Territorial Diagnosis of Algeria; An essay of a principal component analysis

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Abstract:

To understand and manage a territory, it is necessary to understand it in all its aspects. Faced with the complexity of the processes, development professionals today need new keys to understand and support actors in the field and decision-makers in the design and implementation of actions promoting development dynamics. Territorial diagnosis is a technique intended to measure, evaluate and model the various development issues. It leads to the promotion and enhancement of territories.

This research has set the objective of developing a territorial diagnosis of Algeria with its forty eight wilayas. We supported our study with a principal component analysis (PCA). This allowed us to define the characteristics of the different regions of Algeria and presented the diversity of Algerian territory

.**Keywords:** Territorial diagnosis, Development, territory, Principal Component Analysis (PCA), Territorial Typology, Algeria

Jel Classification Codes: L83 ;Q32;Q34.

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1. INTRODUCTION

Territories appear more and more as privileged places for the organization of development processes and the creation of wealth (Courlet, 2008).

The permanent evolution of territories implies a change in the practices and mentalities of development actors. From now on, it is a question of going beyond the traditional sectoral policies to engage in transversal policies for the development of territories.

The notion of territory corresponds to an evolution of economic reality but also to an epistemological evolution in space economics. It aims to introduce the economic, social, historical and cultural dimension that participates in the formulation and implementation of any regional or local development project. (BENKO, 2007)

Indeed, the concept of territory integrates, in addition to the economic potential provided by generic factors (capital, labour, technology), the historical, social and cultural dimensions that can be put at the service of development. Territorial dynamics invariably involve a combination (an embedding in the sense of POLANYI (1950)) of aspects identified as strictly economic and aspects qualified as socio-institutional or cultural.

To understand and manage a territory, it is necessary to grasp it in its spatial, demographic, social and economic aspects. Faced with the complexity of processes, development professionals today need new keys to understand and support field actors and decision-makers in the design and implementation of actions promoting development dynamics in a territory.

The implementation of such an approach calls for a new way of thinking: the definition of a local development project of the territory. This project cannot be done without the development, upstream, of a territorial diagnosis highlighting its characteristics, challenges and opportunities. The territorial diagnosis has become a method, a tool, intended to measure, evaluate and model the various economic and social issues.

Indeed, the diagnosis is an analysis device that makes it possible to highlight the economic, spatial and social issues and specificities of a territory, and to assess the potentialities and constraints, strengths and weaknesses, and to identify the actors with their stakes, strategies and practices.

The objective is to lead to the promotion and enhancement of territories starting from a prospective vision. In its study phase, this diagnosis includes geographical, demographic, social, cultural, economic, institutional dimensions, and takes into account the external factors that affect these dimensions.

Starting from the assumption that the territorial diagnosis makes it possible to characterize a space (country, region; wilaya; commune) by giving a vision of the dynamics that are specific to it, our problem is centered on the diagnosis of the territory in a development perspective.

2. The territorial diagnosis: an instrument for observation and analysis of the territory.

The territorial diagnosis is a tool that makes it possible to establish a fair representation of the community so that commitments and actions are relevant to the local reality.

1-2 The territorial diagnosis: What is it?

The diagnosis is an analysis device that makes it possible to highlight the economic, spatial and social issues and specificities of a territory, and to assess the potentialities and constraints, strengths and weaknesses, identify the actors with their stakes, strategies and practices. The objective is to lead to the promotion and enhancement of territories starting from a prospective vision.

1-3 Why a territorial diagnosis?

The objective of a territorial diagnosis is to allow the appropriation by the actors in the field of the same vision of their territory and its future. Therefore, it must be participatory and presented in an integrated and prospective way: it is a strategic vision and not a simple description.

