economy (Baumol, 1986; Barro and Sala-I-Martin, 1991,1992)³.

Empirical studies on convergence have advanced significantly and many times show contradictory results (Quah and Durlauf, 1999; Quah, 2001; Islam, 2003; Janikas and Rey, 2008). According to Catherine Fuss (1999) convergence is said to occur when the gap between statistical series or their dispersion decreases over time.”⁴ Similarly, studies considering the interdependencies of the spatial dimension in the analysis of convergence from an empirical as well as theoretical point of view have multiplied in the early 2000s⁵.

Among the works that have addressed the question of economic convergence it is inevitable to cite the theory of growth developed by Robert Solow (1956). This theory postulates that it is possible to achieve economic convergence between regions with irregular growth. The principle of this theory suggests that the regional disparities initially created according to the different regional divisions tend to disappear over time. According to the Solow model, in the long term, economies had to converge towards the same stationary state, namely the same capital per head and the same production per head. So, applying this principle to the region, we can predict beforehand that each region is converging towards a rate of growth of income per head of long term called «steady state»⁶.

³ Baumont, C., Ertur, C. & Le Gallo, J. (2000) . Convergence des régions européennes : Une approche par l'économétrie spatiale,

⁴ Fuss, C. (1999). Mesures et tests de convergence : une revue de la littérature, Revue de l'OFCE n° 69, Département des études, Université Libre de Bruxelles.

⁵ Bourdin, S. (2013). Une mesure spatiale locale de la sigma convergence pour évaluer les disparités régionales dans l'Union européenne.

⁶ Stationary state is a state of the economy where capital grows at the same rate as all other variables, i.e. at a zero rate (source: Gilles de Truchis, growth and the Solow model Macroeconomics, Semester 2 - Year 2014-2015)

The problem of economic convergence has also been tackled in the light of the spatial approach, since growth cannot be achieved without space which determines the conditions necessary for balanced regional production leading to sustained economic development. Already in the 1960s, several economic studies emphasized the preponderant weight of space in ensuring balanced regional economic development. In this context, mention should be made of the work initiated by Jeffrey G. Williamson (in 1965) as they highlighted the role of space in explaining regional growth at a national level. This trend was at the heart of the current of the New Geographical Economy developed in the 1990s as part of the investigations conducted by Krugman. P (1991). According to this assumption, economic activities are generally concentrated around development poles composed by several regions or sub-regions. This polarization often leads to a change in the spatial distribution of wealth between regions and within the same region. This theory of the new geographical economy has given prominence to the role of space because this geographical parameter greatly helps decision-makers and territorial officials to better understand the phenomena of economic growth in general and in region.

In this context of regional development, it is also important to highlight the economic performance of neighboring regions. This reality was strongly revealed by (Getis, 1991) indicating that the geographical distribution of economic performance of neighboring regions is often similar. However, regional disparities continue to impact the contribution of regions to national GDP growth. This leads us to analyze these disparities in the light of studies on convergence.

1.2. Analysis of regional and territorial disparities in Morocco

The importance of economy as far as the regional division in Morocco is concerned goes back to the 1970s. At that time, there was a division based solely on the economic aspect called “The economic region”. This division was introduced in 1971 when seven economic regions were created, made up of neighboring prefectures and nearby provinces. These large regional groupings, which had no decision-making or management powers (Mohamed Berriane, 2015)⁷, were consulted only during the development of development plans in the 1970s and 1980s. The division into 16 regions, adopted in 1996, has come to highlight the human and economic

⁷ Berriane, M. (2015). Dynamiques territoriales et politiques publiques : territoires fonctionnels et territoires officiels.

realities of the regions. Unfortunately, this division has not been a precursor to sustained economic development; rather it has led to the emergence of great disparities between and within regions.

