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FORMATION OF AN INDEX OF ECONOMIC CAPACITY IN BARCELONA*

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This study presents an evaluation of the "economic capacity" for the year 1988 of each of the 1919 censual sections that Barcelona is divided into. In view of the confidential nature of all information concerning incomes and resources, we have employed an indirect method of estimation using all the territorial information available al the highest level o disaggregation, that is the censual sections. This evaluation gathers variable indicators of income distribution and wealth, and without being exactly one or the other, incorporates elements of both aspects. Taking these variables into account, through Generalised Principal Components Analysis we obtain the economic capacity index of the average household in the censual section. Then it just remains to scale this factor according to the variability of family income by districts in Barcelona, giving a value of 100 for the whole city.

Key words: Economic capacity, quantification, principal components, correspondence analysis.

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1. INTRODUCTION

The purpose of this study is to build an index of economic capacity at the most disaggregated level in Barcelona, which is in our case the censual section (1919 censual sections of approximately 300 households on average). This index can be used for a wide range of purposes, economic studies with territorial reference of any kind, electoral sociology, planning in the public administration, and business and services such as marketing and banking.

Due to the fact that all information concerning incomes and economic resources is confidential, statistical, techniques must be used to create this index. There are different ways of measuring the economic capacity per household, each having its advantages and disavantages. First of all, there is the possibility of making a specific survey; this would have to be very carefully carried out due to the sensitive nature of the subject, which makes it particularly difficult to obtain reliable information about it. The advantage of this method is that it estimates the economic capacity directly from every statistical unit (household) selected. Another possibility consists in estimating economic capacity indirectly from expenditures. In both cases it is necessary to carry out a survey which would inevitably be time-consuming and costly. However, economic capacity would be measured at an individual level (in our case, the statistical individual is the family), and would therefore allow us to characterise the families according to their socio-demographic characteristics, and to obtain average figures for the different territorial units defined in Barcelona (the censual sections, quarters and districts mentioned above), if the selected sample will allow it.

Here, we have employed an indirect methodology for estimating economic capacity, which obviates the need to carry out a survey and consists in using all the territorial information available at the highest level of disaggregation (the censual sections). In fact, this information has already been compiled, especially at a municipal level (to be exact, from the register of inhabitants, the register of vehicles and the land registry), or from services, such as the telephone company. This information has been traditionally taken as an indicator of income or wealth, depending of the cases, by censual section. Therefore, the statistical methodology consisted in extracting the common factor of all the available indicators as the closest approximation to financial capacity. Note that the issued index is not a traditional index of income or wealth, since it incorporates elements of both; nor is it strictly speaking a family index. Indeed it is an average family index by censual section. The main advantage of such a methodology is that it can provide a quick estimate of the economic capacity per censual section at very low cost.

2. AVAILABLE SOURCES OF INFORMATION

Barcelona City Council has provided the following information from its municipal registers of inhabitants (1988), vehicles (1987) and land (1988), aggregated by censual section. From "Telefónica de España, S.A." we received the average annual telephone consumption of its private clients for 1989, also aggregated by censual section:

It is first worth pointing out the (relative) heterogeneity of the indicators provided: they do not all express quite the same. In particular, we can say that the socio-professional category represents a "potential" income in a censual section, or what we might call the "intellectual estate" of the censual section. The size of vehicles and motorcycles, and specially the rateable value of construction and services, are indicative of estate. Land value is more difficult to characterise as it is linked to speculation, but it is an indirect indicator of income spent as it reflects the level of prices in a given area. The size of premises can also be considered an indicator or estate, while the age of vehicles or premises is difficult to characterise, though they can be taken more as indicators of income spent, a lower age indicating higher purchasing power. Telephone consumption is certainly a traditional indicator of income spent, while the connection charge gives some idea of the telephone equipment installed by clients and the number of lines can be indicative of development in a given area.

