Spatial Inequality of Growth between Morocco Regions

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Abstract

Although significant progress had been made in Morocco, the inter-regional inequalities persist. The aim of this paper is to analyse this spatial inequality and convergence phenomenon in Morocco, using regional data between 2000 and 2007. Thus, relying on methods of spatial data analysis and taken from theoretical and empirical contributions, this paper analyses the role of the sectorial externalities and spatial spillovers in growth.
Next, we tested the existence of a convergence process and the conditions for its improvement. The results showed the existence of a growth convergence process in value added and productivity but not in employment. On the other hand, the variables of human capital and infrastructure can significantly reduce regional inequality. Thus, we conclude that the conventional policies based solely on the infrastructure development or education are not sufficient. A more comprehensive approach that integrates these two axes and encourages business development and knowledge transferis needed.

Keywords: Convergence, regional inequality, local structure, regional growth, agglomeration economies, spatial spillovers.

1. Introduction

Observing the spatial disparities today, reveals that these are not only visible between the different countries, but they are also more pronounced between regions of the same country in accordance with their level of development. In Morocco, although significant progress is being made, at the national level, interregional inequalities persist. The indicators show strong disparities in the development of different regions, which differentiates the living environment of the inhabitants and stimulates spatial migration.

Unequal regional development is the result of a process in which regions with an initial advantage due to historical accidents, attract firms increasingly. This company wanting to take advantage of the agglomeration economies that these regions offer will contribute to the digging of gaps with capital-neglected regions. Thus, firms entering the agglomerations agree to incur high costs in exchange for multiple (transport, production and transaction costs) benefits. These agglomeration economies are manifested through specific externalities (specialization, diversity of agents, etc.).

Several authors have been interested in the issue of inter-regional inequalities (Krugman, 1991; Sala-iMartin, 1996; Glaeser et al., 1992). They highlight three types of externalities. Intra-

regional externalities: Intra-sector and cross-sector (specialization, diversity and competition), and Inter regional externalities (effect of proximity). These inequalities lead us to question the means of reducing them and put the question of possible economic convergence in the place of divergence.

The idea of addressing these issues is justified by a threefold observation. Firstly, in a broad literature on territorial inequality, little work has been devoted to studying the developing countries, especially in the Moroccan case. While in many developed countries, these studies are considered as a basis for regional policy-making. Indeed, the region has always been the main venue for cohesion interventions. Conventional policies based solely on the establishment of infrastructure or education are insufficient. A more holistic approach integrating these two axes is needed, while encouraging business development and knowledge transfer. Secondly, the issue of disparities is considered topical in Morocco. Indeed, a discrepancy has recently been observed since the launching of the Advanced Regionalisation project. The objective of this project is to reduce these disparities through the intervention of public authorities. Thirdly, most regional studies in developing countries do not take into account spatial effects in their analysis of regional growth. In fact, the introduction of these effects can serve as a substitute for the omitted variables thereby improving estimates and forecasts, and enabling the role of space to be captured in the formation of the phenomena studied.

This study will firstreview the literature on the issue. The second part is dedicatedto the analysis of growth in order to highlight regional disparities and their specific reasons. The third partis an analysis ofthe determinants of reducing disparities through a convergence model.

2. Articulation between agglomeration economies and convergence.

Agglomeration economies come from the spatial concentration of certain activities. This concentration involves the formation of returns to scale, which in turn lead to lower costs for localized firms. Moreover, they can benefit from externalities from the actions of other firms in the same industry or even another industry. However, the strong spatial concentration could have adverse effects. Indeed, other factors such as congestion can be a source of negative externalities (agglomeration diseconomies).

Thus, for theorists of the new economic geography (Krugman, 1991), agglomeration creates congestion costs that result in increased infrastructure needs. These centrifugal forces are pushing for decentralization of economic activities near the place of residence of the workforce. The diseconomies of agglomeration is a disadvantage for densely developed regions, because they slow their growth. However, they are a benefit for the poor regions. Indeed, when the diseconomies of agglomeration outweigh the benefit of the latter, companies are abandoning densely developed regions towards poor and less dense regions. We then witness a catch-up phenomenon where poorer regions are beginning to catch up with the richer regions, the convergence process. It has been widely discussed in the literature. Indeed, starting from the article of Sala-i Martin (1996), many studies have examined the process of convergence between different countries or regions and generally use two measures of convergence .The first, are based on neoclassical growth models (Solow, 1956) and involves a tendency to equalize economies. In other words, there is convergence when a "poor" economy tends to grow faster than "rich" economy (Sala-i Martin, 1996). This convergence may be absolute (unconditional) or conditional. It is absolute when it is independent of the initial conditions and it is conditional

when the determinants of the steady states vary from one economy to another and that they converge to the same growth rate. The second measure used in the literature is the decrease in regional differences (Sala-i Martin, 1996). Thus, it simply relies on comparison of the logarithms of standard deviations in different periods.