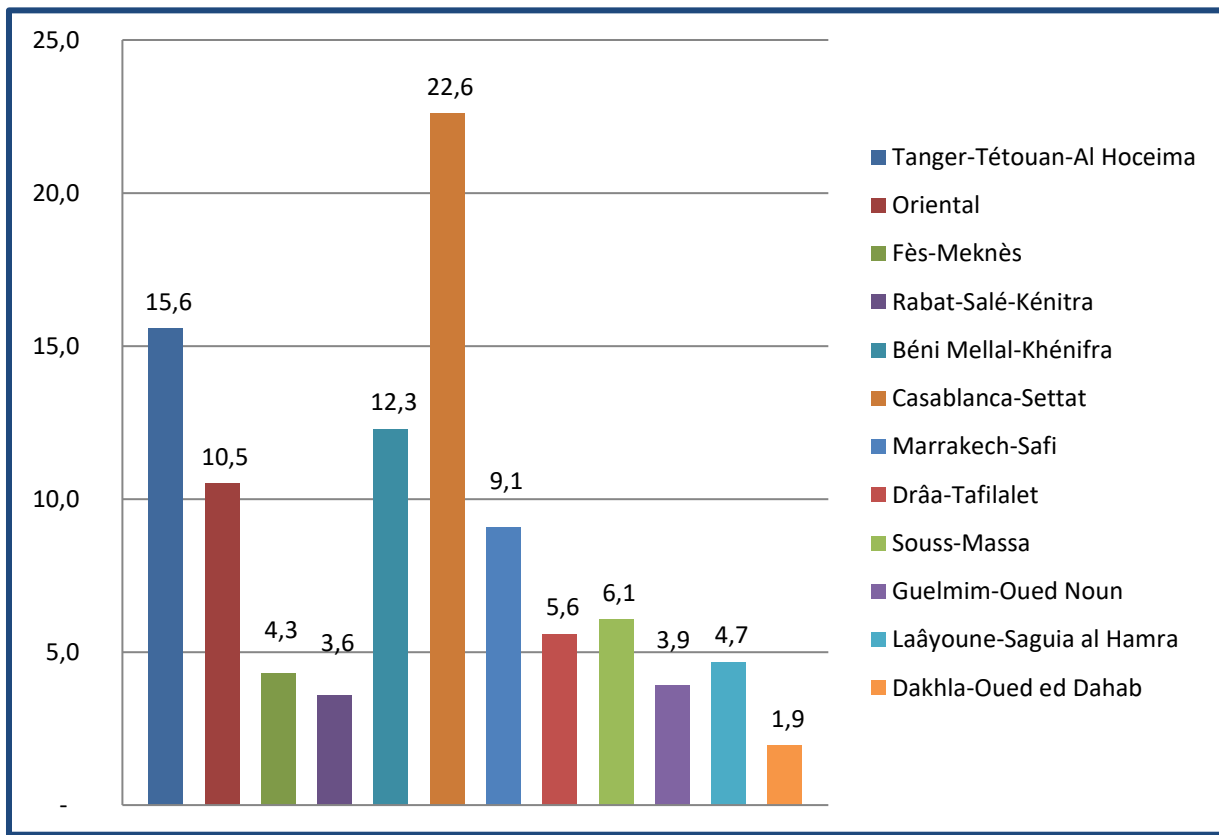
As for the new division of 12 regions, it corresponds to another logic based on the major poles or even two-urban poles radiating on spaces of economic growth. However, is it capable of generating a ripple effect between regions and fostering a tangible convergence of the regional economy?

Studies carried out by different institutions and agencies responsible for inspection and evaluation show that Territorial disparities have become increasingly intolerable and arise real problems to the economic social and environmental development of the regions. Several factors may explain this phenomenon, including the lack of coherence between public policies mainly at the regional level, the ineffectiveness of governance mechanisms and the lack of coordination of interventions between actors both at the national and regional level. Regarding the efforts made by public authorities through regional divisions, disparities between regions have always been central to theoretical and empirical debates on territorial development. Territorial decision-makers and researchers specialized in the field of regional economic development are trying to find out whether regional divisions tend towards convergence or on the contrary towards economic divergence. This means knowing whether the territorial disparities are widening or are oriented towards a process of regional convergence.