2-The territorial diagnosis of Algeria: a brief socio-economic presentation

2-1 The terms of reference:

The territory on which we will establish the diagnosis is Algeria. It covers an area of 2,381,741 km2, with 1,200 km of coastline and common borders with Tunisia, Libya, Morocco, Western Sahara and Mauritania and with Mali and Niger. Enjoying this privileged geographical position and this considerable space,

Algeria is the largest country in Africa. With a land of contrasts and various reliefs, where Mediterranean landscapes meet, vast semi-arid high plateaus and lunar desert spaces. However, the country is mostly arid and semi-arid, despite its reputation as a Mediterranean country. Areas of the territory that receive more than 400 mm of rain per year are limited to a strip of up to 150 km deep from the

littoral. The relief chains accentuate the speed of the drying up of the climate by going south, talking about arrangements parallel to the coast. Three very contrasting ensembles share the Algerian territory:
• the Tellien ensemble, in the North (4% of the total area of Algeria);
• all the highlands (9% of the total area);
• the whole of the Sahara, in the South (87% of the territory).

Algeria enjoys a Mediterranean climate, the sun shines throughout the year and the winters are mild.

2-2 Elements of socio-demographic diagnosis

Since independence, the population of the forty-eight Wilayas of Algeria has continued to grow. Algeria had 12.7 million people in the 1966 General Population and Housing Census. In 2016, the resident population is estimated at more than 40 million (more than triple the population of 50 years ago).

The Algerian population is very unevenly distributed on the territory, indeed it is mostly concentrated less than 250 km from the Mediterranean coast, beyond 250 km south of the coast the population is rare except in a few cities that correspond to oases.

The 12 wilayas with a density of less than 20 inhabitants per km² (Djelfa, Laghouat, El Oued, Naama, El Bayedh, Ouargla, Ghardaïa, Adrar, Bechar, Tamenrasset, Illizi and Tindouf) represent 89% of the country's surface area for barely 13% of the population.

The other 36 wilayas, all with a density of more than 20 inhabitants per km², and all located in the north of the country, represent 11% of the area (about 240,000 km2) and account for 87% of the population.

Among these 36 wilayas of the North, the highest densities are found around the large agglomerations (Algiers, Oran, Constantine and Annaba), followed by the more rural coastal wilayas (Chlef, Tipaza, Tizi Ouzou, Jijel, Skikda, etc.), then the interior wilayas (Relizane, Mascara, Médéa, Souk Ahras, etc.) and finally the wilayas close to the Sahara (Tébessa, M'sila, Tiaret, Saida, etc.).

2-3 Elements of economic diagnosis:
The main economic data according to the 2014 statistics are as follows:
.GDP: USD 214 billion in 2014)
Sectoral distribution of GDP (ONS 2012 data):
-agriculture: 9.7%
-hydrocarbons: 35.4%
-non-hydrocarbon industry: 5%
-BTPH: 10.1%
-market services: 21.7%
- non-market services: 18.2%

Growth rate: 2.7% (5.9% excluding hydrocarbons)
Unemployment rate: 9.7% of the active population (24.3% of young people, ILO source)
Inflation rate: 3.3% (2014)
HDI: 93rd in 2014, with a human development index of 0.717.
Trade balance: +USD 2.9 billion (source Bank of Algeria/2014); -USD 6 billion at the end of May 2015.
Hydrocarbons: 35% GDP; 97% of exports; 60% of tax revenues.

Algeria is the world's 11th largest producer of natural gas in 2013 and 17th largest oil producer in 2014. The country's economy is extremely dependent on hydrocarbons, which account for the bulk of the country's export revenue and the main item for building up the country's GDP and fiscal resources.

In addition to the hydrocarbon industry, Algeria has an important industrial and agricultural base but very uncompetitive for historical reasons due to the model of centralized statist development adopted during the 60s and 70s until mid-80s.

Since mid-1980, a process of liberalisation of the economy has begun and the country now has nearly 800 000 private ENTERPRISES of the SME type, including nearly 50 000 in the industrial field.

The rise in hydrocarbon prices during the 2000s until the end of 2014 enabled the country to accumulate significant financial resources that made it possible to launch ambitious public infrastructure and economic investment programmes. These programmes have not yet succeeded in enabling a significant diversification of the Algerian economy.

