



Research Article

EVOLUTION OF THE GEOGRAPHICAL CONCENTRATION OF THE TUNISIAN ACTIVITIES

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ABSTRACT

The study of the concentration and the agglomeration of employment on the Tunisian territory is an important tool which makes it possible to clarify the local policies of regional development. The object of this paper is to carry out a descriptive and comparative analysis structures of the geographical presence of the economic activities and its recent evolution (period 1984-2014). One of the principal results obtained is important imbalance as regards attractiveness of the Tunisian areas for employment in spite of a sensitive improvement during the same study period.

Key words:

Concentration, imbalance, indexes, employment.

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INTRODUCTION

The objective of this paper is to carry out a descriptive analysis of the geographical agglomeration of the economic activities and its recent evolution (period 1984-2014). The

Principal questions put in this study are the following ones

- Are the economic activities concentrated geographically in Tunisia?
- Which are the areas which represent agglomerations of employment most important on the Tunisian territory?

Theoretical and space framework of the study

The geographical distribution of the economic activities is seldom uniform on the territories. Since more than one century, the researchers try to discover the concentration factors of the economic activities in space according to two types of approach: geographical and economic.

Geographical concentration of the activities tally theoretical

The first type of approach goes back to work of von Thünen¹: this one explains thanks to a theoretical diagram the appearance of zones specialized in an agricultural production, specialization being function of the distance to a center of hypothetical market. Alonso and Muth² base their model on the concept of ground rent to explain the space structure of the cities around the Exchange Business District (CBD), place of

concentration of the head offices and the related activities of tertiary sector there. The economic approach differs from the preceding one in what the characteristics of space are not introduced as such into the construction of the models. In the most recent approach, known as of “the new geographical economy”, in fact the mechanisms of cumulative agglomeration are studied, by which similar areas, even identical in a time T, can differ from endogenous manner in central areas and outlying areas. We propose here after a short outline of the principal determinants of the localization of the activities, drawn from the two types of approach. It is possible to gather them in two main categories: centripetal forces (or forces of agglomeration of the activities) and centrifugal forces (or forces of dispersion of the activities).

Forces of agglomeration of the activities

How to explain the formation and the growth of the cities and the poles of activities? The basic assumptions explaining the

Agglomeration of the activities are the following ones

- The primary source of the agglomeration of the activities lies in the exploitation of outputs of scale increasing at the level of the firm.
- The imperfect competition is at the base of a second big factor of agglomeration. The trend reduction in the costs of transport generates a decompartmentalization of the markets. These externalities of agglomeration were highlighted by the theories of Marshall and can be subdivided in three categories³:
- The presence of suppliers and customers (input-output linkages; forward-backward linkages);

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1 Von Thünen J. (1826), Die isolierte Staat in Beziehung auf Lfandwirtschaft und Nationaloekonomie, traduit par Wartenberg et Hall, von Thünen's isolated state, 1966
2 It's a adaptation of von Thünen model

3 Krugman (1993), “First Nature, Second Nature, and Metropolitan Location”, Journal of Regional Science

- A divided job market (ploughing market pooling): the quantity and the diversity of the offer of local work constitute an attraction force for the companies because they facilitate supply-demand pairings of employment.
- Externalities of information (information spillovers): also called 'externalities dynamiques' because contributing theoretically to the growth, they result from the transfer of knowledge between firms agglomerated by the means of abstract networks, but also from the rotation of the skilled labour and management between the firms.

Forces of dispersion of the activities

Duranton⁴ clearly highlighted the factors of dispersion of the activities, being able to explain the centrifugal movements of good number of activities compared to the current downtown areas. The costs of transport remain a big factor of dispersion, or at least limit the tendency to the agglomeration of the activities. Three types of costs of transport can be considered:
 A. *Costs of transport to go to work or carry out its purchases* (commuting costs or shopping costs; intra-urban transport). These costs constitute the base of the great majority of the models of urban economy. The urban economy arrives at two principal results:

1. There exists a decreasing gradient of ground rent (bid rent function): the ground rent decreases as one moves away from the urban centre;
2. The intra-urban costs of transport are the principal force which limits the growth of the urban centre.

B. *Costs of transport for the manufactured goods (shipping costs)*. The existence of a resident population attached on the ground (like the farmers, and more generally any type of not very mobile population geographically) obliges the firms to serve this nonmobile request.