The indicators revealed in regional accounts by the Office of the High Commissioner for Planning in 2019 point to wide disparities in GDP growth rates between regions. Seven out of twelve regions recorded growth rates above the national average (2.6%). These are the regions of Guelmim-Oued Noun (7.1%), Laâyoune-Saguia al Hamra (7%), Drâa-Tafilalet (5.8%), Beni Mellal-Khénifra (5.6%), Oriental (5.5%), Dakhla-Oued ed Dahab (4%) and Tangier-Tetouan-Al Hoceima (3.8%).

In addition, 22.6% of national growth is to be attributed to the Casablanca-Settat region, which contributed 0.6 percentage points to GDP growth. The two regions of Tangier-Tetouan-Al Hoceima and Beni Mellal-Khénifra contributed 15.6% and 12.3% respectively to GDP growth in volume terms, 0.4 points and 0.3 points respectively. The remaining nine regions contributed 50% of the growth recorded in 2019, or 1.3 percentage points.

Graph N°1: following shows the contribution of regions to national GDP growth (in %)



Source: Information note on the 2019 regional accounts of the High Commission for Planning (HCP).

Regional GDP per capita stood at 32,394 DH in 2019 at the national level. Six regions have a GDP per capita above this national average. These are the regions of Dakhla – Oued – Ed-Dahab (86 166 DH), Laayoune – Saguia al Hamra (51 202 DH), Casablanca-Settat (50 075 DH), Guelmim-Oued Noun (38 858 DH), Rabat-Salé-Kénitra (36 596 DH), and Tangier-Tétouan-Al Hoceima (33 367 DH). In the other regions, GDP per capita ranged from 17,971 DH in the Drâa-Tafilalet region to 27,197 DH in the Souss-Massa regions. Thus, the dispersion of GDP per capita is increasing. The average absolute gap has increased from 13 106 DH in 2018 to 13 115 DH in 2019⁸.

The unequal distribution of investment activities and projects between regions is likely to accentuate territorial disparities and forces the contribution of some regions to national economic growth to be relatively modest. This reality was revealed by the NMD, stressing that the reforms undertaken to establish the foundations of a balanced territorial development have made it possible to inject additional momentum into the dynamics of the territories. However,

⁸ High commissariat of the plan. (2019). Information notes on the regional accounts, Morocco

they have not been able to rectify the territorial disparities as national wealth remains driven by a small number of regions. In 2020, three out of twelve regions account for nearly 59% of GDP (Casablanca-Settat, Rabat-Salé-Kénitra and Tangier-Tétouan-Al Hoceima)⁹.

This is due to the low attractiveness of certain regions for foreign investors compared to other regions, to the geographical location of the regions and to national investments in major structuring projects which enable some regions to develop more rapidly than others. These conditions have been emphasized by the theories of the new geographic economy (Krugman, 1991), highlighting the strong relationship that is permanently established between economic growth and geography (Baumont, 1999). Similarly, Martin's remarks (in 2001) did reveal that the geographical dimension is strongly involved in the spatial structuring and localization of economic activities at the territorial level.

Analysis of disparities confirm their persistence both economically and socially. They affect the territories (inequalities between regions), but also the environments of residence (urban, preurban, rural).

The objective pursued through this work is to understand the trend of the regional system resulting from the last regional division and more particularly whether there is indeed a convergence of regions or the opposite. In other words, are regional disparities widening or are they being considered in a process of sustainable regional convergence? With the latest regional division, the dynamics of economic development could lead to a possible catch-up of rich regions by poor regions. This phenomenon will be highlighted by β -convergence, which will study the relationship between economic convergence and the spatial distribution of activities. While the σ -convergence tries to measure the evolution of the economic disparities of the regions resulting from the division adopted by Morocco in 2015. These two tests will be covered in the next chapter.

