MEASURING QUALITY OF LIFE IN SMALL AREAS:

AN APPLICATION TO THE PROVINCE OF BARCELONA

ABSTRACT

Multidimensionality is a main point in quality of life definition. Relative position of individuals, global infrastructures or inequalities in some areas, are only three issues that have to be measured. But any of them can be further decomposed in many other basic components. Wealth or mobility for measuring individual positions, differences in labour market positions between sexes, and educational or health infrastructures in the general conditions in any area are simple examples of the different dimensions that can be found in any definition of quality of life.

When we try to deal with this task many problems may arise. For instance, if one researcher wants to quantify health infrastructures in all towns of a province, he will find a smaller number of hospitals than the number of towns. Hence, a list of assumptions must be made in order to distribute the infrastructures in the territory. This is only one of the problems that have to be solved to compute a measure of quality of life for any town.

In the present paper we show an index number methodology to the measurement of quality of life, able to allow for cross and serial comparison. An application to 314 towns of the Barcelona province is computed and results are presented.

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This project has been developed in a convention framework between Diputació de Barcelona and the Regional Quantitative Analysis Research Group. We are grateful to Anna Monreal and Vanesa Tomàs for their support, and for many public and private institutions with which we have worked to achieve the enormous amount of data that was needed to compute the final results.

[⊗] With support of the "Comissionat per a Universitats i Recerca de la Generalitat de Catalunya".

1. Introduction

Our aim in this paper is to develop a methodology which is able to measure the quality of life, understanding it in a multidimensional way, in a set of a very different variety of municipalities, units of measure, and periods of time. Hence, we provide the policy maker a very useful tool in order to consider a global map of different scopes of quality of life. But the static map is also complemented with a dynamic measure, that is presented as an index number. The absolute measure of the position of any town is considered here as important as the relative measure of this position. In order to consider a comparison we take into account both elements to develop the index number.

First of all, we define what do we understand as quality of life. Following Dasgupta and Weale (1992):

> Measures of quality of life can take one of two forms: they can reflect the *constituents* of well-being, or alternatively, they can be measures of the access people have to *determinants* of well-being. Indices of health, welfare, freedom of choice, and more broadly, basic liberties, are instances of the first; those indices which reflect the availability of food, clothing, shelter, potable water, legal aid, education facilities, health care, resources devoted to national security, and income in general, are examples of the latter.

Then, we have to consider that social welfare not only deals with individual welfare, but also understands society as a collectivity. In this sense, the opportunities of this collectivity are at least so important than the opportunities enjoyed by the individual. Quality of life is defined using the elements (objective and subjective) that build the system up. Therefore, measuring quality of life should be done in the whole system where it is defined. This consideration drives to the fact that quality of life can be separately defined for every individual, as there exist subjective elements. Nevertheless, these objective elements can also change over time, what should guide us to describe a new definition depending on the period, or on the territory over analysis.

Quality of life is a multidimensional concept. Following Wish (1986), there are five vectors to consider: economical, political, environmental, social and health and educational. We should study all five, then, if we want to look at global quality of life. If we also focus the object of study over the municipalities, we will see that territory is very important, as there are returns to scale in some services, such as education or health. It handles to the policy maker to decide where has to be placed the unit of service. Nevertheless, it must be considered that all the individuals belonging to any part of the province will have right to use these services that are placed away from their town.

Describing territorial groups is a very important part of the work and has been also considered. So we have used different territorial groups defined as urban systems and urban subsystems (see Artís and Suriñach (dir.), 1999[a]).[1]

Our territorial scope is the Barcelona province. It is a NUTS-III level territorial unit that holds holds 24% of Catalan (NUTS-II) territory, 75,9% of its population and 76% of the employed workers in 1996 (7719 km^2, 4628277 inhabitants and 1659972 workers, respectively). It is (together with Madrid) Spain’s most populated and urbanised province. Finally, we have analysed 314 municipalities, grouped in 48 urban subsystems and urban 24 systems.

In any case, we had to work with a big set of data. Not only in terms of municipalities, but also in terms of variables. These variables were very different in units of measure, and in statistical characteristics. This point forced us to develop a very flexible method in order to account for all possible dimensions of quality of life.

We develop this work in the following sections. In section 2 we show the Synthetic Quality of Life Index (SQLI) structure. Section 3 presents the methodology we have used, and section 4 displays the main results. Section 5 concludes. Appendix 2 lists some methodological problems we had to face.

