THE CHARACTERIZATION OF FUNCTIONAL LEVELS IN THE SETTLEMENTS SYSTEM OF ECUADOR

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I.   INTRODUCTION

Studies to determine the functional potential and the hierarchy of the settlements system usually have a descriptive purpose and it is hardly possible from them to set concrete performance measures. The cause lies in the method used, which consists of the aggregation of selected variables leading to obtain a single parameter which allows stablishing the hierarchical order of cities.

When establishing the hierarchy by aggregation, whatever the method used, over the process, one loses basic information necessary for determining the weight in each city for each one of its functions. This article provides a methodological proposal, applied to the case of Ecuador, which prevents the loss of information by organizing settlements, according to their characteristics, in functional levels, thus maintaining the uniqueness of each city and making it possible to establish specific policies according to their potential and functional specificities.

II.   THE FUNCTIONS OF THE SETTLEMENTS SYSTEMS

To establish the functional potential of settlements systems, significant public and private services have been selected, considering their weight and their functional capacity to articulate the territory generating centrality/dependence effects.

II.1. Public services

In what concerns to public services the value of the function of each facility will end up depending on the frequency of occurrence. Thus, the less frequent a facility is, the greater functional importance it has and, consequently, the more it qualifies to the settlement that contains it. It is under this criterion that the functional potential of public facilities is established.

The concept of public functions includes facilities that for the most part is taken in charge by the public administration in order to provide services to citizens. The selection of the facilities aimed to ensure that their frequency of appearance could discriminate all possible strata of population sizes and be of a daily, periodic or occasional use.

The method used to establish the functional potential of settlements was as follows: the range of each facility, established according to the following expression: r = 1-f / n, where "f" is the number of settlements that has the facility "n" is the total number of settlements and "r" is the range. The range would go from 1 (concentrated) and 0 (scattered).

Once the range for each facility was set, we proceeded to establish nodality as follows:

a) Facilities has been weighted according to their potential in each settlement.
b) The weighting has taken the formula of standardization of the standard unit score or Z score

$$z = \frac{x - \overline{X}}{\sigma}$$

The functional potential is defined as the polynomial sum of the range of each function multiplied by the value of the corresponding standardized variable.

Once the potential has been calculated and the settlements have been ordered by the factor, settlements groups are determined by the public facilities they own. We have created 5 groups of settlements.

II.2. Private functions

For the functional potential analysis, we have considered private services, wholesaling, manufacturing and infrastructure and transportation services.

II.2.1. Private services

In the area of private services we have considered professional services and retail. Professional services qualify the settlement as these services usually appear concentrated and at the same time do not have a proportional distribution with the settlement's population. Large cities are essentially characterized for their variety of personal services to the population (lawyers, architects, etc.), a variety that makes people regularly come from other places.

As for the commercial retail activity we have it has made a selection of activities related to products not daily consumption, such as furniture, appliances, etc., which are of long use and therefore are not of daily acquisition either.

To establish the hierarchy of private functions, settlements are ordered by sales volume, from highest to lowest establishing, on the one hand, professional services and on the other, retail. Then, settlements groups are defined using as an indicator of dispersion standard deviation, both in the case of private services and retail. Finally functional levels of settlements are set as a synthesis of professional services and retail trade.

II.2.2. Wholesale trade

The analysis has considered a selection of all wholesale companies, and has ordered settlements by the total turnover of companies located in them according to the grouping of settlements standard deviation, forming 5 groups.

III.2.3. Manufacturing industries.

Industrial function has followed the same procedure as in the previous case: It selected the total manufacturing and then grouped settlements by total turnover, forming a total turnover and comprised in 5 groups.

III.2.4. Infrastructure and transportation services.

The nodality analysis has considered airports, ports and public passenger transport by road. In the first two cases the indicator is has / has not and in the third case has considered the number of buses that have the settlement as place of destination. Functional potential results from aggregation of these three indicators.

III. THE FUNCTIONAL POTENTIAL OF THE SETTLEMENTS SYSTEM.

The definition of the functional potential of settlements has been achieved by setting an order by levels according to the place of each settlement in the analyzed functions.

The method used aims to prevent settlement's system complexity from remaining unveiled by applying an aggregation method which could draw out an organized relationship of the settlements making it unable to determine the position or level of each settlement in the different functions, which would in turn subsequently make it impossible to set proposals that are appropriate for each case and that aim for specific actions.

For example, a settlement A may have a higher level to a settlement B in public and private services and a lower level in wholesale distribution and transport system, so it would not be possible to establish which of the two settlements has a greater functional potential, however we can determine which functions settlement A or B must work harder on in order to improve its functional potential with respect to the other settlement. In short, we are suggesting that in many cases it is not possible to compare pairs of settlements with each other and therefore we cannot determine which has greater potential level.

Each settlement has been categorized by a functional indicator, expressed in Arabic numbers, which determines its place in each of the functions discussed; thus, in the event that an X settlement is in public services in group I, in private services in group II and wholesale distribution in group I, the functional indicator would be 121; that is, the indicator is a descriptor of the position of such settlement in each of the studied functions. This way, it becomes possible to make decisions to try to enhance the functional level of settlements.

This mode of operation allows setting a relationship order, but also a typology of settlements according to their differential position in each of these functions. This results in

a wide casuistry, as actually present settlement systems, and the method makes it possible to make meaningful clusters that make legible reading of settlement system possible without hiding its complexity.