All the available information has a clear definition in expressing an average value per censual section, taking the most suitable denominator in each case. On the contrary, the quantification of the socio-professional category obtained from the register of inhabitants is not evident, although this information is decisive for any evaluation of income distribution, because the corresponding value in a given censual section is not obvious. Traditionally, this information is presented in the form of a compound index of occupational variables, level of education, type of accommodation, etc. In the present case, we have built a specific socio-professional index of the city of Barcelona, only taking into consideration the occupation of working-age population. Indeed, we known from previous studies that the non-active population expresses an orthogonal dimension to the active one, linked to the age of censual sections; at the same time, the educational level does not provide any complementary information to that of the occupations, relative to censual sections. Therefore, we used the distribution of the working-age population to get a classification of the active population according to their declared or last declared occupation, (in cases where this information is missing, the educational level is used instead), forming a frequency table of 1919 rows (one per each censual section) and 24 columns (the categories of the socio-professional variable). The problem lies in passing from this variable (de-

fined as a multidimensional one) to a synthetic numerical index. We do so by means of the Correspondence Analysis of the above table, obtaining a first factor that summarises 51.63% of the information in the original table. Thus we will use this factor as a numerical quantification of the socio-professional value of each censual section. This factor orders the censual sections according to their professional profile. It reflects the fact that residence is chosen according to the social prestige of occupations. We can therefore name the first axis obtained as a social status axis, which is not directly related to income or wealth (a construction worker can have a very high income) but is related with lifestyle and the possibilities life has to offer. It thus defines potential economic capacity by censual sections.

Finally, after detecting the colinealities among the indicators provided, we used the following ones, which represent different pieces of information for the index of economic capacity:

- Social status (first factor of the CA of the socio-professional table)
- Average power of motors cars per household
- Average age of motor cars
- Average rateable value of construction and services of premises
- Average rateable of sites of premises
- Average monthly spending on telephone per household

3. FORMATION OF THE INDEX

Moving on, so as to extract the common factor most correlated to all the original variables (indicators), we carried out a Normalised Principal Component Analysis weighing each section according to the number of registered households. The matrix of correlations of indicators is as follows:

Social Status	1.00					
Age of motor cars	0.57	1.00				
Rateable of sites	0.82	0.41	1.00			
Power of motor cars	0.67	0.45	0.71	1.00		
Rateable construction services	0.71	0.65	0.74	0.71	1.00	
Telephone consumption	0.74	0.49	0.75	0.71	0.76	1.00

Note that the maximum correlation is that of social status with site value, while the lowest correlations are in the age of vehicles. The singular value decomposition of this matrix gives a first factor which summarises 72.06% of the information of all the original variables together. The expression of the first factor found on the basis of standardised original variables is as follows:

$$\begin{aligned} e.c.i. \;=\; & 0.89\ Social\ Status + 0.84\ Power\ of\ motor\ cars + \\ & + 0.68\ Age\ of\ motor\ cars + 0.90\ Rateable\ construction\ servies + \\ & + 0.88\ Rateable\ of\ sites + 0.88\ Telephone\ consumption \end{aligned}$$

(where e.c.i. stands for economic capacity index).

The correlations between variables and the first factor are given directly by the coefficients of the model. Note that high value of correlations (from 0.84 to 0.90, except for the age of motor cars, which is slightly lower), indicating that this first factor represents in fact a new (unobserved) variable, a compromise between all the variables (indicators) observed. The similarity of the coefficients suggest that the index formed is an approximate average of the selected set of standardised indicators. Finally, all that remains is to express this first factor as an index on the basis 100 for the whole Barcelona. The first factor as the best linear summary of the indicators observed, gives the ordering of the censual sections according to the level of their economic capacity, the mean of this factor corresponding to the average economic capacity for the whole of Barcelona. It does not, however, give the relative difference between censual sections. To do this we need to estimate the variance in the e.c.i. by censual section; we do so using the obtained variance of family income by districts in Barcelona from previous studies of the subject. Finally, expressing the index according to the dispersion found, we obtain an index centered on 100, with a deviation of 34.03; its range of variation goes from 32 to 292, in other words, it goes from approximately a third to approximately three times as much, giving a relative difference between the extremes of nine times as much. The resulting distribution curve is asymmetrical, as we can see in Fig. 1, the histogram of the index produced.

This characteristic, common to all functions of income distribution, becomes clearly evident in the concentration curve (or Lorentz curve, Fig. 2), which is one of the most widely used instruments in the study of inequality.