2. The Synthetic Quality of Life Index (SQLI) structure

The methodology that inspires this work was developed for the USA in Liu (1978). The main idea consists on building a synthetic index using intermediate indexes that have been computed using basic data or other indexes. Determining weights for different

TABLE 1. Synthetic Quality of Life Index structure

SYNTHETIC QUALITY OF LIFE INDEX (SQLI) SQLI = IAP + ISE + CCL
IAP = Individual Ability of Progress **IAP = WI + LI + ELI + MotI + DI**
WI= Wealth Index LI= Labour Index ELI= Educational Level Index MotI = Motorization Index DI = Demographic Index
ISE = Index of Social Equilibrium **ISE = IAH + MigrI + SII + OCI + CongI + STASI**
IAH= Housing Access Index MigrI= Migration Index SII= Sexual Inequalities Index OCI= Obligatory Commuting Index CongI= Congestion Index STASI= Social and Third Age Services Index
CCL = Community Conditions of Life **CCL= HC + PTI + EFI + HFI + CEI + CFMMI + MFSI**
HC= Housing Characteristics PTI= Public Transport Index EFI= Educational Facilities Index HFI= Health Facilities Index CEI= Climactic and Environmental Index CFMMI= Cultural Facilities and Municipal Media Index MFSI= Municipal Financial State Index

variables is one of the more crucial points that face this work, and it is as important as choosing the index structure. Both elements will be decided *a priori*. Table 1 shows the final structure of the SQLI, which is settled considering three main components of quality of life:

[1] We have to remark that the minimum size of the subsystem is 13.500 inhabitants. The systems are exposed in appendix 1.

1. *Individual Ability of Progress*: this first element measures personal features of people living in the municipality. It takes into account wealth, labour, education level, health level and mobility possibilities.
2. *Index of Social Equilibrium*: here the social inequalities that can be found in the collectivity are considered: sexual, migration, housing access, commuting and old people services.
3. *Community Conditions of Life*: global services are here considered: housing, public transport, education and health services, environment, culture and local taxes.

The basic indexes (or subindexes, such as WI, LI, ..., and MFSI) have been built using several variables. Then the SQLI index is composed by 3 main indexes, 18 subindexes and 63 variables. And every variable was computed using basic information. We have to remark that there are important aspects concerning to quality of life, such as Security, that could not be considered due to the absence of complete data.

3. Methodology

The statistical method we have developed has been required to accomplish several requisites, which can be summarised in five points:

1. The index has to be able to aggregate quality of life indicators with different units of measure.
2. The aggregation process has to be able to compare quality of life indicators with a highlevel of different relative dispersion.
3. The index has to allow for defining a measure metric, independently of the former two points, which must be function of data characteristics (*let the data talk*).
4. The final index has to allow for a comparison over time: when a system grows up their basic variables, the final index has to increase.
5. If the relative size of the systems changes along time, the index has to condense this information without overvaluing (infravaluing) the index of a system.

Considering these criteria has lead us to define a final methodology, after considering several ones. The measure philosophy that is behind this final method consits on treacting the variability of data. First variability is extracted from data, then the different variables are aggregated using technical wegihts, and finally the aggregate variability is added.

Now we define, step by step, this methodology. First of all, standardise every variable to measure how far is every municipality (or subsystem or system) from the global average. We do so through the following expression:

$$Z_i = \frac{X_i - \overline{X}}{S_x}$$

where X_i is the value of variable X for municipality i, $\overline{X}$ is the province average of variable X, and S_x is the standard deviation. Z_i is the relative position of municipality i in variable X, measured as the number of standard deviations that it is above or below the variable. The final variable, Z, has 0 average and standard deviation equal to 1.

The next step is to aggregate the standradised variables that form an index. This aggregation will sum the relative positions of the municipality in every variable. The sum will be done using the weights that the researcher determines. Then, if a index is built with M variables, there will be summed $Z1$, $Z2$, ... ZM standardised variables. Following the work developed in *Comissions des Communautés Européennes* (1987), if we want the final variable to have 0 average and standard deviation equal to 1, in order to ignore the variability in this step, then the aggregation has to follow:

$$V_i = \frac{w_1 Z1_i + w_2 Z2_i + ... + w_M ZM_i}{\sqrt{w_1^2 + w_2^2 + ... + w_M^2 + \sum_{l=1}^{n} \sum_{l \neq n} r_{l,n} w_l w_n}},$$

where w_j are the weights of every variable, and $r_{l,n}$ are the lineal correlation coefficients between Zl and Zn. The result, V_i, is the weighted relative position of municipality i in the aggregate index, measured in terms of weighted standard deviations. But if we want the final index to have some variability different from 1, then we have to introduce it.