The importance of imports of capital and consumer goods, much of which is earlined for infrastructure programmes, has led since the start of the downward cycle in

hydrocarbons in 2014 to a trade deficit that is difficult for the Algerian economy to sustain. Beyond the fall in hydrocarbon prices, Algeria's proven reserves and production are falling.

What does Principal Component Analysis (PCA) reveal as a method of territorial diagnosis?

To refine our study, we now plan to use data analysis methods and more specifically principal component analysis to better characterize the territory under study, namely Algeria.

This factorial approach will allow us, on the one hand, to eliminate redundancy in the original data by trying to group the initial statistical information by a smaller number of synthetic variables (the factors). And on the other hand, to group the wilayas characterized by a socio-economic environment as homogeneous as possible. According to a typology that highlights the characteristics of the different classes

This analysis will also make it possible to define several differentiated territorial units considered as units of analysis. This tool will also highlight characteristics related to competition, competitiveness and local and regional economic attractiveness.

3-1 Constriction of the data matrix and definition of the selected indicators.

We have decided to retain among the many socio-economic indicators, 19 variables that we consider relevant to conduct our ACP because it perfectly synthesizes all the initial information and these variables mainly concern:

- physical criteria
- demographic criteria
- economic criteria
- equipment and social criteria

3-2 Processing and analysis of CPA results:

First of all, we must center and reduce the initial variables in order to get rid of the units of measurement that are very heterogeneous. And then we will exploit this stock of data by the software: SPSS version 20.0.

3-2-1 l identification of the main components:

When we carry out an Principal Component Analysis (PCA), several elements (tables, graphs) are created to help us in the interpretation of the results, Among them, we will retain the table of eigenvalues.

& Eigenvalues

The data concerning the wilayas of Algeria were processed using a centred-standardized PCA. The table of eigenvalues (total variance explained) shows that the structure on the first axis contains a lot of information and that we must also look at the following two axes:

Table number (01): total variance explained

Variance totale expliquée

Composante	Valeurs propres initiales			Extraction Sommes des carrés des facteurs retenus		
	Total	% de la variance	% cumulés	Total	% de la variance	% cumulés
1	7,306	38,454	38,454	7,306	38,454	38,454
2	2,431	12,796	51,251	2,431	12,796	51,251
3	1,814	9,548	60,799	1,814	9,548	60,799
4	1,522	8,009	68,808	1,522	8,009	68,808
5	1,271	6,689	75,496	1,271	6,689	75,496
6	,923	4,860	80,357			
7	,864	4,549	84,905			
8	,731	3,849	88,754			
9	,540	2,843	91,597			
10	,439	2,308	93,906			
11	,364	1,915	95,821			
12	,272	1,434	97,255			
13	,222	1,170	98,425			
14	,103	,542	98,967			
15	,073	,386	99,354			
16	,049	,257	99,611			
17	,033	,174	99,784			
18	,025	,134	99,918			
19	,016	,082	100,000			

Méthode d'extraction : Analyse en composantes principales.

Source: CPA result

According to the kaiser criterion, we can retain all the axes that have an e-value greater than 1, in our case, we have highlighted 5 axes whose e-value is greater than 1. These axes reproduce 75.496% of the initial information. However, only 3 factorial axes seem significant, if we take into account their compositions as a function of the initial variables, this meaning is interpreted by the importance of the coefficients of the initial variable in the axis.

The three axes selected explain 60.799% of the total variance (Table number 01). This choice is justified by the arrangement of saturations (contribution of variables in the constitution of the factor) and by their thematic sense. The axes have been retained when they relate to identifiable and explainable processes. it is therefore possible to proceed in a relevant way to a reduction of the information matrix in the dimension of the variables (passage of nineteen variables to three axes).

& Economic interpretation of the results.

After having retained three factorial axes, it is now a question of interpreting these axes and giving them a socio-economic meaning that would account for the informational content they convey.

The economic interpretation of the principal components is based on the study of the correlations that appear between the variables that make up each factor axis.

