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**Conference Paper**

## Portuguese cities' happiness

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## Portuguese Cities' Happiness

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Keywords: happiness index, Portugal, Cities

### Abstract:

Happiness is an aspiration of every human being, and can also be a measure of social progress. Yet can one say that citizens are happy in Europe today? If they are not, what - if anything - can be done about it? (Helliwell, Layard, & Sachs, 2013, p. 3)

Understanding cities and citizenship has become a common place in today's regional and urban policies. To be able to quantify - and understand - concepts such as urban quality of living, wellbeing and happiness is a major urban planning tool.

But how does one measure an abstract concept such as happiness and how does one eventually use this knowledge in to plan and build our cities?

According to much of the debate over happiness, the wellbeing or life quality have been centered on the role of income, even if it's general knowledge that human capital levels play an important role in the happiness indicators (Florida, Mellander, & Rentfrow, 2013, p. 614).

Therefore, to know what happiness is and what a happy city means it is necessary to plan a high quality city for all citizens.

This paper seeks to determine the happiness degree in Portuguese cities and how relates to structural, social and economics features.

Happiness is hard to define and is composed by several and common factors (life quality, economic, housing, demographic, education, mobility, environment or geographic criteria). As such, it is necessary to grasp its comprehension.

Hence, twenty Portuguese cities were selected and analysed using twenty independent variables, both according to literature and to empirical evidence.

The Life Quality Index (LQI) - set by DECO Proteste to twenty-one Portuguese cities - , was used as the dependent variable, a major proxy of wellbeing and happiness. The independent variables were collected from several statistical sources (2009-2013).

Statistical analysis was first conducted using the correlation coefficient to estimate interdependence between the Life Quality Index (LQI) and other variables. Second, multiple regression analysis was used to identify which of the pre-selected independent variables impacts happiness the most.

Correlation findings show, opposite and surprising results taking into account literature previews and other countries' empirical results. A negative and significant correlation (-0.514) between LQI and the Wages variable suggests that it is in the low wages cities that people are happier. This and other unexpected results mean that further research is needed. Regressions findings confirm that housing variables explain about 44% of the variation in the LQI.

Overall, defining and measuring happiness is not an easy task. This paper results confirm that happiness is not only related with social, economic or structural features, but also comprehends a fourth dimension, cultural, environmental or even individual one.

## Introduction:

*The question of the purpose of human life has been raised countless times; it has never yet received a satisfactory answer and perhaps does not admit of one (...). We will therefore turn to the less ambitious question of what men themselves show by their behavior to be the purpose and intention of their lives. What do they demand of life and wish to achieve in it? The answer to this can hardly be in doubt. They strive for happiness; they want to become happy and to remain so. (Sigmund Freud, Civilization and Its Discontents, 1930)*

Available on <http://faculty.georgetown.edu/irvinem/theory/Freud-CivDis.html>

Happiness is a goal to everyone. You may be successful and have a lot of money, but without happiness it will be meaningless. But, before we move further, it's a good idea to get deeper understanding of the word happiness itself. Understanding what happiness is will give us good ground upon which to build our discussions.

Let us start with an official definition. According to Merriam-Webster's Online Dictionary, happiness comprehends:

- a state of well-being and contentment
- a pleasurable or satisfying experience

This definition is a good starting point and we can dig deeper from it. For Miguel Esteves Cardoso, a Portuguese writer, happiness is not to be sad; not be sick; not being unemployed and not be forced to think about all the other things that precede - and exclude automatically by basic needs issues - consideration of happiness. (Público Journal, 3<sup>rd</sup> December 2011)

According to Glaeser (2012), city makes us richer, smarter, greener, healthier, and happier.

Cities are probably the greatest creation of mankind. They allowed and allow the encounter, sharing, innovation and the development of the human species. Our culture, freedom and our prosperity are ultimately the result of people who live, work and think together. Here precisely lies the greatest triumph of the city.

We live in a competitive world, much given to rankings. Cities are one of the targets of numerous classifications. If cities are the highest form of organization of human life, and human

purpose is the pursuit of happiness, perhaps the best assessment you can do is precisely the level of happiness that each city provides to its inhabitants.