The final dispersion will be a composition between all variances (S^2_{Zl}) and covariances ($S_{Zl,Zm}$) of all variables, measuring them in percentage terms:

$$s_V = \sqrt{w_1^2 \frac{S_{Z1}^2}{\overline{X}_{Z1}^2} + ... + w_M^2 \frac{S_{ZM}^2}{\overline{X}_{ZM}^2} + \sum_{l=1}^{M} \sum_{l \neq n} w_l w_n \frac{S_{Zl,Zn}}{\overline{X}_{Zl} \overline{X}_{Zn}}},$$

where s_V is the final standard deviation of the index. Then, adding a 100 level to the province average, municipality i will have the following index:

$$I_i = 100 + V_i * s_V .$$

If we want to make an interpretation of this index, it has to be done in relative terms. So, if I_i=102, municipality *i* has a 2% level over this component of quality of life of the province.

The described methodology, then, gives the relative position that a municipality has in the province. However, we have also considered the possibility of computing a increase or decrease through time in quality of life. In this case, we have to take a base period. In this base period the province average will be equal to 100. In our study we have fixed this period in 1991. Then, the temporal analysis will be done comparing the relative position of a municipality in any variable in year *K*, with the 1991 province average:

$$Z_i^K = \frac{X_i^K - \overline{X}^{91}}{S_x^{91}}$$

Therefore we are measuring the relative position in terms of the base year standard deviation. Then, the dispersion of all variables can also be higher or lower through time. As in any index number, the election of the base year will be very important, but will also be completely *arbitrary*. And as we are further from the base year, all comparisons will loose informative richness, indeed. This is because the metric that we are using depends on the base year. Nevertheless, there exists the possibility of changing the base year without much work.

The final question that has to be addressed to the QLSI deals with the changes of population size of all municipalities. There are two common solutions: Laspeyres index and Paasche index. The first one does not consider the change of size that we are considering, and simply computes the final result using the initial sizes of the base year. This index is extensively used in the economic literature, due to the lack of information of the component sizes.

The second alternative, the Paasche index, does consider the change in sizes. As we have the relative sizes of all municipalities every year, it will be the chosen option.

Paasche index is defined as a weighted arithmetic average index of simple indexes:

$$Paasche\ Index = \frac{\sum_{i=1}^{N} I_i p_i}{\sum_{i=1}^{N} p_i}$$

where weights (sizes of municipalities) p_i change every period.

Then we can technically define the QLSI as a *weighted (a priori) arithmetic average index of partial indicators that summarise the relative standardised position of every individual (municipality, Subsystem or System) after synthesising the variability of all variables, with a temporal aggregation type Paasche.* To sum up, the QLSI is an aggregated index that is computed using partial information of every dimension of quality of life.

This index allows for comparisons between municipalities in every period and along time, taking 100 province average in 1991.

As it has been already mentioned, changing the base year would contemplate a change in the quality of life measure definition. Then, if we compute an index number 1996 year based, the comparison would be done using the quality of life definition of 1996, and it would not be the same as it was in 1991.

Then, for 1996, for instance, we can build two different QLSI:

- The first 1996 QLSI is measured in 1991 quality of life terms and analysis the quality of life growth as it was defined in 1991.
- The second 1996 QLSI is measured in 1996 quality of life terms. In this case, the index allows a transversal comparison between municipalities using the 1996 quality of life measure.

When the researcher faces so many alternatives, he has to assume that too much information can lead to confusion. This motivates us to make the following proposal for presenting data:

- First, we present one temporal index, 1991 based. It will compute the growth of quality of life for the following years. It will be year based changed after a reasonable number of years, namely 10.
- And second, we also show the results for every period, considering its period based index. It allows for a transversal comparison considering every period the quality of life definition. These indexes will not be comparable among periods.