C. *Costs of transport on the agricultural goods*.

Delimitation of the space framework

Governorship and district to treat agglomeration of the economic activities leads us to clearly define what recovers the term 'governorship or délégations'. Conceptually, the decree of June 21, 1956 and the law n° 71 of March 27, 1969 represent the bearing legal framework creation of the administrative cutting of the territory of the republic. It is registered there that the Tunisian territory is cut out in district, each district is cut out as governorships, each governorships is cut out in delegations. The list of the areas is the following one:

| Code | District | Governorship |
|------|--------------|---|
| 1 | North west | Tunis-Ariana- Ben Arous- Manouba-Nabeul- Zaghouan-Bizerte |
| 2 | North East | Béjà-Jendouba- Le Kef-Siliana |
| 3 | Central West | Sousse-Mahdia- Monastir-Sfax |
| 4 | Central East | Kairouan- Kasserine-Sidi Bouzid |
| 5 | South West | Gabes-Medenine- Tataouine |
| 6 | South East | G a f s a - T o z e u r - Kébili |

Data of the study

The principal variable used in this study is the employee job instead of work, coming from the database of the Institut National de Statistique (INS) and the API one. The received data of the INS and API make it possible to as well obtain a rather fine disintegration at the sectoral level as at the geographical level (delegation) for the period going from 1984 to 2014.

Geographical concentration of the economic activities in Tunisia

In this part, we try to see the economic activities up to what point are concentrated geographically through the national territory and the total evolution in the time of Tunisian economic fabric. In order to appreciate the geographical degree of concentration of the economic activities, we proceed in three times. First of all, we clarify the various geographical degrees of concentration used, by basing us on the empirical literature. Then, we calculate and interpret the geographical concentration observed for several variables of economic activity in 2014 and the evolution between 1994 and 2014.

Total geographical concentration of the economic activities

Some indexes

The number and the form of the basic space entities having an influence on the value of the indexes obtained, one generally uses several levels of space disintegration. In the present study, the basic space entities are the delegations (N=264) and the governorships (N=24). The geographical degrees of concentration can be divided into two groups: absolute degrees of concentration, and indexes of equal distribution⁵.

The first characterize the geographical distribution of a variable X without reference to another variable, while the seconds characterize the concentration of a variable X by taking as reference the geographical distribution of a variable Y. By preoccupation with a coherence between the various indexes and symbols, will be used to indicate the nth basic space entity (i=1 N). X and represent there the shares of variables X and Y so that $\sum xi = \sum yi = 1$

Index of space Herfindahl: The index of space Herfindahl⁶ is during geographical of the industrial degree of concentration of Herfindahl. It is calculated in the following way

$$H = \sum_{i=1}^m x_i^2$$

With xi = share of variable X (here: employment) catch by entity I in the territory of reference (here: Tunisia). The value of H lies between 1/m and 1; if all the activity is localised in only one entity, the geographical concentration is maximum and the index of Herfindahl is equal to 1. On the other hand, in the event of perfectly uniform geographical distribution of activity X on the territory, the concentration is minimal and H is equal to 1/m. For a great number of basic space entities, this

⁴ Duranton G., Overman H. (2001), *Localisation in UK Manufacturing Industries: Accessing Non-Randomness Using Micro-Geographic Data*, Preliminary, 25-10-2001, London School of Economics

⁵ Mills E.S. (1972), *Studies in the Structure of the Urban Economy*, Johns Hopkins University Press, Baltimore

⁶ Ellison G., Glaeser E. (1994), "Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach", *Working Paper n°4840 NBER Series*, Cambridge MA

last value can be approximated to 0. The reverse of the index of space Herfindahl (1/H or number is equivalent) led to an interesting interpretation: it is about the equivalent number of space entities which would share uniform activity X of manner between them.

Standard Index of Gini Milanovic : In the family of the indexes of Gini, Milanovic⁷ (1997) proposes a relatively simple way of calculating to quantify the inequality of a distribution of incomes. It is possible to apply it to a geographical distribution. Mathematically, the index is calculated as follows:

$$G_M = \frac{1}{\sqrt{3}} \times \frac{\sigma_x}{\bar{x}} \times \rho(x, r_x)$$

The index of Gini is the product of constant, index of variation of the variable, and index of correlation between the values of the variable and their row R. In the event of strictly linear relation between the values of the variable and their row, the author shows that G = 1/3. In the majority of the situations emanating of the 'world réel', Milanovic shows that the index is higher than 1/3. In our case, an index GM definitely higher than 1/3 indicates a strong geographical concentration.