3. Research methodology and data:

The analysis of the productive structures between 2000 and 2007, allows identifying a series of lessons about the structure of industrial activities and regional disparities. To quantify regional inequalities, a hierarchical analysis based on several macroeconomic variables was performed. Firstly, we study the effect of regional specialization and regional externalities using a SHIFT-SHARE decomposition of regional growth. Secondly, we analysed the role of space and interregional spillover on regional disparities. Finally, using convergence model, we studied the factors that promote or reduce the spatial inequalities.

Three measures of growth based on the review of the empirical literature and available datahave been used: The first measure is the employment growth. It is the most frequently used in the literature (Glaeser et al., 1992; Henderson et al., 1995; Combes, 2000; Mager, 2006). The second measure is the growth of added value, this measure has been also used extensively in the literature (De Lucio et al., 2002; BATISSE, 2002). The third measure is the growth of laborproductivity. This variable are less used than the others, however, it is the most important. Indeed, it measures the productivity gain from the transfer of knowledge (De Lucio et al., 2002).

The data used in this contribution came from files of the industry survey conducted annually and exhaustively with industrial companies by the Department of Industry and Trade. These aggregated data cover 16 regions and 23 sectors (total of 368 obs.) From 2000 to 2007. We also used the data of regional statistics from HCP.

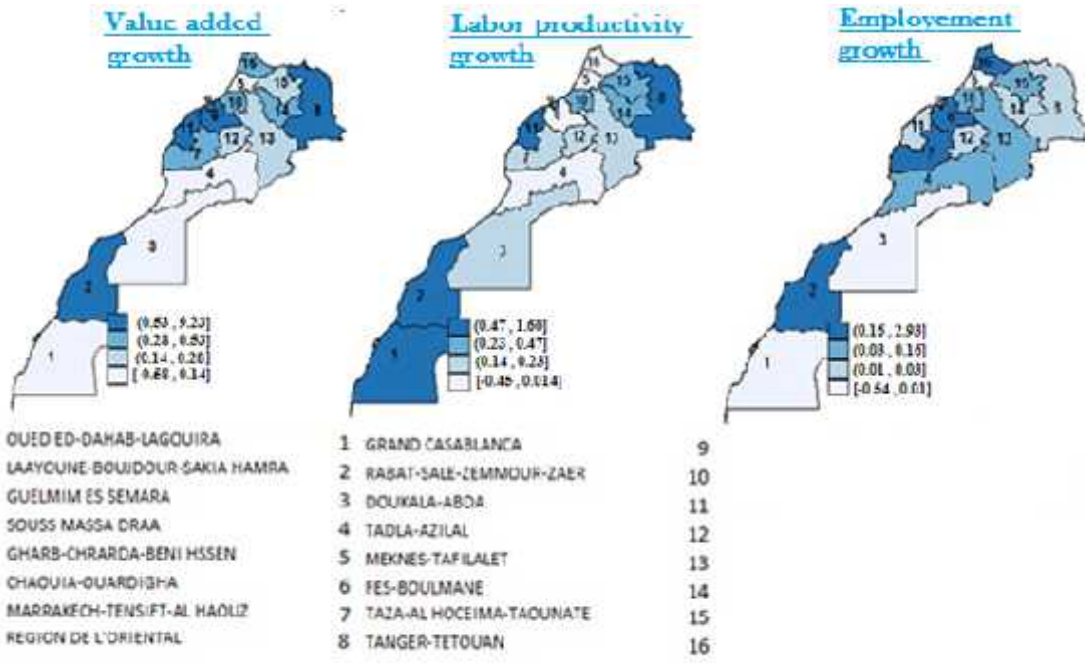
4. Analysis of the growing inequality in Moroccan regions.

The regional dispersion of employment between 2000 and 2007 shows a strong heterogeneity between different regions. Indeed, the Grand Casablanca region alone absorbs almost half of industrial employment in this period. However, this region experienced a slowdown in employment growth, with a negative growth rate (-3.33%) compared to 97% for the region of CHAOUIA OUARDIGHA. During the same period, the region of LAAYOUNE-SAKIA BOUJDOUR- HAMRA achieved the best growth performance (900%) in value added. In addition, the growth of its labor productivity was 160% between 2000 and 2007 compared to 45% for Gharb-Chrarda-BeniHssen, and - 5% for GUELMIM SEMARA ES.