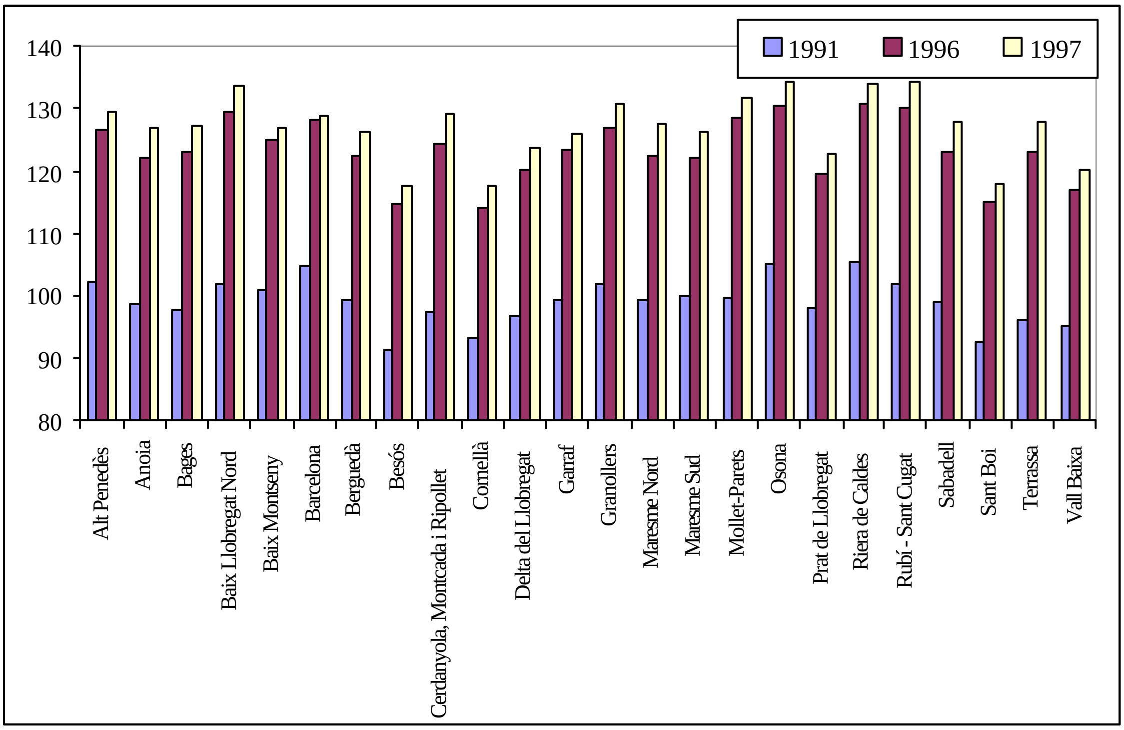
4. Main Results

The study we have developed has accounted for 314 municipalities and the considered periods have been 1991, 1996 and 1997. We chose 1991 as base year due to the fact that the census was then elaborated. Tables 2 and 3 present the results for the 24 urban systems of Barcelona for every year. Table 2 shows the temporal index, while table 3 displays the transversal index.

Time analysis results are summarised in figure 1. The general improvent in the quality of life indicator for the whole Barcelona province is there straightforwardly seen. Nevertheless, there are some systems that improve much more than others. Among the ones that grow more than the average we find Anoia, Bages and Maresme Nord systems, while Baix Montseny, Barcelona, Berguedà, Garraf, and Maresme Nord grow less than the average.

It can be also seen in the transversal QLSI. The system positions in this index are plotted in figure 2, and show the same path than the temporal QLSI.