&Factor axis n° 1: the axis reflecting socio-economic dynamism

Indeed, this axis reflects the socio-economic potential of the country in terms of population, activities and infrastructure. This is the most important because it alone explains 38.454% of the total variance.

The variables that are strongly correlated with it and that thereby determine its meaning are:

□ Demographic variables: Total population and density (inhabitant /Km²), as well as the activity rate these variables reflect demographic dynamism.

□ Economic variables: Indicators of industrial activities such as the number of SMEs, industrial zone, industrial society and activity zone are highly correlated with the positive part of the axis; these indicators define the level of activity

We can therefore interpret the first axis, as a component that reflects the urban character and the level of activity, equipment and social satisfaction of the wilayas.

□ Factor axis n° 2: the axis that reflects social coverage This second axis explains 12.796% of the total variance (modest explanatory power). This is the axis of social services: a positive correlation with coating rate, AEP, electrification, gas coverage.

□ Factorial axis n° 3: the axis that reflects agro-pastoral potential

It represents the agro-pastoral potential of the communes. This third axis still explains 9.548% of the total inertia. This axis reflects the rural character, where there is a strong presence of irrigated areas and agricultural areas used which are positively correlated with the axis. which highlights the agro-pastoral character.

To better visualize the interpretation of the different axes, we represent them the matrix of components according to the determining initial variables.

Table number (02): Component Matrix

Component Matrix[a]

	Component		
	1	2	3
population	,963	,015	,154
density	,865	,226	-,319
Primary OCD	,117	,466	,369
nbr CEM/high school	,763	-,094	,161
teacher training establishments	,877	-,251	,093
housing deliveries	,846	-,266	,029
inhabitant/doctor	,925	,168	-,126
linear road	,135	-,920	,011
coating rate	,359	,442	,325
EPA	,165	,409	-,108
ELECTRIFICATION	-,131	,540	-,168
CITY INCUBATOR	-,049	,520	,312
unemployment rate	,377	-,354	-,123
number of SMEs	,943	,061	-,188
investment volume	-,458	,105	-,309
INDUSTRIAL COMPANIES	,897	,160	-,251
ZI+ZA	,669	,129	,129
Irrigated UAA	,055	-,030	,648

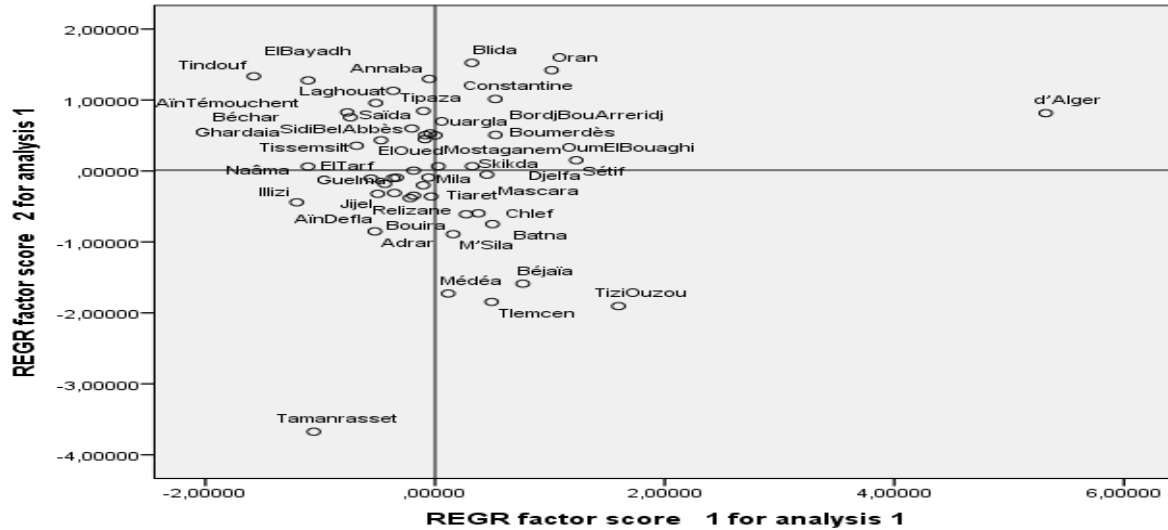| SAU	,064	-,193	,783

Extraction method: Principal component analysis.
3 components extracted.