To set de order relation between settlements, the following criteria apply:

I. Settlements A and B are part of the same functional group if both have the same number of functions, even if they are of different kinds (public function, private services, wholesale activities, etc.)
II. Settlements A and B are in different functional groups if they have different numbers of functions.

These criteria are completed with the following assumptions:

1. Settlement A has greater potential than B if, having the same kind of functions, it has a higher level in one or more functions and for the remaining functions its level is equal to B.
2. Settlement A has a functional potential equivalent to B if, having the same kind of functions, all analyzed functions have the same level.
3. Settlement A has lower potential than B if, having the same kind of functions, it has a lower level in one or more functions and for the remaining functions level equals B.

The result of this is that A and B are not comparable to each other when:

a) Both are part of a different functional group.
b) Both are part of the same functional group but do not meet any of the three assumptions above. This happens when one or more functions of A have higher level than B and in other functions B has a higher level than A.

The applied method therefore allows to justifiably adscribe the various settlements to different functional groups and within them it allows grouping these settlements in types containing the same type of functions and the same level in each function.

The application of the method results in the following:

-   The existence of 908 settlements containing between one and five functions considered in this work. This set of settlements can be distributed into five functional groups, representing each functional group to settlements containing the same number of functions; ie Functional Group I contains all settlements with the five functions, Functional Group II gathers settlements that have four functions, etc.
-   The distribution of the 908 settlements in 139 different types, on the understanding that by types we mean settlements that have the same number and category of functions and the same functional level in each category; that is, they are equal settlements in their functional descriptor.

The fact that many settlements are not comparable with one another does not preclude establishing an ordination, resulting from the grouping of the types of settlements at different levels. It is what has been termed as Synthetics Functional Levels (NFS). These NFS are not the result of a hierarchy of settlements from an ordinal scale, but is rather the result of a decision of inclusion -which must be explicit- of different types of settlements within each NFS and that must meet the requirement of presenting among them greater internal similarity than with those who are placed in other NFS.

The method makes it possible to subdivide these NFS forming new groups, provided the criteria that new NFS have a greater internal functional similarity than with the remaining NFS.

The decision on the number of NFS, provided that the above criterion is met, will depend on the policies to be developed. In the end there may be as many functional levels as settlement types (in this case 139). The decision on the number of NFS does not come first and then differentiated public policies are defined on them, but rather the decision is made while these policies are defined. As a result of this the number of NFS can reach as much as may be deemed necessary, according to the characteristics of the system of settlements and policies applicable to it.

In this study, five NFS are established and are roughly defined, and as an illustrative example, policies that may be particular to each of these levels. Obviously within each NFS, one can develop further policies more adjusted to the characteristics of the different types of settlements that are in each NFS

The approach made to establish NFS is as follows:

- Synthetic Functional Level I. They are grouped in this NFS, settlements with the five functions that are at level 1 in at least four of the five categories of functions considered. It includes the two main cities, Quito and Guayaquil, which host the largest number of public and private endowments in all functions. The limit of this level is quite evident, since under these two cities an important functional leap occurs. Policies to develop are mainly of consolidation of these two cities as centers of articulation with the outside and territorial planning to order strong processes of existing immigration, suburbanization and population relocation.
- Synthetic Functional Level II. It includes settlements with the five functions in question, of which at least two of them are at level 1 or 2. In this functional level are 16 settlements that make up 14 types of settlements. These cities should be enhanced as centers of articulation and formation of regional functional areas.
- Synthetic Functional Level III. It includes settlements that have a presence in all five functions considered and do not belong to Level I or Level II. In this NFS are 77 settlements that result in 30 types. In this NFS the purpose is to create functional areas of subregional scale and strengthen the provincial capitals included in this level to properly articulate the territory of their respective provinces.
- Synthetic Functional Level IV. It includes settlements that have between 3 and 4 functions out of the five considered. In this NFS we find 265 settlements that give rise to 67 types of settlements. Territorial policy should aim to strengthen these settlements with new services and facilities allowing to proper articulation with their rural settings.

- Synthetic Functional Level V. It includes settlements having 1 or 2 functions out of the five considered. In this NFS are 548 settlements that give rise to 26 types of settlements. Since these are functions that develop strictly local, the purpose is its consolidation as local centers that may improve the quality of life of these rural centers.

IV. CONCLUSION

The study can draw the following conclusions:

- The methodology used is intended to establish an approach to functional characteristics of Ecuadorian settlements by classifying them according to their unique characteristics and according to their relative position in respect to the remaining settlements. The methodological procedure followed has consisted in developing a functional descriptor in which has been set the ordinal place that holds that particular settlement in regard with the rest. Thus, each settlement has a five digit code, each of which represent the various analyzed functions (public services, private services, manufacturing, wholesaling and transport) and in which the value of the digit -one to five in our case--, determines the importance of the function considered in that particular settlement. This means that value 1 represents that fact that in that function the settlement has the highest functional level and all settlements with level 1 in that function occupy the highest level in that function's hierarchy.
- With the selected method it is possible to group settlements which have the same functional descriptor and it is feasible to consider, therefore, that similar policies would be applicable to all other settlements with the same descriptor. This method does not establish an urban hierarchy but rather various sets of cities that are included in the same groups if they have the same functional characteristics.
  The proposed method makes it possible; afterwards, to establish groups of cities in functional levels if necessary to apply differentiated public policies and in no way loses the value of the descriptor, which always distinguishes each city.
- The procedure complements, in our view in a proper manner, usual methodologies intended to establish a hierarchy of settlements, but that in the process of aggregation draw out a unique value that cannot determine the functional differences between cities.