2. The β -convergence and σ -convergence: a review of empirical literature

There is a strong correlation between convergence and Solow-Swan's neoclassical growth model. The use of this concept makes it possible to characterize the convergence of the economies of regions or nations based on several macroeconomic variables, in particular GDP per head, the investment ratio, the average annual population growth rate by region, the urbanization rate of each region, etc.

⁹ High commissariat of the plan. (2020). Information notes on the regional accounts, Morocco

Although they have often shown contradictory results, empirical studies on economic convergence have been highly developed in recent decades. This incongruity of results comes down to the methods adopted and the approaches used on the one hand and the way in which the conception of the convergence of regions or countries was operated on the other hand. The most common approaches in this area of economic convergence have been based on cross-section convergence tests introduced by William Baumol (1986)¹⁰, then developed by Robert J. Barro, Xavier Sala-i-Martin (1991, 1992).

At this level, we offer two beta and sigma convergence tests. β -Convergence tries to show a possible catching-up of rich regions/countries by poor regions (negative relation between the rate of change and the initial level) while convergence seeks to measure the evolution of economic disparities (reduction in per capita GDP differences between two dates)¹¹.

Several empirical works have been done on economic convergence using the β -convergence approach. This convergence-based approach means that the region initially having a lower-than-average GDP per capita should experience a faster-than-average growth rate during the study period.

Previous empirical and theoretical studies have developed two notions of convergence: conditional and absolute (unconditional) convergence. Convergence is said to be absolute (unconditional) if no other variable is integrated into the model to be estimated. Convergence is conditional when it is dependent on other exogenous variables relating to the region. These include the investment rate by region, the share of producer sectors, etc.

3. Methodology (approach/method/modelling)

To analyze the economic dimension in the last regional division, we adopt an econometric modelling based on the analysis of spatial autocorrelation and the estimation of β -convergence, which implies a long-term equalization of the growth rate of GDP per capita of 12 regions from the last division.

The choice of this approach is motivated by the nature of our research question, which consists in measuring the beta-convergence and sigma-convergence of regions. The first step is

¹⁰ Baumol, W.J. (1986). "Productivity Growth, Convergence, and Welfare: What the Long-Run Data Show". *American Economic Review*, Vol. 76, No. 5, pp. 1072-1085

¹¹ Bourdin, S. (2013). Une mesure spatiale locale de la sigma convergence pour évaluer les disparités régionales dans l'Union européenne.

to approach the evolution of regional economic disparities through σ -convergence. Secondly, to find out whether the latest division may have triggered a trend for initially less-developed regions to catch up with more-developed regions in terms of economic growth.

This choice is also dictated by the availability of the data required for our analysis (GDP/region, etc.) and by the economic context of the regions resulting from the new territorial organization based on advanced regionalization. In the same vein, this model is the most appropriate for meeting the analysis objectives already mentioned in the introductory section.

The study period considered is from 2004 to 2019, but over three sub-periods of 5 years each, resulting in 36 observations for absolute beta-convergence and conditional beta-convergence. Based on the data available at the region level¹², we proceeded to estimate β - convergence and σ -convergence.

The Hausman¹³ test is used to test whether there is a correlation between the specific effects and the explanatory variables of the model. This makes it possible to choose between the fixed-effect model and the random-effect model, according to Kpodar (2007).

In addition, some methodological limitations should be raised, particularly in relation to the problems of the availability of some data at regional level and in relation to the various sectors of activity.

3.1. β - absolute convergence (unconditional)

To know the economic convergence of the regions is to measure the disparities between the different regions, to quantify this disparity, it is important to estimate the following relationship:

$$\frac{1}{k} \ln \left[\frac{y_{i,t}}{y_{i,t-k}} \right] = \alpha + \beta \ln (y_{i,t-k}) + \varepsilon_{i,t} \quad (1)$$

With y = GDP per capita and $k = 5$ years and $i =$ index of the region, α and β and are unknown parameters to estimate and ε_i un random error term.