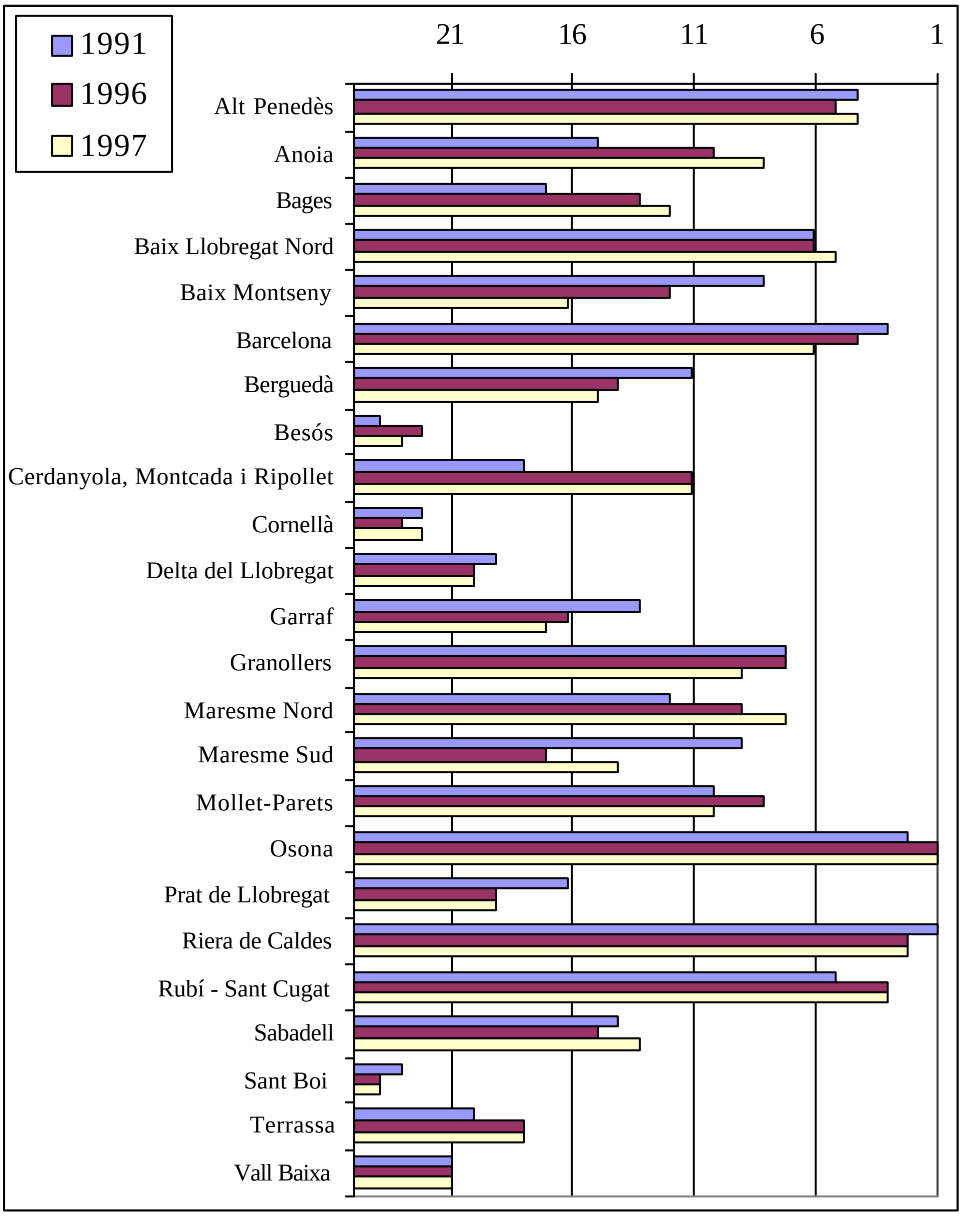
Figure 1. QLSI time evolution



These results are explained by the movements in the main three components. Hence, we can extract some conclusions:

- The QLSI is higher in the pre-coastal strip, in Osona as well as in Barcelona city.
- The coastal-strip has a lower QLSI than the rest of systems, and it is lower than the interior systems (Bages, l'Anoia or el Berguedà).
- The high level in the IAP component explains the high level in the general QLSI of the pre-coastal strip systems.

Figure 2. QLSI transversal positions of the systems



- Congestion in the coastal strip and in Barcelona, joint with a bad position in the Social and Third Age Services Index, drives the coastal-strip systems and Barcelona to worse QLSI.
- Services provision is clustered in Barcelona. It forces the CCL index to good positions in this city as well as in systems around it.
- There is a relative convergence process between systems in the QLSI, which is mainly explained by the CCL component. This is due to the fact that the other components do not converge or even diverge.

Barcelona shows always a very good position, both in IAP and in CCL. But the relative decrease in CCL and the last position in ISE drive this system not to have the better position among all systems, and to loose relative positions through time.

5. Conclusions

In this paper we have showed a statistical methodology about measuring quality of life in small areas. The construction of an Index able to measure quality of life faces some problems, such as aggregating indicators with different units of measure; comparing quality of life indicators with very different relative dispersion; allowing for defining a measure metric depending on data characteristics (*let the data talk*); the temporal comparison of the final index has to be complete; and the relative size of the systems has not to overvalue (infravalue) the index of a system.

The used QLSI structure is shown and final results are presented and commented. The more important points are summarised in the 24 studied systems. We can see how the quality of life is higher in the pre-coastal strip, as well as Barcelona and Osona. Barcelona is not the better system due to its bad position in the IES index, while the coastal strip is congested and it causes that they have bad results in the final index.

We have to conclude saying that this paper is being computed for 1998, and it will be yearly renewed.