Index of Hoover⁸ : The index of Hoover is an indication of equal distribution: it makes it possible to compare the distribution of variable X here (: employment) with that of a variable of reference Y. It is calculated in the following way:

$$\text{Hoover} = \frac{1}{2} \sum_{i=1}^m |x_i - y_i|$$

The index is of easy interpretation: it expresses the share of the variable X which it would be necessary to move between

$$G_K = \frac{2}{m^2 \bar{Z}} \times \left[\sum_{i=1}^m \lambda_i (Z_i - \bar{Z}) \right]$$

Where Zi = Xi/Yi, Xi and Yi are respectively the values of the variable of concentration and of the variable of reference for entity I, λi is the position of entity I in the classification in ascending order of Zi, Z bar is the average of Zi. The index generally varies between 0 (absence of concentration) to 1 (maximum concentration, i.e. 100% of the activity concentrated in a space entity). In the continuation of the text, the variables of reference (Yi) used for calculations of the relative indexes of Gini are:

- basic space entities (index GK): the value of each entity I is equal to 1/m;
- area of the basic space entities (index GK area): the value of each entity I is equal to its surface reported to the total surface area of the country.

Total geographical concentration: results for some economic variables

In what follows one will take again the values of the various geographical degrees of concentration of various variables characterizing the economic activity namely: total employment and the number of companies. With at the end of 2014, Tunisia counted 548548 companies. It's the governorship of Tunis which sheltered of it the greatest number with 102356 companies, that is to say 18,7% of the total of the companies. If one added to it the three other governorships of Large Tunis (Ariana, Ben Arous and Manouba), one would reach the figure of 191971 and one rate of 34,1%. Sfax arrived in second position with 49586 companies followed by Nabeul (39453), Sousse (34910), Bizerte (26285), Monastir (25235), Kairouan (18712), Mahdia (18453) and Médenine (18245).

Table 1 Degree of concentration population by governorship

| | Herfindahl spatial Index | 1/H | Gini Milanovic Index | Hoover | Gini relative Index | Gini area Index |
|------|--------------------------|------------|----------------------|------------|---------------------|-----------------|
| 1994 | 0,0539425 | 18,538258 | 0,26605586 | 0,17965904 | 0,266055859 | 0,72159056 |
| 2014 | 0,0525211 | 19,0399679 | 0,27905603 | 0,19335671 | 0,27905603 | 0,72232176 |

entities I to lead to a geographical distribution equivalent to that of variable Y. It varies between 0 (perfect equal distribution) and 1 (theoretical maximum concentration).

Index of relative Gini : Following the example index of Hoover, the index of relative Gini is also an indication of inequality of distribution between two variables. The index of Gini is included/understood starting from the Lorenz curve: this one is built starting from the classification in ascending order of the relationship (Zi) between the variable of concentration (Xi) and the variable of reference (Yi). We proposes the mode of obtaining following for the locational Gini index (GK):

The interpretation of the index of Hoover by governorship indicates that it would be necessary to move 23, 7% of employment, 19% of the population and 30% of the companies to arrive at a uniform distribution between governorships for the year 2014, while this figure was appreciably the same one for employment and amounted to 21,5% for the companies and 18% for the population for the year 1994.

The weakest concentration of the population compared to the economic activities is confirmed by geographical degrees of concentration significantly weaker on two geographical scales. Indexs of space Herfindahl (basic entities governorship) of the population, the use and the distribution of the companies (respectively 0,052; 0,057 and 0,074) correspond to a theoretical uniform distribution of these various variables. In the same way, the analysis of the reverse of space Herfindahl of employment shows that the number are equivalent of space entities which would share the uniform activity of manner between them, is large (17 out of 24) and

7 Milanovic Br. (1997), "A simple way to calculate the Gini coefficient, and some implications", Elsevier Economic Letters 56, pp. 45-49
 8 Krugman P. (1991a), Geography and Trade, Leuven University Press – MIT Press

that this percentage is stable in time what indicates of a weak geographical concentration.