¹² High Commissariat of Plan, Morocco: <https://www.hcp.ma> & Minister of Economy and Finance: <https://www.finances.gov.ma>

¹³ The Hausman specification test is a test that can be applied to many specification problems in econometrics. Its most widespread application is in specification tests for panel effects.
HAUSMAN, J. A. (1978) Specification tests in econometrics. *Econometrica*, volume 46, issue (6 Nov., 1978) pp. 1251–1271

Generally, the (unconditional) β -convergence analysis consists of demonstrating whether regions with low initial income relative to their long-term position will grow faster than regions with high initial income. It is said that β -convergence exists when β has a negative and statistically significant sign because in this case the average growth rate of GDP per head between dates 0 and t is negatively correlated with the initial level of GDP per head.

3.2. Conditional β -convergence

Convergence is conditional when it is dependent on other exogenous variables relating to the region. The test of the hypothesis of conditional β -convergence is carried out through the convergence equation of certain variables allowing to maintain constant the stationary state of the regions:

$$\frac{1}{k} \ln \left[\frac{y_{i,t}}{y_{i,t-k}} \right] = \alpha + \beta \ln (y_{i,t-k}) + \delta X_{i,t-k} + \varepsilon_{i,t} \quad (2)$$

- With X vector of the introduced control variables, is a vector of variables allowing to maintain constant the stationary state of the region i

- ε_i is the error term.

It is important to note that empirical convergence studies usually use several explanatory variables. Generally, these variables are not explicitly linked to a well-defined growth model but are chosen in an ad hoc or arbitrary manner according to the specific economic and structural characteristics of the area studied. In the empirical literature, several variables are used with a lack of consensus regarding their introduction into convergence analysis. The expected effects of these control variables on the growth rate correspond to their influence on the position of the steady state.

These include variables related to GDP/head, the investment rate, the regional population growth rate, the ratio of domestic investment (GFCF/GDP), the degree of political instability, the ratio of regional public consumption (Budgetary expenditure to GDP), etc. Given the lack of study period data for the 12 regions, four control variables were selected:

1. Population growth rate over the period considered.
2. Investment rate as % of GDP at the beginning of the period.
3. Agricultural sector's share of total PV in each region.
4. Share of services in total PV of each region.

Variables 3 and 4 were chosen to consider the sectoral specificities at the level of the 12 regions.

In addition, the estimate of β makes it possible to calculate the rate of convergence according to the following equation:

$$\theta = \ln(1 + \beta T) / T \quad (3)$$

with T is the length of the study period

As for the time it takes for the economies of the regions to close half the gap between themselves and their steady state, it is called the half-life (Half Life):

$$\tau = -\frac{\ln(2)}{\ln(1+\beta)} \quad (4)$$

3.3. Estimation of the σ -convergence

The empirical studies developed by Robert J. Barro, Xavier Sala-i-Martin (1991, 1992) introduced the concept of sigma-convergence, which seeks to measure the evolution of economic disparities (reduction of differences in GDP per capita between two dates). The σ -convergence test consists of comparing a dispersion indicator, calculated for the end of the period, with this indicator calculated for the beginning of the period. Two dispersion indicators are usually used: the standard deviation of GDP per capita in ln or the coefficient of variation.

The standard deviation is calculated for each year and for each region. If the standard deviation decreases, there is convergence between the regions, if it increases, there is divergence between the regions, if it is constant, the convergence is insignificant.

There are empirical studies that have developed other methods of measuring sigma-convergence. We present below the method proposed by Hénin and Le Pen (1995) and Hart (1995).

Measuring the sigma-convergence:

We refer to the proposal of Hénin and Le Pen (1995) and Hart (1995) to design another way of analyzing the σ -convergence, rather than relying on the evolution of dispersion coefficients, a test of dispersion reduction can be performed. To do this, we consider the following equation:

$$\ln(y_{i_t}) - \ln(y_{i_0}) = a - b \ln(y_{i_0}) + \varepsilon_{j_t} \quad (5)$$

According to (Hénin and Le Pen, 1995), there is β -convergence if $-b$ is negative. There is σ -convergence if the variance of y_{i_0} decreases over time.