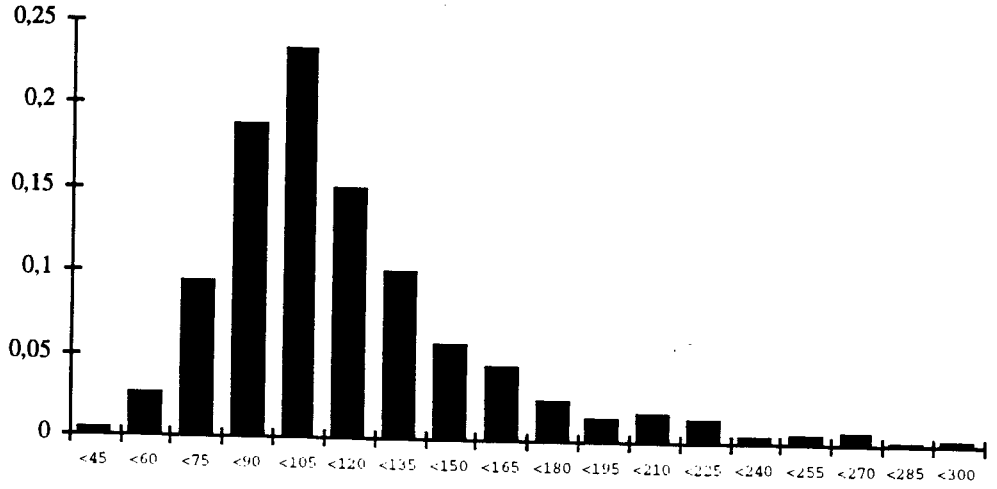

Figure 1.
Histogram of economic capacity index.

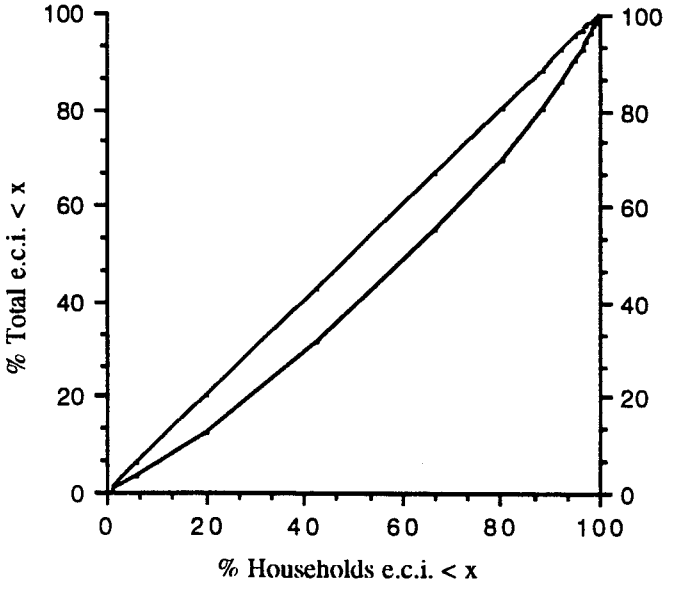

Figure 2.
Lorentz curve of the economic capacity index.

This index can be obtained from the Service of Statistics of the Barcelona City Council; here we give the value of the index for the 10 districts of Barcelona, which allows their comparison with other related studies.

	DISTRICT	E.C.I.	Number of families	% E.C.I. cumulative	% of families cumulative
1	Ciutat Vella	62.70	39067	6.20	6.94
8	Nou Barris	77.35	60264	13.86	17.65
3	Sants-Montjuïc	86.14	62042	22.38	28.68
10	Sant Martí	86.94	69597	30.99	41.05
9	Sant Andreu	88.84	46726	39.78	49.36
7	Horta-Guinardó	91.71	59792	48.86	59.98
6	Gràcia	100.98	47058	58.85	68.35
2	Eixample	114.36	102338	70.17	86.54
4	Les Corts	138.80	27978	83.90	91.51
5	Sarrià-Sant Gervasi	162.67	47762	100.00	100.00
	BARCELONA	100.00	562624		

REFERENCIAS

[1] **Aluja, T.** & **Ventura, A.** (1991). *Index de capacitat econòmica familiar a la ciutat de Barcelona.* Ajuntament de Barcelona i Caixa d'Estalvis i Pensions de Barcelona.

[2] **Oliver, J.**; **Busom, I.** & **Trullén, J.** (1989). *Estimació de la renda familiar disponible per càpita de Barcelona, els seus districtes i els 27 municipis de la Corporació Metropolitana de Barcelona (1985).* Ajuntament de Barcelona.