Source: CPA result

3-3Interpretation of the distribution of individuals (wilayas) by factorial axis:
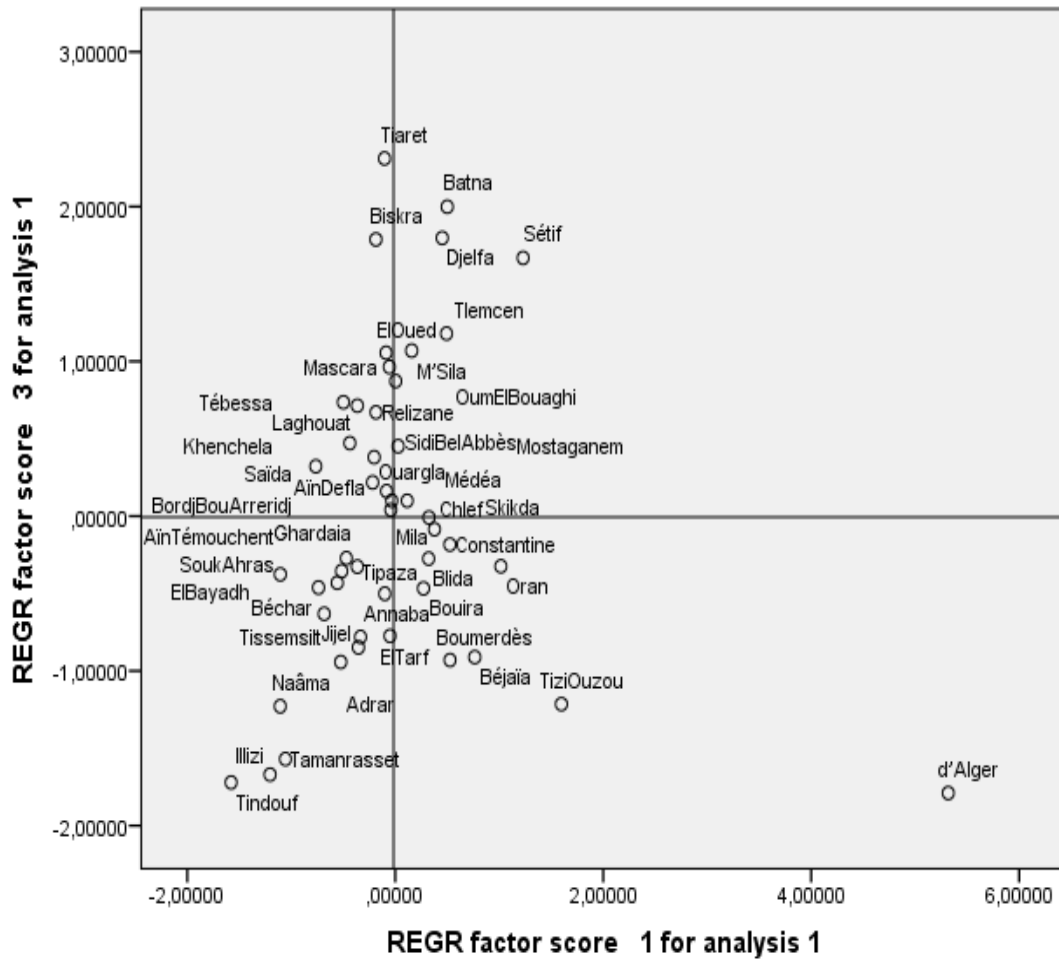### Figure number (01) : representation of municipalities by factorial axes (F1 and F2)

axis factor n°1 :

Source: CPA result

Figure number (02): representation of municipalities by factorial axes (F1 and F3)

Source: CPA result

& Factor axis n°1:

Figures 1 and 2 of the dispersion of individuals clearly show the discrimination of the wilaya of Algiers; capital that is distinguished by a strong positive correlation with the first axis. This reflects its purely urban and active aspect as well as its level of equipment and satisfaction of social demand which is very high. The city of Algiers is the anchor point of the country. {the head of the urban framework of Algeria).