So this equation can be rewritten like:

$$\ln(y_{it}) = a - b \ln(y_{i_0}) + \ln(y_{i_0}) + \varepsilon_i \quad (6)$$

$$\ln(y_{it}) = a + (1 - b) \ln(y_{i_0}) + \varepsilon_{it} \quad (7)$$

By considering the variance on both sides we will have:

$$\text{var}(\ln y_{it}) = (1 - b)^2 \times \text{var}(\ln y_{i_0}) + \text{var}(\varepsilon_{it}) \quad (8)$$

$$\frac{\text{var}(\ln y_{it}) - \text{var}(\varepsilon_{it})}{\text{var}(\ln y_{i_0})} = (1 - b)^2 \quad (9)$$

$$\frac{\text{var}(\ln y_{it}) - \text{var}(\varepsilon_{it})}{\text{var}(\ln y_{it})} \times \frac{\text{var}(\ln y_{it})}{\text{var}(\ln y_{i_0})} = (1 - b)^2$$

where R^2 the correlation coefficient:

$$R^2 \times \frac{\text{var}(\ln y_{it})}{\text{var}(\ln y_{i_0})} = (1 - b)^2 \quad (10)$$

$$\frac{(1-b)^2}{R^2} = \frac{\text{var}(\ln y_{it})}{\text{var}(\ln y_{i_0})} \quad (11)$$

There is σ -convergence when $\frac{\text{var}(\ln y_{it})}{\text{var}(\ln y_{i_0})} < 1$ i.e., when $(1-b)^2 < R^2$

In our case, we adopted the first, conventional, and most used method of calculating the standard deviation for each year and for each region.

4. Results and discussion

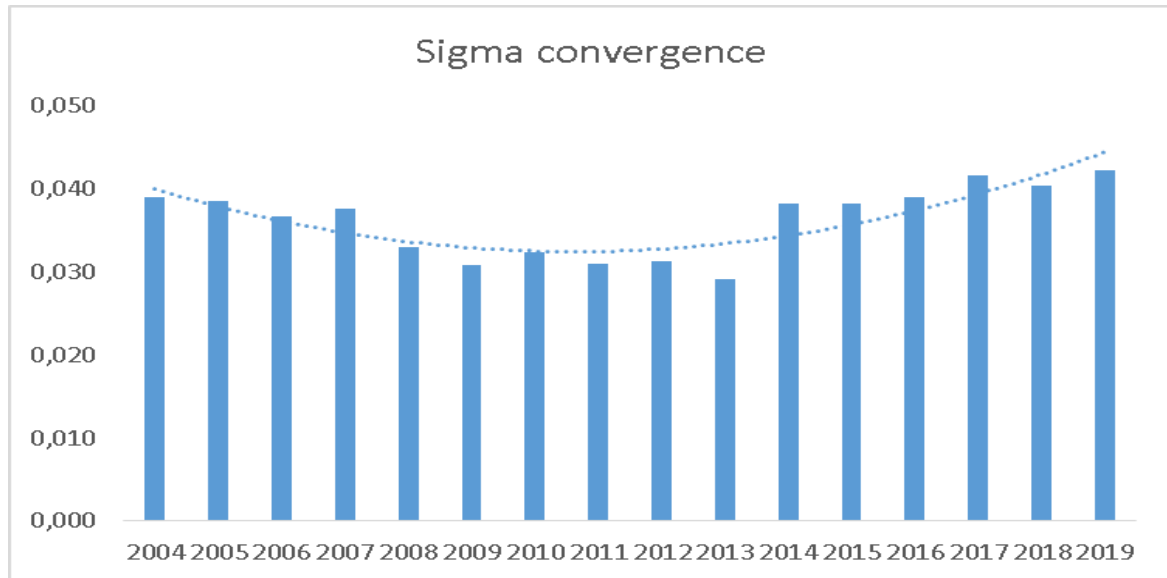
4.1. SIGMA convergence results

The results show that there is a broken trend in terms of convergence between the GDPs per capita of the 12 regions of the Kingdom. In the first phase from 2004 to 2013, the coefficient of variation of the logarithm of GDP per capita (CV) has been decreasing almost continuously, indicating a convergence between the 12 regions. On the other hand, from 2013 to 2019, the trend has reversed, and we are seeing an increase in dispersion with an increase in the coefficient of variation that indicates a divergence between regions. This can be explained by the fact that certain regions, notably Casablanca-Settat, Tangier-Tetouan-Al Hoceima and Rabat-Salé-

Kénitra, have benefited more from large structuring projects thus allowing a significant variation in their GDP/head.