In the same way, DOUKALA-ABDA performed also significantly with a growth rate of value added of 109% compared to 58% in Gharb-Chrarda-BeniHssen and -29% in GUELMIM ES SEMARA (see Figure 1). Similarly, the structure of employment structure at national level reveals a concentration in intensive workforces industries like clothing/fur industry and food industries, which accounts respectively for 34.41% and 14.70% of the national employment. This concentration is problematic because the economies of some region are very dependent on these two industries. Thus, we find that the share of the food sector in national employment in 2007 was 93.82% in the region of GuelmimEsSemara and 92.91% in the region of Oued Ed-Dahab - Lagouira (see Table1). This specialization in a very unstable sector (weather condition, external

competition, etc.) has caused negative growth in industrial value added (-40% for the region GuelmimEsSemara and -13% for the region OUED ED -DAHAB-LAGOUIRA).

Figure 1: Growth in value added, productivity and employment by region



In the same way, the specialization on high-value-added sectors can have a positive effect. Indeed, LAAYOUNE-BOUJDOUR-SAKIA HAMRA specialized in different kind of manufacture, namely the MANUFACTURE OF OTHER NON- METALLIC MINERAL PRODUCTS experienced considerable growth (700%). Thus, we can say that specialization can be considered as an advantage or a handicap depending on the nature of the sector.

However, there are other variable than sectorial specialization, which affect regional growth. These variables called regional effects cover the phenomena of externalities and agglomeration economies. In order to analyse these sectorial and regional effects on regional growth, we will use the Shift-Share Analysis.

Table 1: Relative shares of the regions in industrial employment in 2007 (%)

Region	**Sector absorbing the largest share of employments in 2007**	**Share of employments held by sector in the region**
CHAOUIA-OUARDIGHA	MANUFACTURE OF MACHINERY AND ELECTRICAL APPLIANCES	33,70%
DOUKALA-ABDA	CHEMICAL INDUSTRY	37,30%
FES-BOULMANE	INDUSTRY CLOTHING AND FUR	57,48%
GHARB-CHRARDA-BENI HSSEN	FOOD INDUSTRIES	44,97%

GRAND CASABLANCA	INDUSTRY CLOTHING AND FUR	29,11%
GUELMIM ES SEMARA	FOOD INDUSTRIES	93,82%
LAAYOUNE-BOUJDOUR-SAKIA HAMRA	MANUFACTURE OF OTHER NON-METALLIC MINERAL PRODUCTS	49,86%
MARRAKECH-TENSIFT-AL HAOUZ	FOOD INDUSTRIES	34,75%
MEKNES-TAFILALET	FOOD INDUSTRIES	30,66%
OUED ED-DAHAB-LAGOUIRA	FOOD INDUSTRIES	92,91%
RABAT-SALE-ZEMMOUR-ZAER	INDUSTRY CLOTHING AND FUR	61,79%
ORIENTAL	MANUFACTURE OF OTHER NON-METALLIC MINERAL PRODUCTS	28,91%
SOUSS MASSA DRAA	FOOD INDUSTRIES	58,27%
TADLA-AZILAL	FOOD INDUSTRIES	53,17%
TANGER-TETOUAN	INDUSTRY CLOTHING AND FUR	43,24%
TAZA- AL HOCEIMA-TAOUNATE	INDUSTRY CLOTHING AND FUR	70,59%