This paper seeks to enlighten how happy the Portuguese cities are and how this happiness is related to structural, social or economics features.

## Variables and Territory:

The quality of life is multidimensional, integrating objective and subjective dimensions. To measure the latter is the real deal of urbanology, where all the notions that vary from person to person or from society to society have to be considered: ‘What kind of city do you want to live in?’ asked by Charles Montgomery - the mentor of “Happy City Experiment”. Social, economic and environmental development of a country induces different notions or quality of life settings. For developing countries the quality of life’ essential elements are the existence of basic sanitation, education equipment or health, among others. *"In many cases, in this matter, people's perceptions of their quality of life are equally or perhaps even more important than the objective reality in which they live."* Available on: <http://www.qualidademadeira.com.pt/barometro-regional-qualidade/indice-qualidade-vida-ram>

The quantification of the population's quality of life is traditionally passed through the interpretation of the results of Gross Domestic Product (GDP). However, the complexity and understanding of the society and the city leads to the need to assess the quality of life not only from the economic perspective, but also integrating dimensions such as environment, education, housing and the characteristics of a territory.

According to the concept of Sustainable Communities, there are a set of factors that are considered crucial to the definition of sustainable cities, including features such as “inclusive”, “attractive” or “cohesive”.

Following The Egan Review: Skills for Sustainable, *“Sustainable communities meet the diverse needs of existing and future residents, their children and other users, contribute to a high quality of life and provide opportunity and choice. They achieve this in ways that make effective use of natural resources, enhance the environment, promote social cohesion and inclusion and strengthen economic prosperity”* (The Egan Review, 2004, 18)

In addition to this, in the Wheel of Sustainable Communities there are 7 major components to run flexibly, articulate and above all integrated city: Governance, Transport and Connectivity, Services, Environment, Economy, Housing and Built Environment, Social and Cultural. These

components assume that the city is seen as a whole as all the development components are closely coordinated and allow us to understand the complexity of problems.

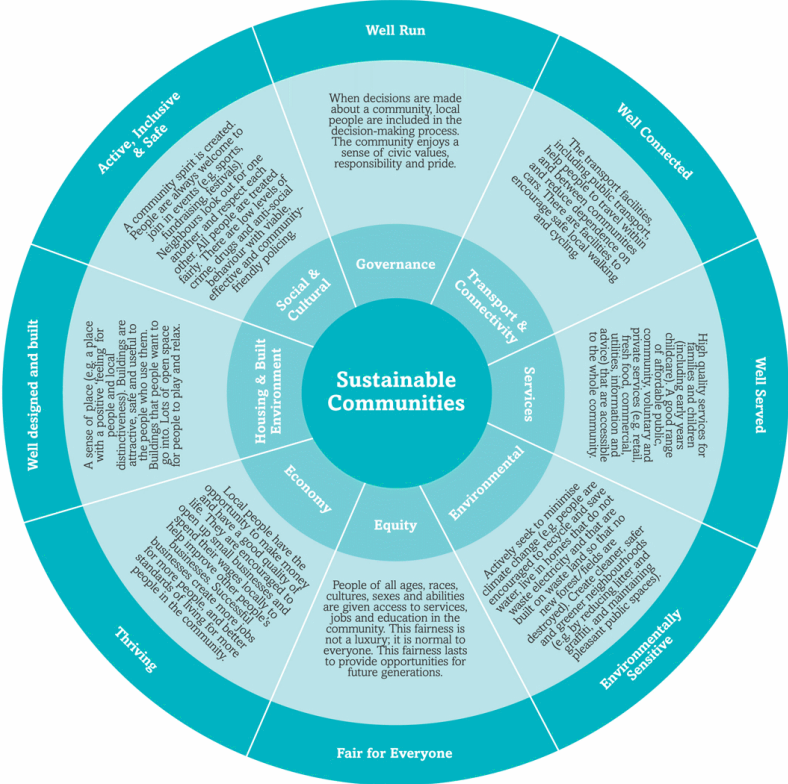


Figure 1 – Sustainable Communities – The Egan Wheel

Available on <http://www.citized.info/pdf/commarticles/ASC%20MAKING%20PLACES.pdf>

Within all the aspects of the Wheel of Sustainable Cities, the independent variables were grouped according to seven factors that were considered vital: economy, housing, demography, education, transport, environment and geography.