CV = average log of GDP per capita/ Standard deviation of log of GDP per capita

Figure n°1: Indicating the results of sigma convergence estimation.



Source: elaboration by the author using the software

4.2. Absolute or unconditional beta-convergence results

The results are obtained based on a panel regression instead of a cross section regression because the number of regions is very small (12 regions).

Panel regression with random effects was applied to the 12 regions but over three sub-periods of 5 years each, allowing 36 observations.

The choice of the random effect instead of the fixed effect method for absolute beta convergence was advocated by the results of the Hausman test (Table 1). As indicated in the methodology, equation (1) estimated absolute beta-convergence:

$$\frac{1}{k} \ln \left[\frac{y_{i,t}}{y_{i,t-k}} \right] = \alpha + \beta \ln (y_{i,t-k}) + \varepsilon_{i,t} \quad (1)$$

With y = PiB per capita and k = 5 years and i = regional index

Table 1: Hausman's test.

Correlated Random Effects - Hausman Test			
Equation: BETACONV_ABSOLUE			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.174622	1	0.1403

Source: elaboration by the authors using the software

The Hausman test indicates that the random effects estimate is the most appropriate in this case (in Table 1, the problem > 0.05).

The results of the estimation of equation (1) show that the coefficient β is not significant (in Table 2, the coefficient of β has a p-value > 0.05). Therefore, the existence of a beta-convergence process is rejected. In other words, the absolute convergence Beta shows that there is no convergence between the 12 regions.

Table 2: Results of the estimation of equation (1) of the absolute beta-convergence, by random effects.

Method: Panel EGLS (Cross-section random effects)				
Periods included: 3				
Cross-sections included: 12				
Total panel (balanced) observations: 36				
Swamy and Arora estimator of component variances				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constante	0.113241	0.123415	0.917563	0.3653
$Y_{t,t-k}$	-0.007726	0.012414	-0.622387	0.5378
R-squared	0.010893			

Source: elaboration by the authors using the software

4.3. Conditional Beta-convergence results

The conditional beta convergence estimation consists of increasing equation (1) by control variables to consider the specificities each region. Additional variables introduced are based on literature. We will, however, simply select four as indicated above, given the lack of data for the 12 regions over the entire study period.

Thus, as mentioned in the section reserved for the model, the equation to be estimated becomes:

$$\frac{1}{k} \ln \left[\frac{y_{i,t}}{y_{i,t-k}} \right] = \alpha + \beta \ln (y_{i,t-k}) + \delta X_{i,t-k} + \varepsilon_{i,t} \quad (2)$$

With X vector of introduced control variables

The Hausman test indicates this time that the fixed effect method is the most appropriate (in Table 3, Prob <0.05).

Table 3 Hausman test.

Correlated Random Effects - Hausman Test

Equation: BETACONV_CONDIT

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	13.13371	5	0.0222

Source: elaboration by the authors using the software

In terms of results, the estimation of equation (2) by fixed effects shows that the coefficient β for the $Y_{i,t-k}$ term is negative and significant (in Table 4, the coefficient β has a P-value < 0.05). This means that this time there is a process of convergence towards a stationary state in the sense of conditional beta convergence.

The fact that the sigma and absolute beta convergences do not allow to prove the existence of an apparent convergence while the conditional beta convergence allows it can-This is explained by the fact that conditional beta convergence is only a necessary condition and not sufficient to achieve a reduction in dispersion between regions in the direction of sigma convergence.