6. References

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TABLE 2. TEMPORAL QLSI	**1991**				**1996**				**1997**			
SYSTEMS	IAP	ISE	CCL	**SQLI**	IAP	ISE	CCL	**SQLI**	IAP	ISE	CCL	**SQLI**
Alt Penedès	95,9	107,4	100,7	**102,0**	104,9	121,8	142,6	**126,4**	111,8	125,7	141,2	**129,4**
Anoia	92,8	108,0	93,9	**98,8**	93,7	123,7	137,8	**121,9**	101,3	128,5	140,5	**127,0**
Bages	88,3	109,5	93,6	**97,9**	95,9	124,1	138,7	**123,1**	104,8	127,6	139,1	**127,2**
Baix Llobregat Nord	103,8	109,0	92,0	**101,7**	112,6	130,2	136,1	**129,5**	121,5	133,6	136,3	**133,5**
Baix Montseny	102,9	111,0	88,3	**100,9**	109,3	122,7	134,7	**125,0**	115,3	125,3	132,8	**127,0**
Barcelona	109,8	94,0	111,1	**104,7**	118,5	98,2	160,1	**128,0**	125,9	97,9	156,7	**128,7**
Berguedà	75,9	119,8	96,0	**99,2**	83,7	128,5	141,7	**122,3**	91,5	133,6	140,9	**126,2**
Besós	83,6	96,4	93,8	**91,3**	85,3	105,3	144,1	**114,6**	91,9	109,2	142,9	**117,6**
Cerdanyola, Montcada i Ripollet	97,3	95,7	99,9	**97,4**	107,0	114,4	143,8	**124,6**	115,9	119,2	143,8	**129,1**
Cornellà	85,3	95,6	98,4	**93,2**	85,5	105,8	141,6	**113,9**	95,8	108,5	140,9	**117,7**
Delta del Llobregat	97,9	101,6	91,4	**96,8**	102,5	115,0	135,4	**120,3**	110,7	118,5	134,6	**123,7**
Garraf	90,6	110,0	94,5	**99,1**	98,5	124,7	136,5	**123,3**	105,8	128,3	134,4	**126,0**
Granollers	103,8	111,9	88,8	**101,7**	109,1	126,7	135,8	**127,0**	116,7	132,2	134,3	**130,7**
Maresme Nord	90,0	118,6	86,0	**99,2**	92,9	130,9	132,7	**122,6**	101,2	138,2	132,0	**127,5**
Maresme Sud	99,0	112,7	86,9	**99,9**	102,3	120,3	134,6	**121,9**	109,5	125,6	134,9	**126,2**
Mollet-Parets	100,4	107,0	90,7	**99,4**	109,6	127,6	138,1	**128,4**	117,6	131,3	136,4	**131,4**
Osona	103,1	118,7	91,3	**105,2**	106,1	132,5	140,9	**130,3**	113,1	138,8	140,1	**134,4**
Prat de Llobregat	98,9	103,9	92,0	**98,2**	111,1	101,8	139,9	**119,4**	114,6	108,4	139,3	**122,7**
Riera de Caldes	106,5	114,8	93,8	**105,6**	116,6	129,2	136,7	**130,6**	125,1	132,3	136,0	**133,9**
Rubí - Sant Cugat	113,6	99,8	94,5	**101,9**	126,9	117,4	139,8	**130,2**	134,7	120,9	140,1	**133,9**
Sabadell	98,5	99,9	98,8	**99,0**	99,8	119,3	140,2	**123,0**	107,7	126,1	140,1	**127,8**
Sant Boi	91,3	97,1	90,7	**92,7**	92,8	107,3	137,1	**115,0**	101,0	110,5	135,4	**118,0**
Terrassa	95,1	98,5	95,3	**96,1**	100,5	122,7	136,3	**123,0**	108,2	128,6	136,8	**127,7**
Vall Baixa	92,9	96,7	96,5	**95,2**	99,1	101,3	143,0	**116,8**	106,1	106,6	141,3	**120,3**
Total	100	100	100	**100**	106,0	110,5	146,2	**123,7**	113,6	113,8	144,6	**126,6**