In demography, the population density it’s considered a variable that could measure happiness – the association of dispersed and compact city concepts, where the urban form affects the proximity to services, equipment and the relations between the neighbors/community. However, the perception that the values associated with demography may vary from country to country, as in this case – based on rural/urban dichotomies – "Davis and Firedavis found that

*rural dwellers in Ireland were more satisfied with life than when those in urban areas".* (Florida, Mellander, & Rentfrow, 2013, p. 616)

It was considered important to include the housing component because is a fundamental right to the population and houses should be equipped with basic sanitation and electricity infrastructure. Following Florida et al "*It might be expected that happiness is higher in places where housing is more available, less expensive and more affordable*". (Florida, Mellander, & Rentfrow, 2013, p. 615)

### **Dependent variable**

With the purpose of involving citizens in the debate of the well-being measurement, making people more informed and engaged in the policy-making process, the OECD developed an interactive tool – the “Better Life Index” - that provides the possibility to compare and visualise basic key factors. Eleven topics were identified as essential to well-being in terms of material living conditions and quality of life, based on the experience of the OECD.

In the past years, many entities have become more attentive to indexes that provide information about the happiness in societies and cities. In Portugal it was also defined a Life Quality Index (LQI), by Deco Proteste, 2012.

The dependent variable used in this paper is precisely the LQI, based on a July 2012 survey (“Cidades – As melhores para viver”, conducted by Deco Proteste, the Portuguese Association of Consumers Defense). The survey tracked a significant sample of each Portuguese district capital, between September and November 2011. To evaluate twenty-one Portuguese cities, Deco Proteste considered about three thousand and fifty-five responses that were weighted according age and gender. The criterion adopted was the choice of three aspects that each interviewed considerer important to study the happiness in the cities.

### **Independent variables**

#### **Economy**

Three variables were used to measure economy.



Wages: This variable measures the amount of money that each person receives monthly, in euros. The data source is the National Institute of Statistics of Portugal, 2012. Ponta Delgada (Azores) doesn't have data on this variable.

Income: Income measures the possibility that each person has to buy the everyday products, percentage per capita. The data were gathered from the Municipal Incomes Study, in National Institute of Statistics of Portugal, 2011.

Unemployment rate: This variable is the ratio between the unemployed and the active population, in percentage. The data were from the National Institute of Statistics of Portugal, 2011.

## **Housing**

Housing cost: Measures the average monthly costs that each person has with housing, in euros. The data source was the National Institute of Statistics of Portugal, 2011.

Homeownership: This variable measures the amount of population that owns a house, in percentage of total. It was established a ratio between the total number of housing units to the number of owners and co-owners. The data source was the National Statistics Institute of Portugal, 2011.

## **Demography**

Population density: This variable is the ratio between the numbers of population per square kilometer. The data was, once again, the National Institute of Statistics of Portugal, 2011.

## **Education**

Three variables were used to measure education.

Illiteracy rate: This variable is the ratio between the population aged ten years and over who cannot read or write, that is unable to read and understand a written sentence, and the total

population aged ten years or more, in percentage. The data were from the National Institute of Statistics of Portugal, 2011.

High education population: This variable measures the population with higher education in the country, it's the ratio between the resident population aged twenty-one years or more with higher education completed and the total resident population aged twenty-one or more, in percentage. The data were from the National Institute of Statistics of Portugal, 2011.

School dropout rate: Ratio between the resident population aged between ten and fifteen years, who left school without completing the 9<sup>th</sup> grade, with total resident population aged between ten and fifteen years, in percentage. The data were from the National Institute of Statistics of Portugal, 2011.