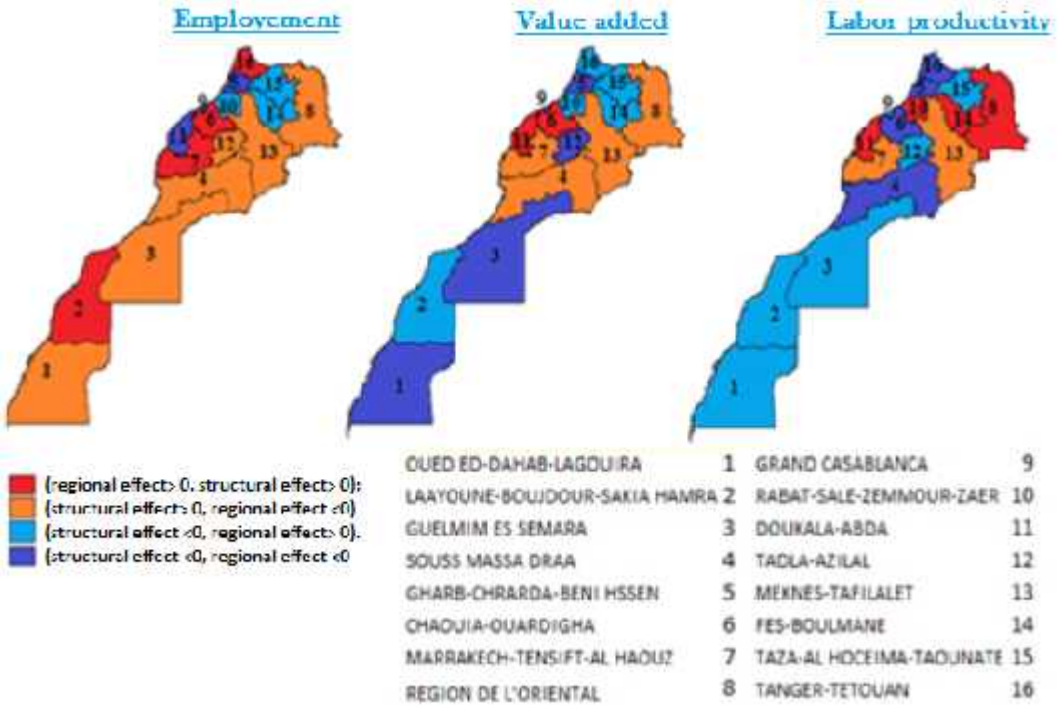
5. SHIFT-SHARE analysis: a measure of the performance of the regions

For regions such as sectors, growth is unequal, for some it is very strong, for others it is medium or low or even negative. The shift-share method allows analysing to what extent the differences in regional growth can be explained by the sectoral structure (specialization) or by the regional effects (externalities and agglomeration economies) (Dinc and Haynes, 2005; Redor P., 2006; Carre and Levratto, 2011). Indeed, this method allows analysing the advantages and handicaps of the sectorial structure in the regions. Thus, a positive structural effect means that the region specialized in a high growing sector. The residual effect, also known as the regional effect is based on the idea that some sectors are growing rapidly in some regions, while they are in decline at the national level. This means that these regions offer some conditions for the development of these sectors. These conditions are positive externalities. Formally, the regional structural effect is calculated by applying to each sector of the region, not its real growth, but the national growth of the sector (for details on the calculation of the components of Shift-Share analysis refer to Carre and Levratto (2011)). In this paper, we regrouped the regions according to their structural and geographical effects. Thus, four scenarios appear (Figure 2):

- Favourable initial structure and favourable geographical conditions (regional effect > 0, structural effect> 0).
- Favourable structures but unfavourable geographical conditions (structural effect> 0, regional effect <0).
- Favourable geographical condition but unfavourable structures (structural effect <0, regional effect> 0).
- Unattractive structures and unfavourable geographical conditions (structural effect <0, regional effect <0).

We found that most regions have favourable industrial structures that promote the development of employment. However, some regions such GRAND CASABLANCA and RABAT-SALE-Zemmour-Zaer, or even FES-BOULMANE (see Figure 2 below) have negative structure effects. This outcome linked to the presence of diseconomies from congestion agglomeration.

Figure 2: Typology of spaces according to the SHIFT-SHARE analysis



6. Analysis of proximity effects in the development of regions: the spatial autocorrelation

Alongside the elements derived from the regional dynamics, the agglomeration economies are also induced by the exploitation of more abundant information facilitated by the geographical proximity of firms.

The statistical estimation of the proximity effect is based on the use of specific tools such as spatial autocorrelation. This tool represents autocorrelations, whose calculation and appreciation requires a spatial weight matrix, which allows us to consider space. In the first case, space weights are obtained by setting the value 1 whenever we have two regions with a common border, otherwise, we set the value 0. In the second case, a function of the inverse of the distance between two data regions is considered (Cliff and Ord, 1981).

The spatial autocorrelation is checked using several statistics: Moran's I global and local and Getis et Ord statistic.