In addition, conditional beta convergence when it exists does not mean that all regions converge towards the same balance, but rather that each region converges towards its own stationary state (which is not necessarily the same for all regions) This is because of the different specificities of each region or because certain regions may have suffered shocks which are not generalized to the other regions.

Table 4: Results of the estimation of equation (2) for conditional beta-convergence, using fixed effects.

Dependent Variable: $(\text{LOG}(\text{PIBHAB}_t) - \text{LOG}(\text{PIBHAB}_{t-1}))/5$

Method: Panel Least Squares

Periods included: 3

Cross-sections included: 12

Total panel (balanced) observations: 36

White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.471638	0.079077	5.964316	0.0000
$Y_{i,t-k}$	-0.044723	0.006734	-6.641719	0.0000
Investment ratio (t-k)	-0.000523	0.000342	-1.531647	0.1421
Population growth	-1.612956	0.333139	-4.841686	0.0001
Share of agricultural in VA	0.001283	0.000432	2.970044	0.0079
Share of services in VA	-0.003347	0.000636	-5.262698	0.0000

R-squared adjusted 0.52

Source: elaboration by the authors using the software

The convergence speed and half-life ratio will only be calculated for conditional beta convergence since the coefficient of absolute beta convergence is not significant.

Thus, for conditional convergence:

The average rate of convergence θ of regions to their own stationary states is equal to 5.1% per year according to the formula (3) below:

$$\theta = \frac{\ln(1 + T\beta)}{T}$$

The Half Life ratio is equal to 15 according to formula (4):

$$\tau = \frac{-\ln(2)}{\ln(1 + \beta)}$$

As a result, it would take 15 years for half of the gap between a region's per capita GDP and its steady state to dissipate.

Conclusion

In conclusion, and as mentioned in the previous sections, one of the main problems that persist at the regional level is the high level of territorial inequalities. Indeed, using the modelling adopted in approaching the economic growth of the 12 regions through the study of convergence has shown the following:

1. The results obtained from the sigma-convergence test show a convergence between the 12 regions during the first phase from 2004 to 2013 because the coefficient of variation of the logarithm of GDP per capita (CV) has experienced a quasi-continuous decline. However, from 2013 to 2019, the trend has reversed, and we are seeing an increase in dispersion with an increase in the coefficient of variation, which indicates a divergence between regions.
2. Econometric analysis has shown that sigma-convergence and beta-unconditional convergence do not prove the existence of convergence but rather of a divergence between regions.
3. When the control variables were introduced, conditional beta convergence proved convergence between regions. This can be explained by the fact that conditional beta convergence is only a necessary and not sufficient condition for achieving a decrease in dispersion between regions in the direction of sigma convergence. In addition, conditional beta convergence when it exists does not mean that all regions converge towards the same balance, but rather that each region converges towards its own stationary state (which is not necessarily the same for all regions) This is because of the different specificities of each region or because certain regions may have suffered particular shocks and state interventions which are not generalized in an equitable way to the other regions.
4. The econometric analysis has shown that neither sigma-convergence nor beta – unconditional convergence can prove the existence of convergence between regions. Conditional beta-convergence allows it, but it remains a convergence of each region towards its stationary state. Even at this level, it would take 15 years for half the gap between a region's GDP per capita and its steady state to be diffused.
5. The future regional division must integrate the factors facilitating more economic convergence by promoting the vocations and specific features of the regions are one of the criteria for the division of the regions. The economic growth of the regions requires a division which favors the complementarity of the regions from the point of

view of wealth and potential with the possibility of giving all the regions an opening on the sea to improve their economic competitiveness. Indeed, having a reduced number of regions in the next division (up to seven) with the potential and possibilities of having port and air infrastructure is likely to increase their wealth and their contribution to national GDP, to reduce interregional inequalities and ultimately ensure convergence between regions.

6. Public policies must integrate the issue of regional economic convergence and adopt incentives such as bonuses to the least developed territories to encourage investment and create wealth and improve economic growth in the regions.

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