## **Transport**

Commute time: Measures the time, in minutes, that are used in movements between work-home or home-work. The data were collected from the National Institute of Statistics of Portugal, 2011.

Passengers using ground transportation: Expresses the number of passengers using both road and rail transportation, in companies that explore the ground transportation in each region. Instead of the other variables that were collected by county, this one was obtained by NUTS II – Regions - Nomenclature of Territorial Units for Statistics, on National Institute of Statistics of Portugal, 2013. Funchal - Madeira and Ponta Delgada - Açores don't have number of passengers using ground transportation to consider to the paper.

## **Environment**

Urban waste collection: Represents the amount of waste that was collected selectively to a waste treatment facility, by person. It's the ratio between the urban waste selectively collected in the calendar year and the annual average resident population, in kilograms. The 'selective collection' includes waste selectively collected in eco-points, door-to-door, recycling yards and special circuits of various materials and biodegradable urban waste selected for organic recovery. The data were collected in PORDATA – Data Base Contemporary Portugal, 2012.

Electricity consumption: This variable indicates the ratio between the consumption of electricity by type of consumption, with the number of consumers, by type of consumer. The electrical energy includes the energy produced by hydroelectric, nuclear and conventional thermal power stations, and from wave, tidal, wind and solar photovoltaic sources. The data were collected in PORDATA – Data Base Contemporary Portugal, 2013.

## **Geography**

Average annual temperature: This variable indicates the average temperature in each city, in degrees Celsius. The data were collected in the website Weather Base, 2011.

Average annual precipitation: This variable indicates the average precipitation in rainfalls periods, in each city, in millimeters. The data were collected in the website Weather Base, 2011.

<b>Independent variable</b>	<b>Dependent variable</b>	<b>n</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Average</b>	<b>Standard Derivation</b>
	<b>Life Quality Index</b>	20,000	46,000	64,000	54,550	4,399
<b>Economy</b>	Wages (€/per month)	19,000	109,080	1590,600		266,941
	Incomes (% per capita)	20,000	0,238	11,056	1,472	2,318
	Unemployment rate (%)	20,000	9,720	16,290	11,762	1,604
<b>Housing</b>	Housing cost (€/per month)	20,000	233,000	370,000	288,950	34,272
	Homeownership (%)	20,000	49,340	81,923	71,460	8,896
<b>Demography</b>	Population density (n./km <sup>2</sup> )	20,000	749,100	5524,000	2144,540	1140,722
	Population aged 0-14 years (n.°)	20,000	11,940	18,060	14,327	1,482
	Population aged 15-64 years (n.°)	20,000	62,940	70,600	66,223	2,265
	Population aged over 65 years (n.°)	20,000	11,340	23,910	19,453	3,410
<b>Education</b>	Illiteracy rate (%)	20,000	2,130	4,880	3,254	0,713
	High education population (%)	20,000	11,510	27,100	15,889	4,019
	School dropout rate (%)	20,000	0,930	2,410	1,587	0,434
<b>Transport</b>	Commute time (minutes)	20,000	12,400	23,040	16,194	2,833
	Passengers using ground transportation (n.°)	18,000	9007,000	417250,000	146857,278	139511,916
<b>Environment</b>	Residents selected urban waste (Kg/per capita)	20,000	24,100	124,400	63,560	29,707
	Electricity consumption (Kwh/per consumer)	20,000	4049,600	18864,000	7667,195	3307,216
<b>Geography</b>	Average annual temperature (C°)	20,000	10,700	18,800	15,330	1,895
	Average annual precipitation (mm)	20,000	501,000	1264,000	889,500	251,552

**Table 1 – Descriptive Statistics**

## Cities

Portugal has an area over ninety thousand square kilometers, divided in eighteen districts – the most important first level administrative subdivisions – in the mainland. In order to make a complete and integrated analysis of the territory in this paper, districts capitals plus the two capitals of autonomous regions – Madeira and Açores - were chosen to incorporate the statistical studies.