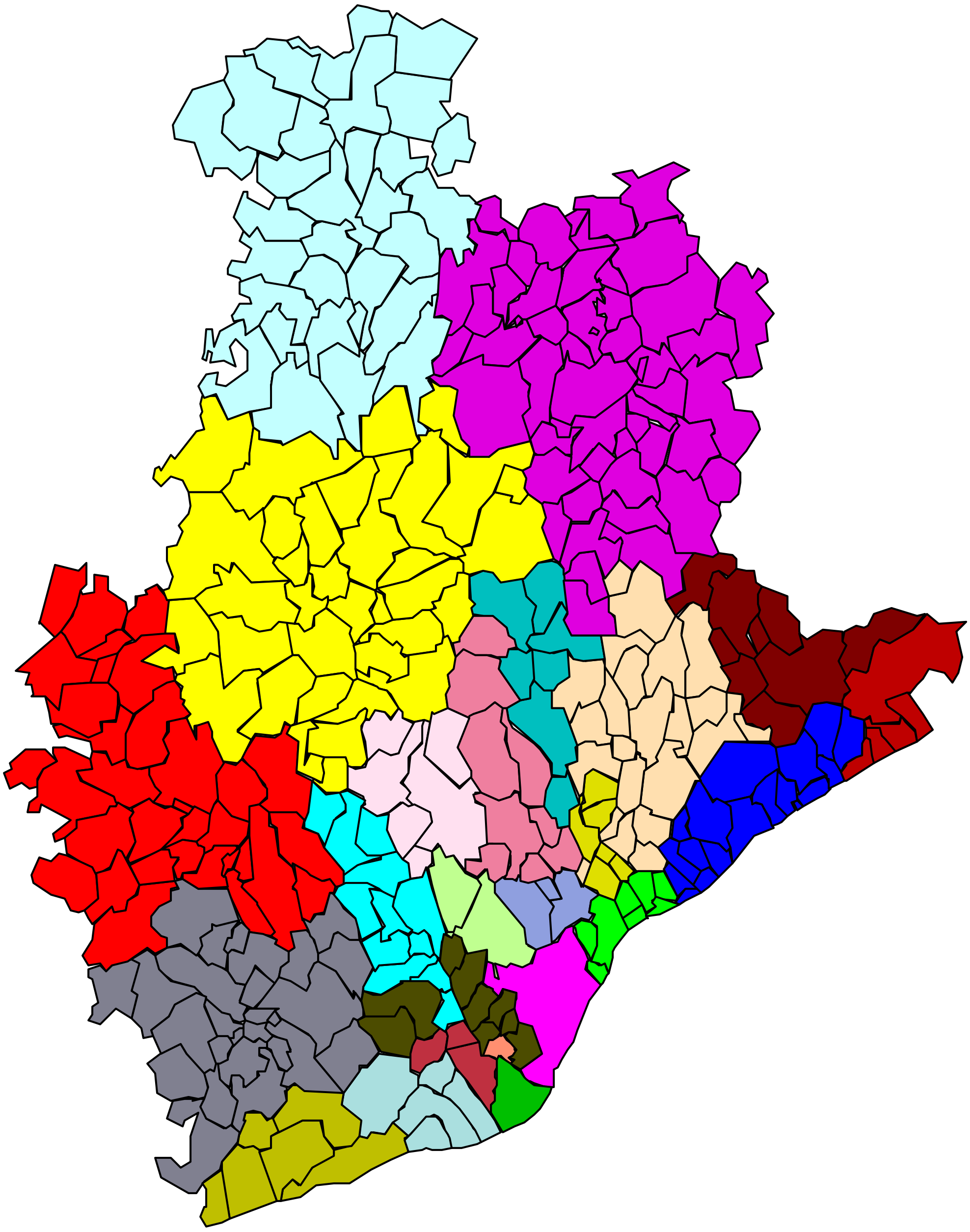
TABLE 2. TRANSVERSAL QLSI	1991				1996				1997			
SYSTEMS	IAP	ISE	CCL	**SQLI**	IAP	ISE	CCL	**SQLI**	IAP	ISE	CCL	**SQLI**
Alt Penedès	95,9	107,4	100,7	**102,0**	99,9	109,7	100,8	**103,9**	99,5	110,3	100,9	**103,7**
Anoia	92,8	108,0	93,9	**98,8**	92,2	110,8	95,4	**100,0**	92,0	111,5	101,0	**101,9**
Bages	88,3	109,5	93,6	**97,9**	92,0	108,5	96,4	**99,4**	93,3	108,0	98,4	**100,0**
Baix Llobregat Nord	103,8	109,0	92,0	**101,7**	106,8	112,4	90,2	**103,7**	108,5	112,4	92,8	**103,7**
Baix Montseny	102,9	111,0	88,3	**100,9**	103,7	106,5	87,7	**99,5**	103,5	106,1	89,8	**98,8**
Barcelona	109,8	94,0	111,1	**104,7**	108,1	91,5	113,5	**103,9**	107,9	90,7	109,9	**103,4**
Berguedà	75,9	119,8	96,0	**99,2**	81,4	113,6	100,8	**99,4**	81,8	114,1	99,3	**99,0**
Besós	83,6	96,4	93,8	**91,3**	85,3	97,2	96,7	**93,0**	84,5	96,8	97,6	**93,3**
Cerdanyola, Montcada i Ripollet	97,3	95,7	99,9	**97,4**	102,2	99,2	98,6	**99,9**	103,4	99,8	99,6	**100,8**
Cornellà	85,3	95,6	98,4	**93,2**	84,1	97,1	95,6	**92,2**	86,1	96,0	97,3	**93,4**
Delta del Llobregat	97,9	101,6	91,4	**96,8**	98,5	101,6	86,8	**95,7**	98,9	101,5	90,0	**96,0**
Garraf	90,6	110,0	94,5	**99,1**	94,0	109,4	92,1	**98,9**	93,7	109,8	92,5	**98,3**
Granollers	103,8	111,9	88,8	**101,7**	103,4	112,2	90,4	**102,6**	103,2	113,0	91,2	**101,6**
Maresme Nord	90,0	118,6	86,0	**99,2**	90,8	125,7	85,3	**101,8**	91,1	127,4	90,6	**102,6**
Maresme Sud	99,0	112,7	86,9	**99,9**	97,7	109,1	86,9	**98,3**	97,5	109,3	92,7	**99,3**
Mollet-Parets	100,4	107,0	90,7	**99,4**	104,1	108,9	92,6	**102,2**	104,3	109,0	92,9	**101,3**
Osona	103,1	118,7	91,3	**105,2**	100,5	116,3	98,1	**105,8**	99,9	116,8	98,1	**104,8**
Prat de Llobregat	98,9	103,9	92,0	**98,2**	104,7	93,5	92,6	**96,5**	101,8	94,2	94,8	**96,4**
Riera de Caldes	106,5	114,8	93,8	**105,6**	109,3	114,0	91,5	**105,6**	110,6	113,0	92,7	**104,5**
Rubí - Sant Cugat	113,6	99,8	94,5	**101,9**	117,5	102,5	92,0	**104,0**	117,8	102,4	94,5	**103,8**
Sabadell	98,5	99,9	98,8	**99,0**	96,1	105,2	95,3	**99,1**	96,5	106,2	97,4	**99,9**
Sant Boi	91,3	97,1	90,7	**92,7**	90,2	95,4	89,1	**91,4**	90,4	94,8	89,5	**91,0**
Terrassa	95,1	98,5	95,3	**96,1**	95,9	106,2	88,5	**97,2**	96,2	106,4	91,4	**97,4**
Vall Baixa	92,9	96,7	96,5	**95,2**	94,8	93,8	95,9	**94,5**	94,3	94,2	96,8	**95,0**
Total	100	100	100	**100**	100,0	100,0	100,0	**100,0**	100,0	100,0	100,0	**100,0**