Table 2: Moran's I statistics for the growth of employment of value-added and labor productivity between 2000 and 2007

Variables	distances		spatial contiguity	
	I	p-value	I	p-value
Labor productivity growth	0.018	0.160	0.159	0.058
Employment growth	-0.038	0.342	-0.205	0.082
Added-value growth	0.008	0.121	-0.056	0.438

It appears that the results obtained by the method of the binary adjacency are more significant than those obtained by the inverse of distances. Indeed, the results obtained by the second method indicate that there is no significant relationship between the near and distant regions (P-value greater than 10%)

Thus, based on the results computed bythe spatial contiguity matrix, spatial autocorrelation of labor productivity growth appears to be positive (0.1583) significant (P = 0.058). This indicates that neighbouringregions are generally more similar. While the spatial autocorrelation of job growth is negative (-0.205) and significant (P = 0.082), which means that neighboring regions are generally dissimilar. However, we see in terms of added value growth, the non-existence of a significant autocorrelation calculated by both methods.

This result implies that the spatial spilloversin Morocco are only visible in terms of labor productivity.

However, Moran's I statistic is a global statistic that does not allow us to evaluate the local structure of spatial autocorrelation. This is why we analyze the results of Moran's diagrams (Anselin, 1994).

To implement these tools we use the binary matrix, because as we have found, it makes it possible to achieve more significant results.

Table 3: The spatial Association of Moroccan Regions in the Moran diagram

	Association HH	**Association BB**	**Association BH**	**Association HB**
Labor productivity growth	12,50% 2 regions	50% 8 regions	18,75% 3 regions	18,75% 3 regions
Employment growth	0%	56,25% 9 regions	25% 4 regions	18,75% 3 regions
Added-value growth	0%	75% 12 regions	12,50% 2 regions	12,50% 2 regions

Firstly, it seems that most of the Moroccan regions form spatial associations of low growth rates (BB). For labor productivity, 8 regions a BB association, compared to 9 for employment and 12 for added value (see table 3). However, we find the non-existence of spatial associations of high growth rates HH associations except for labor productivity, which regroups only two regions

(Laayoune-Boujdour-SakiaHamra and Doukala-ABDA) (see Graphs 1,2 and 3). On the other hand, we note that the majority of high-growth regions are located near the low growth-rate regions (HB) (18.75% for productivity and employment growth and 12.5% for value-added growth).

To understand these spatial associationsbetter, we analysed our results based on Krugman (1991) theory in which the externalities are both local and global. We are therefore in the presence of two cases:

In the first case, the internal effects of the region dominate the regional external economies. In this case, we are seeing the center-periphery type configurations of Krugman (1991) (HB and BH associations).

In the second case, if the external effects outweigh the two regions, there is strong growth in the regions and their neighbors (HH). This situation can be the result of a convergence process. In fact, rich regions are a source of externalities for the nearby poor regions. There is then a convergence process in which nearby regions converge to the same stationary state.

7. Evaluation of regional inequality through the analysis of regional convergence

7.1. Evaluation of regional disparities through the Sigma convergence after analysing the disparities and the effects of spatial spillovers from geographical proximity.

After analysing the disparities and the effects of spatial spillovers from geographical proximity, it is natural to analyse the persisting or disappearance of such disparities. To do this, we first used the statistical analysis of the Sigma Convergence. The tool refers to the decrease in dispersion measured by the standard deviation (Barro and Sala-i-Martin, 1995). It is merely based on the calculation and comparison of standard deviations within the period considered. There is σ-convergence when this standard deviation decreases.

To enrich the analysis of σ-convergence, we study the relationship between it and the spatial autocorrelation.

Thus, figures 3, 4 and 5 provide the dispersion of employment, added-value and productivity in the Moroccan regions combined with the evolution of spatial autocorrelation as measured by overall Moran's I.

Figure 3: Evolution of MORAN’s I and Sigma-convergence of value added between 2000 et 2007