The twenty portuguese cities are: Aveiro, Braga, Bragança, Beja, Castelo Branco, Coimbra, Évora, Faro, Funchal, Guarda, Lisboa, Leiria, Ponta Delgada, Portalegre, Porto, Santarém, Setúbal, Viana do Castelo, Vila Real and Viseu.



**Figure 2 – Cities – Location**

Available on: <http://www.mapadeportugal.net/indicedistritos.asp>

## Statistical methods and results:

The statistical methods used in this paper include correlation, linear regression and multiple regression. According to Wonnacott and Wonnacott (1970) regression answers a broader and more interesting set of questions and some correlation questions as well.

The analysis started by using the correlation technique, which shows the degree of association between each independent variable and the dependent – Life Quality Index.

As Wonnacott and Wonnacott described, correlation between X (independent variable) and Y (dependent variable) can be estimated no matter of whether:

- X affects Y or vice-versa
- Both affect each other
- Neither affects the other, but they move together because some third variable influences both

The correlation coefficient indicates the degree of association as it was said before and is referred as  $r$  (Prado, 1969) that always stands between -1 and 1 (when this does not occur the correlation is not valid) and the closest to 0 the less correlation there is being 0 the same as no correlation. In this study the value of  $r$ , the correlation coefficient is considered, for better analysis, as seen below:

$-1 < r < -0,5$	<i>Strong inverse correlation</i>
$-0,5 < r < -0,3$	<i>Medium inverse correlation</i>
$-0,3 < r < 0,3$	<i>Not considered as correlation</i>
$0,3 < r < 0,5$	<i>Medium direct correlation</i>
$0,5 < r < 1$	<i>Strong direct correlation</i>

On what regression is concerned, one has used both linear and multiple. The latter was helpful to try to relate several independent variables to the LQI. Independent variables were gathered

in group themes beforehand selected - Economy, Geography, etc. - as described above, to try to understand which group influences more the Life Quality Index.

When applying the multiple regression method one can see the degree of influence of the group in the Index translated by the value of  $r^2$  (this value is comprehended between 0 and 1 and is often turned into percentage). When looking for the statistical validity of this operation we can analyze the *p-value* that should be larger than 0,05 (in absolute terms) to be valid.

## Findings:

Considering the statistical methods described beforehand, the correlation coefficient and linear regression were a starting point to analyze this data and see which variable or variables have stronger association with the *Life Quality Index* (Table 2).

<b>Economy</b>	Wages (€/per month)	-0,615	*
	Incomes (% per capita)	-0,361	**
	Unemployment rate (%)	-0,379	**
<b>Housing</b>	Housing cost (€/per month)	0,120	
	Homeownership (%)	0,493	***
<b>Demography</b>	Population density (n°/km <sup>2</sup> )	-0,363	**
	Population aged 0-14 years	0,100	
	Population aged 15-64 years	0,349	***
	Population aged over 65 years	-0,275	
<b>Education</b>	Illiteracy rate (%)	-0,110	
	High education population (%)	-0,293	
	School dropout rate (%)	0,090	
<b>Transport</b>	Commute time (minutes)	-0,415	**
	Passengers using ground transportation (Kg/ per capita)	-0,334	**
<b>Environment</b>	Residents selected urban waste (Kg/per capita)	-0,327	**
	Electricity consumption (Kwh / per consumer)	-0,448	**
<b>Geography</b>	Average annual temperature (C°)	-0,141	
	Average annual precipitation (mm)	0,316	***

\* Statistically significant - strong inverse correlation ( $r < -0,5$ )

\*\* Statistically significant - medium inverse correlation ( $-0,5 > r > -0,3$ )

\*\*\* Statistically significant - medium direct correlation ( $0,3 < r < 0,5$ )

\*\*\*\* Statistically significant - strong direct correlation ( $0,5 < r$ )