Table 2 Geographical degrees of concentration for employment between 1984 and 2014 by governorship

| | Herfindahl spatial Index | 1/H | Gini Milanovic Index | Hoover | Gini relative Index | Gini area Index |
|---------------|--------------------------|--------|----------------------|--------|---------------------|-----------------|
| 1984 | 0,059 | 16,810 | 0,347 | 0,215 | 0,311 | 0,756 |
| 1994 | 0,060 | 16,703 | 0,366 | 0,234 | 0,330 | 0,755 |
| 2004 | 0,056 | 17,746 | 0,327 | 0,229 | 0,319 | 0,745 |
| 2014 | 0,057 | 17,599 | 0,332 | 0,237 | 0,324 | 0,800 |
| Firms in 2014 | 0,074 | 13,447 | 0,4141777 | 0,301 | 0,405 | 0,936 |

These results can appear surprising when it is known that these two indexes do not hold in their compositions of the surfaces of the basic units of calculations. Then, it is interesting to notice that employment is dispersed definitely more geographically than the whole of the companies. That it is on the basis of data by governorship or delegations, the degrees of concentration are significantly weaker for employment.

Table 3 Degrees of concentration per delegation in 2014

| Index H | GM | Hoover | Gk area | Gk relative |
|------------|------------|------------|------------|-------------|
| 0,00015814 | 0,35312688 | 0,25729948 | 0,85798301 | 0,3549179 |

This can be explained by the difference in measuring units and the existence of a certain portion of companies of big size (more than 100 employees).

Evolution of the geographical concentration between 1984 and 2014

The evolution of the indexes over period 1984-1994-2014 does not bring great upheavals in the degrees of geographical concentration: the evolutions in general are marked relatively little, reflecting by there a certain degree of inertia 'structurelle' of economic space.

Table 4 relative evolution between 1984-2014 of the degrees of concentration of employment by governorship

| | Herfindahl Spatial Index | Gini Milanovic Index | Hoover Index | Gini relative Index | Gini area Index |
|-------------------|--------------------------|----------------------|--------------|---------------------|-----------------|
| Evolution 84-94 | 0,000 | -0,019 | 0,019 | 0,019 | 0,000 |
| Evolution 94-2014 | -0,003 | 0,034 | 0,003 | -0,005 | 0,044 |
| Evolution 84-2014 | -0,003 | 0,016 | 0,022 | 0,014 | 0,044 |

The inertial character of an initial geographical configuration is besides one of the outstanding results of Krugman, when he affirms ultimately that the history counts ('history matters'). Certain tendencies however deserve to be underlined: it is a question of being more attentive within the meaning of the evolution of the geographical concentration (positive or negative) rather than with the width of this one.

Table 5 Evolution of the degrees of concentration of the population between 1994-2014 by governorship

| | Herfindahl spatial Index | Gini Milanovic Index | Hoover Index | Gini relative Index | Gini area Index |
|-----------|--------------------------|----------------------|--------------|---------------------|-----------------|
| 1994-2014 | -0,0014214 | 0,013000172 | 0,013697665 | 0,013000172 | 0,000731204 |
| 1984-1994 | -0,00551891 | 0,581897394 | -0,032618319 | -0,042551154 | -0,036649802 |
| 1984-2014 | -0,00694032 | 0,594897566 | -0,018920654 | -0,029550982 | -0,035918598 |

First of all, a not very visible movement of dispersion geographical starts to emerge and is reflected by a fall of the degrees of concentration what seems to be of setting for the population. One can think that this movement is more marked

on a delegation scale, undoubtedly reflecting the periurbanisation of the population within the large urban surfaces. With regard to employment, the evolution of the indexes is more contrasted. On a governorship scale, the evolution very slightly negative of certain indexes seems to indicate a certain stabilization of the geographical distribution of employment.

CONCLUSION

The reading of these some outstanding results is enough to underline the paramount role which the forces of agglomeration played to work the current economic geography of Tunisia. The temporal evolution of employment over the period 1984-2014 conduit to distinguish two under-periods from strong growth (1984-1994 and 1994-2014) but only one notices a deceleration of this growth for the second period of observation. Of 2004 to 2014. This tendency tends to be confirmed.

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