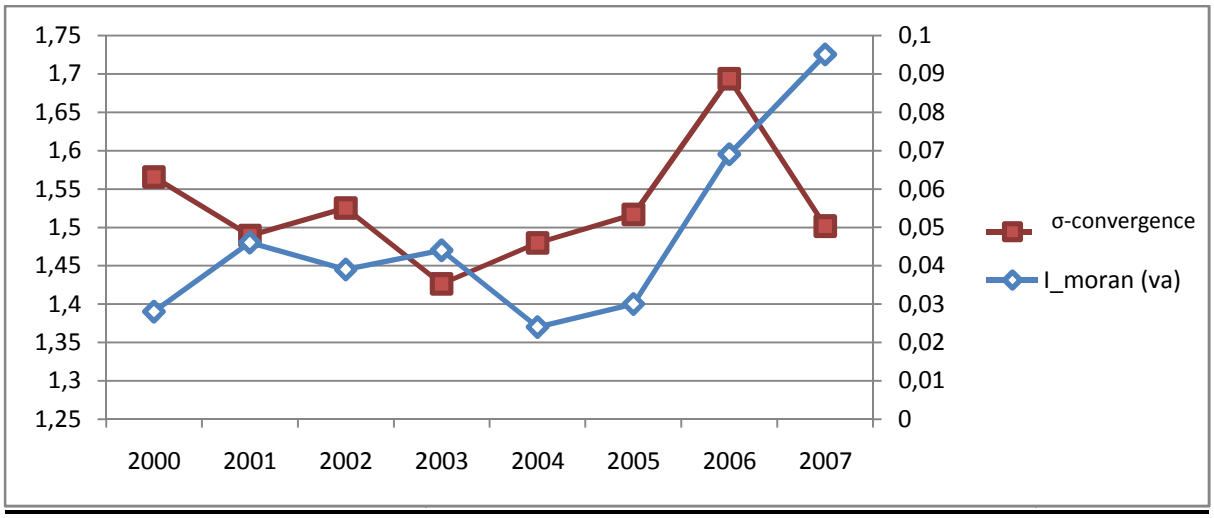


Figure 4: Evolution of MORAN's I and Sigma-convergence of employement between 2000 et 2007

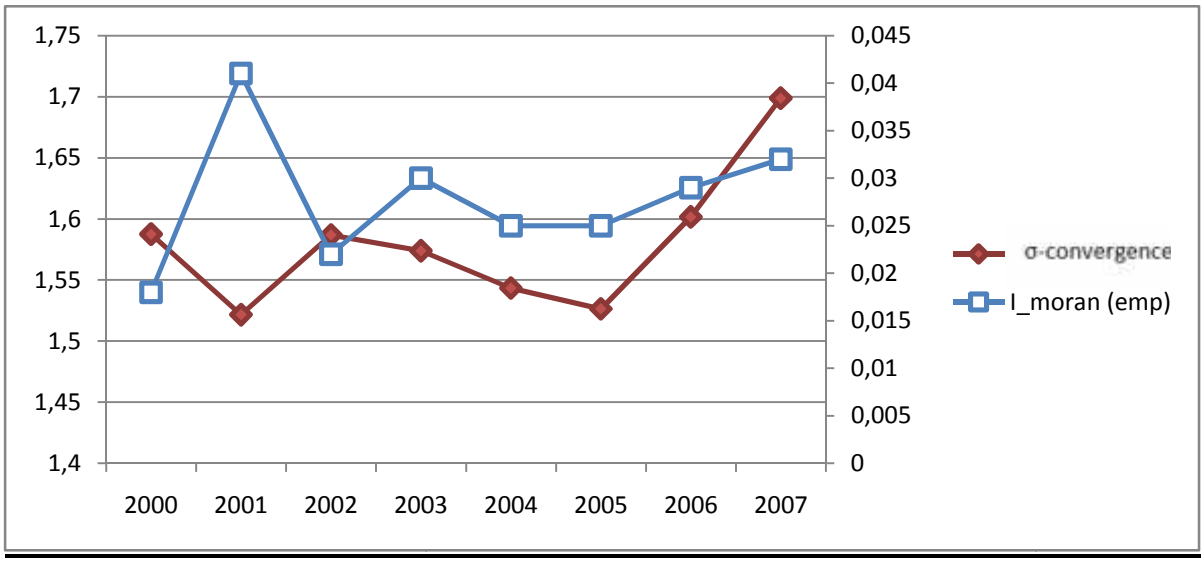
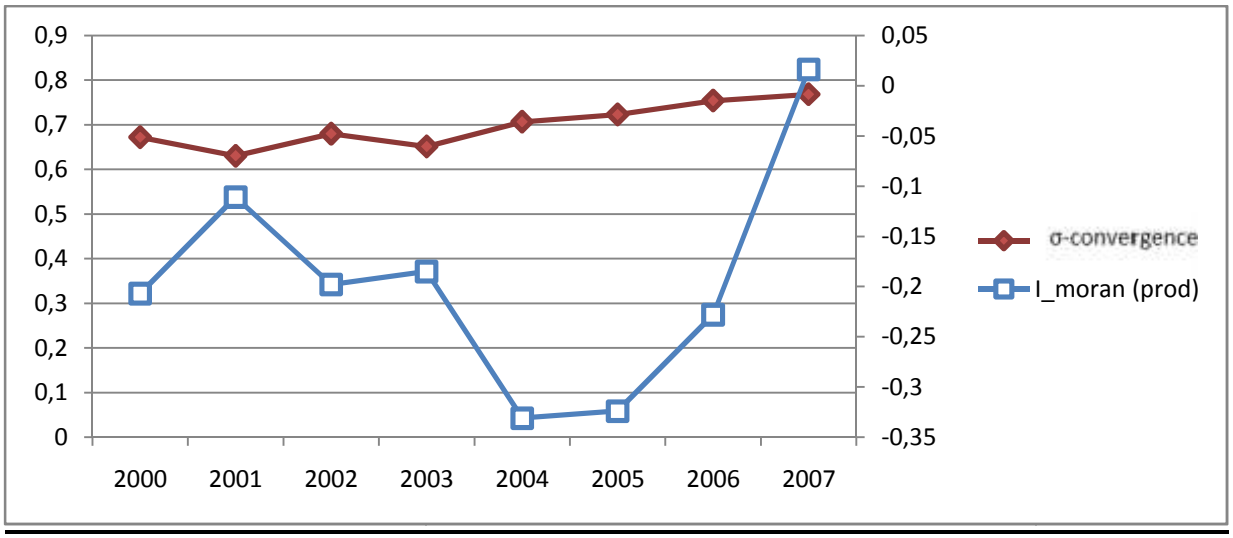