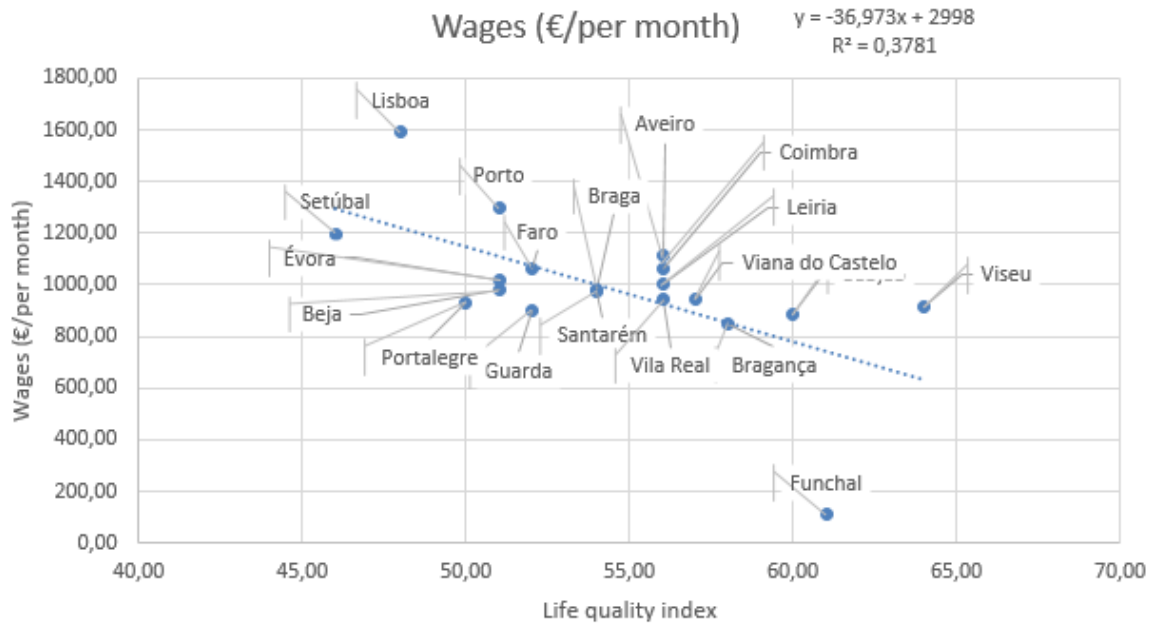
**Table 2 - Correlation Coefficients for life quality index in Portuguese cities**



<b>Economy</b>	Wages (€/per month)	34%
	Incomes (% per capita)	13%
	Unemployment rate (%)	14%
<b>Housing</b>	Housing cost (€/per month)	1%
	Homeownership (%)	24%
<b>Demography</b>	Population density (n°/km <sup>2</sup> )	13%
	Population aged 0-14 years	1%
	Population aged 15-64 years	12%
	Population aged over 65 years	8%
<b>Education</b>	Illiteracy rate (%)	1%
	High education population (%)	9%
	School dropout rate (%)	1%
<b>Transport</b>	Commute time (minutes)	17%
	Passengers using ground transportation (Kg/ per capita)	17%
<b>Environment</b>	Residents selected urban waste (Kg/per capita)	11%
	Electricity consumption (Kwh / per consumer)	20%
<b>Geography</b>	Average annual temperature (C°)	2%
	Average annual precipitation (mm)	10%