APPENDIX 1

Quality of Life Urban Systems and Subsystems in Barcelona

System of l'Alt Penedès	**System of Granollers**
Subsystem of Sant Sadurní	Subsystem of Pla de Granollers
Subsystem of Vilafranca	Subsystem of Congost
System of l'Anoia	**System of Maresme Nord**
System of Bages	Subsystem of la Riera de Calella
Subsystem of Manresa	Subsystem of la Tordera
Subsystem of Bages Nord	**System of Maresme Sud**
System of Baix Llobregat Nord	Subsystem of la Riera d'Arenys
Subsistema d'Esparraguera-Olesa	Subsystem of Mataró
Subsystem of Martorell	Subsystem of la Riera de Premià
Subsystem of Sant Andreu de la Barca	**System of Mollet-Parets**
System of Baix Montseny	**Sistema d'Osona**
System of Barcelona	Subsistema d'Osona Nord
System of Berguedà	Subsystem of Vic
System of Besós	Subsystem of Manlleu
Subsistema Badalona	**System of El Prat de Llobregat**
Subsistema Sant Adrià del Besòs	**System of la Riera de Caldes**
Subsystem of Masnou	**System of Rubí - Sant Cugat**
Subsistema Santa Coloma de Gramenet	Subsystem of Rubí
System of Cerdanyola, Montcada i Ripollet	Subsystem of Sant Cugat
Subsystem of Cerdanyola	**System of Sabadell**
Subsystem of Montcada i Reixac	Subsystem of Barberà del Vallès
Subsystem of Ripollet	Subsystem of Sabadell
System of Cornellà	Subsystem of Castellar
System of Delta del Llobregat	**System of Sant Boi**
Subsystem of Gavà	**System of Terrassa**
Subsystem of Castelldefels	**System of la Vall Baixa**
Subsystem of Viladecans	Subsistema d'Esplugues i Sant Just
System of Garraf	Subsystem of Sant Feliu de Llobregat
	Subsystem of l'Hospitalet
	Subsystem of Molins
	Subsystem of Sant Joan Despí

Quality of Life Systems in Barcelona



Alt Penedès

Anoia

Bages

Baix Llob. Nord

Baix Montseny

Barcelona

Berguedà

Besós

Cerd.,Mont. i Rip.

Cornellà

Delta del Llob.

Garraf

Granollers

Maresme Nord

Maresme Sud

Osona

Parets-Mollet

el Prat

Riera de Caldes

Rubí-St.Cugat

Sabadell

Sant Boi

Terrassa

Vall Baixa

APPENDIX 2

Methodological issues related with variables

- Distances Matrix
- Seasonal Population
- Difficulty in Providing Public Services
- Seasonal Population Difficulties Providing Public Services
- Services Diversification
- Working with Volatility in Small Municipalities
- Working with Volatility in Relatively Defined Variables

Generally speaking, we needed information of all municipalities and for every period. It was possible in census years (1991 and 1996), but not in other periods (1997). Whenever this information was not available we played with two different alternatives. The first one consisted on achieving municipalities (including the very small ones) differences using census data. The second one incorporates the use of more aggregate data (*comarcal* data or big cities data), but that can be more usually refreshed. Playing with these alternatives we have been able to compute a QLSI for every municipality in every year.