Oran, Setif, Tizi Ouzou, Blida are also presented in this axis, these wilayas are major centers of the agglomeration; regional hubs.

A little less important than that, we find Bejaia, Sidi Bel Abbas, Constantine, Boumerdès Tlemcen, Batna, Chlef, Mascara, Skikda, Bourj Bouarrirdj have a positive correlation with the first axis. These are of a moderately urban character, hence the modest level of economic activity and equipment.

On the negative side of the axis, are represented wilaya characterized by the absence of urban character. where we find most of the southern cities and the inner cities.

In conclusion we deduce that the first axis revealed the particularity of wilaya of Algiers which constitutes a socio-economic pole. This axis therefore reflects the spatial, social and structuring imbalances of Algeria.

& Factor axis n°2:

In the dexieme axis that has been retained is almost most of the wilaya of Algeria with a more or less strong correlation, and confirms the efforts of the state in the coverage of social needs.

& Factor axis n° 3:

The third axis, which bears agro-pastoral characteristics, brings together with relatively high positive correlations with Tiaret, Batna, Beskra, Djelfa, Setif, Tlemcen, ElOued, Mascara, as well as most of the interior cities.

This axis opposes on the negative side the wilaya of southern Algeria and the large willaya such as Algiers, Oran, Tizi Ouzou, Boumerdes, Blida, Anaba, testify to the absence of agricultural activities in these regions.

This statistical treatment has therefore made it possible to reduce the horizontal dimension of our starting matrix which now has five "new variables" but only three factors is significant instead of nineteen original variables.

The distribution by wilayafollowed by searching for the "proximities" of observations in a multidimensional space; the nearest wilayas, i.e. obtaining comparable values for the different factors (and therefore characterized by the same socio-economic environment). This second statistical treatment therefore contributes to reducing the vertical dimension of our starting matrix.

4.Conclusion

The Principal Component Analysis (PCA), conducted for the wilayas of Algeria on the basis of the same initial information, have a number of similarities but also specificities of their own, and highlights that this territory has a marquetry of space including:

- Very uneven development. and und coordinated.

- Algiers is a dynamic space characterized by the importance of the size of the city, the quality and level of services and facilities offered as well as its superior tertiary activities and its regional and national influence.

- The wilaya immediately peripheral to Algiers: Blida, Boumerdes, know a certain level of resources and living conditions thanks to the jobs and activities offered by the concentration of investments and activities offered on the pole of Algiers.

- The major cities of Algeria: Oran, Setif Tizi Ouzou Tlemcen are also strongly linked to socio-economic dynamics (services, equipment, employment and transport etc.).

- The majority of wilayas are in a situation of unstable balance, and remain in the precariousness of their resources for lack of other solutions.

-The hyper-centration on the coastal cities does not allow the complementarities of the wilayas between north and south and east and west

- The majority of the wilayas of the south and the wilayasintérieurs are in a situation of unstable balance, and remain in the precariousness of their resources for lack of other solutions.

- Agricultural and pastoral activity occupy an important place in the interior wilayas but the well-recognized agro-pastoral vocation does not seem to be transformed into economic dynamics territorially well distributed and the few financial benefits concern only the wilaya itself, while the country has immense natural, human and patrimonial potential, relatively well distributed.

The results obtained have therefore shown us that there are glaring disparities between the types of territories that we have highlighted from this analysis.

This analysis is necessary because it represents an important basis, especially since it has highlighted the strengths and weaknesses as well as the socio-economic characteristics of each territory. This will facilitate in the future for the actors a better management of their territories to achieve a pragmatic governance according to each type of territory. Thus, at the end of this article, our study shows the role that diagnosis plays in the orientation, management and governance of a territory.

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