**Table 3 - Linear regression findings for life quality index in portuguese cities**

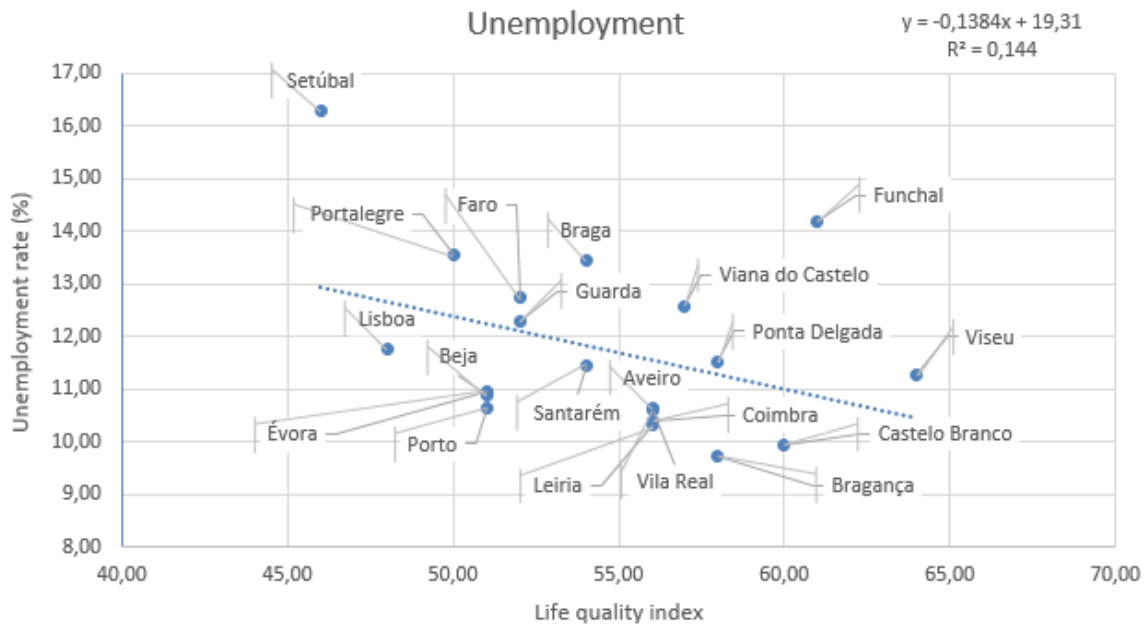
Keeping in mind that for a strong correlation  $r$  should be smaller than - 0,05 or bigger than 0,05 there is only one variable that accomplished these criteria: *Wages*. This variable has as well the highest value of  $r^2$ , of linear regression although is not very high (0,378). Being the correlation coefficient negative (-0,615) it means that it is a strong inverse correlation. Though empirically it was expect that this variable played an important role when thinking about life quality and ultimately happiness, it was a big surprise to observe that in Portuguese cities the less you earn, the happier you are as it can be seen in the Figure 3 below.



**Figure 3 – Wages (Euros/per month)**

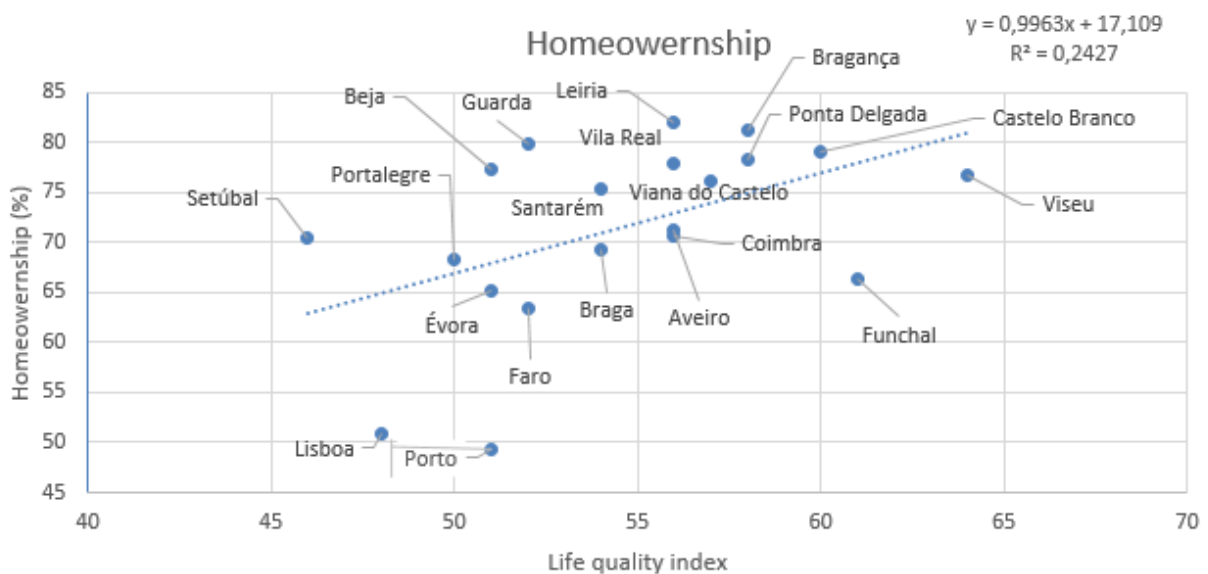
As observed in the correlation table, there are no other strong correlations what were also unexpected, since the variables were chosen by considering the calculus of *LQI* in other studies.