Figure 5: Evolution of MORAN's I and Sigma-convergence of labor productivity between 2000 et 2007



The observation of this graph shows that there is a relationship between the increase in differences between regions and the decrease in Moran's I, this relationship seems even more evident in value added (see Figure 3). This result can be explained by the fact that the convergence process is linked to the proximity. So it would seem that they are the nearest converging regions. This observation proves the hypothesis that implies the existence of an overflow effect of geographical proximity.

Finally, the concept of σ-convergence has several limitations. Indeed, if the economies are shocked at the beginning of the period having temporarily reduced the dispersion, in this case, the choice of another initial period could have opposite results. Thus, we discuss in the following chapter, the results of the other convergence measure (β-convergence).

7.2. Evaluation of regional inequality through the analysis of β-regional convergence

After analyzing the disparities and the effects of spatial spillovers from geographical proximity. It is natural to wonder about the persistence or disappearance of such disparities. To do this, we will try to study the process of catching up (convergence) and his specific reasons. So this question of convergence based on the work of Barro, Salamanca i-Martin (1991) and Mankiw et al (1992). This concept now occupies an essential place in the regional integration policies.

The absolute β-convergence hypothesis is usually tested on the following model:

$$\ln Y_t / Y_{t0} = a \ln Y_{t0} + b + e$$

Where *Yt0*is the initial level of the variable of study and *Ln (Yt / Yt0)* is the growth rate.

There is β-convergence when β is negative and statistically significant, since in this case, the average growth rate between the two dates is negatively correlated with the initial level. The convergence process is characterized by a convergence rate and a half-life. The convergence rate β = Ln (1+âT) /T is the speed with which the region converge on the steady state. The half-life, H = -ln (2) / ln (1 + â) is the time required for reducing half gap between regions.

The test of conditional β-convergence hypothesis is based on a specification for which the determinants of the steady state vary according to the region, namely:

$$\ln Y_t / Y_{t0} = a \ln Y_{t0} + c \ln X_{t0} + b + e$$

Where*Xt*is the vector of the conditional variables.

Traditionally, empirical studies of convergence are analysed with cross section regression. Also, they are based on several control variables. However, these types of designs are affected by unobserved heterogeneity regions. This bias can be partly reduced by the inclusion of panel data (Islam, 1998).

Regarding the conditioning variables, we incorporate several variables among those cited in the literature review, these include:

- Investment rate (txdinvest) (Mankiw et al, (1992) and Levine Revelt, (1992)) measured by the share of investment in value-added.
- Percentage of students in secondary education (Educ) (Mankiw et al, 1992); (OECD, 2010): measured by the share of people aged 15 to 24 years after high school.
- Participation rate (TxAct) (Mankiw et al, 1992): measured by the share of the working population in the total population.
- Share of population in the region (pop), (Cappelen, Castellacci, Fagerberg &Verspagen, 2003): This is the part of the population of the region in the total population.
- Spatially lagged dependent variable (wy) (B.AGHA et al, 2007; Julie Le Gallo 2003) measures the effects of proximity. Spatial proximity makes interactions that promote the exchange of knowledge. These interactions build trust between partners and support dissemination of ideas. At the same time, this proximity stimulates the rivalries between actors in their research process which pushed them to innovate.
- Share of kilometers of coated roads in the region (road) (OECD, 2010): This is the part of kilometers of coated roads in the region compared to the sum of kilometers of national coated roads.

7.2.1. Estimates of the results of analysis

To choose between fixed and random effects, we have conducted a Hausman test. The test appears below the 10% probability level. Therefore, the use of fixed effect is most appropriate. Thus, to estimate the fixed effects we use the LSDV method of adding dummy variables for each region and each year to monitor the effect of this unobserved heterogeneity.

Table 4: Results of the estimates of β -convergence

Variable	**Value added**		**Employments**		**Labor productivity**	
	Eq1	**Eq2**	**Eq1**	**Eq2**	**Eq1**	**Eq 2**
Yt-1	0,3789**	0,9674***	0,6770***	1,0105***	0,0577	0,9178***
Wy	-0,0028		-0,0033		-0,0086	
Educ	0,0039		0,0118**		-0,0096	
Road	0,0011		0,0096**		-0,0013	
Txact	0,0296		-0,0183		0,1437**	

txdinvest	0,0037*		0,0071		0,0082	
Pop	-0,0082***		-0,0082**		-0,0081	
_cons	1,6694***	0,1070*	0,0537**	-0,0326	1,4981***	0,1960*
Convergence speed	0,97	0,03	0,39	-0,01	2,85	0,09
half-life	0,7	20,9	1,8	-66,2	0,2	8,1
N	112	112	112	112	112	112
R2	0,9746	0,9563	0,9891	0,9808	0,9052	0,8380
Fisher test	225,9853	368,3246	1169,5118	716,9613	70,8108	46,7044
Prob> F	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
hausmen test	29,8100	22,7400	21,6000	17,7800	38,6500	32,8100
Prob>chi2	0,0001	0	0,003	0	0	0
legend: * p<0,1; ** p<0,05; *** p<0,01						

Examination of the results shows the existence of the absolute convergence process of Moroccan regions in value added and productivity. Indeed, the coefficients (1 + β) of lagged productivity and the lagged value added (Equation 1), seem less than 1 (0.97 for the added value and productivity to 0.92) and significant. Thus, these results confirm the existence of a convergence process with a rate of 3% for the added value and 9% for productivity. Also, the values of the half-life would indicate that at the current rate, around 21 years is necessary to halve the regional inequalities, in value added and about 8 years need to halve the regional inequalities in labor productivity. However, we note the lack of a convergence process in employment, with a negative rate of -1%. These results can be explained by conditioning variable.

Indeed, the conditional convergence shows that we can achieve convergence of employment and improving the convergence rate of the value added and productivity. This is possible by improving the level of certain variables.

For added value, we find that the introduction of conditioning variables induced a convergence rate improvement (from 3% to 97%). Also, the positive and significant coefficient of investment rate (0.0037) indicates that this improvement is probably due to the fact that the convergence process can exist through the similar rate of investments. On the other hand, it would appear that the share of the population in the region has a negative effect on growth. Indeed, when there is a high concentration of the population in a region, the regions must devote significant resources to the construction of schools, hospitals, housing and other social services needed by the population (demographic investments in the terminology of A. Sauvy) (Henry, J. 1974). Even if the funds invested in these operations are socially necessary, they are not immediately productive. Also, the negative effect of the population seems to affect employment in the same way that the value added with a similar coefficient (-0.0082).

Nevertheless, it appears that there are many other variables that act positively on the growth of employment and involve accelerating convergence. Thus, we have moved from divergence results in negative speed -1% to convergence with a speed of 39%. This is due to the positive and significant effect on the percentage of students in secondary schools and public investment measured by the share of coated roads in the region. Thereby improving the convergence of employment in Morocco can be possible through education levels of the population and similar public investment. This result is the same as the one which was obtained by the authors of the

OCDE (2010), mentioned that the infrastructure does not affect regional growth, unless improving education. In other words, the roads can open new markets, but also provoke fierce competition. This competition causes the death of local companies or their relocation. However, if human capital and innovation are present locally, capital is more interesting to stay in the region.

8. Conclusion:

By our analysis of regional inequalities, we found the existence of large growth gaps in employment, value-added or productivity with growth rates from 10% to-54%. We have also shown that the specialization in high potential sector are important to ensure high growth. However, we showed that even with high potential sectors, region might realize negative growth because the importance of regional effects, including externalities. We also were able to identify several variables, which need to focus public policies to improve the convergence and reduce disparities. Indeed, a policy focused on improving investment in poor regions can significantly reduce the disparity in value added. Similarly, conventional policies based solely on the infrastructure development or education are not sufficient. A more comprehensive approach needed that integrates these two axes and encouraging business development and knowledge transfer.

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