It was also unexpected to see that *Income* also has an inverse correlation (-0,361) with the *LQI*, meaning that the lower the incomes get (% per person) the higher the life quality. The only result that was expected, in the group Economy, was the *Unemployment*. The *Unemployment* correlation coefficient (-0,379) says that the higher the unemployment rate is, the life quality decreases. By looking at these first three results it can be said that in Portuguese cities people need jobs to be happy but the least they earn the better. (Figure 4)



**Figure 4 – Unemployment**

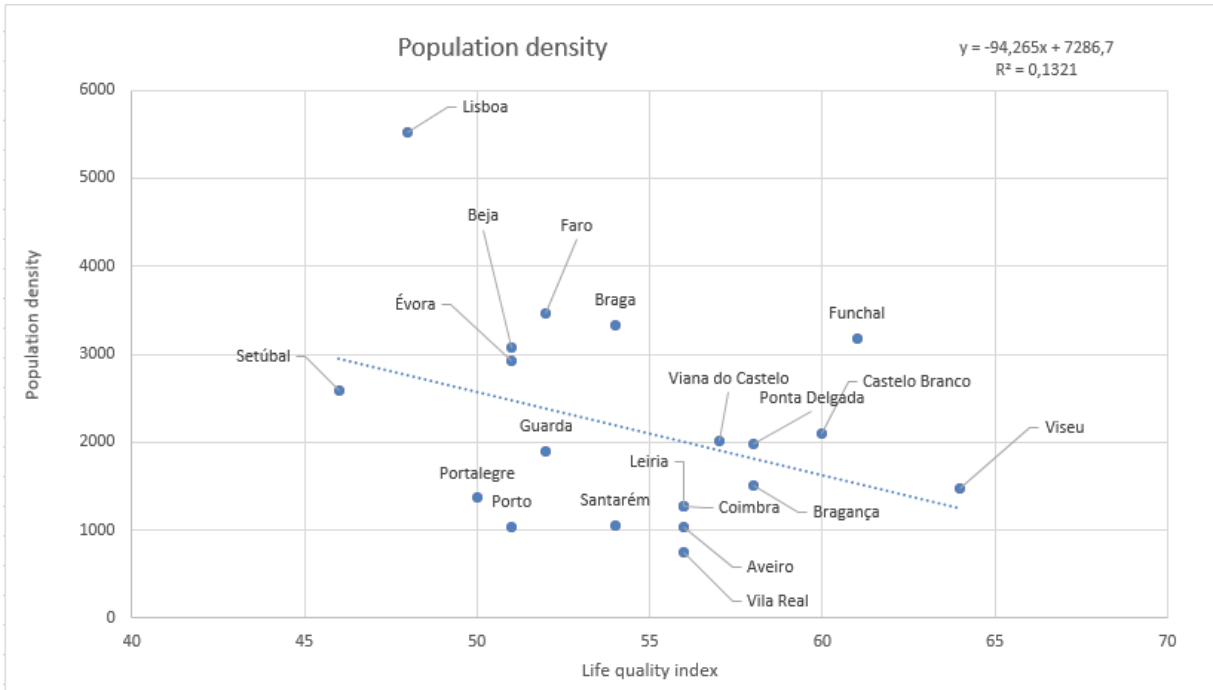
Another standing out result, only a medium correlation but almost on the limit, is the Homeownership and this time it is a positive correlation ( $r = 0,493$ ) meaning that the Life Quality Index increases when the percentage of people that own a house also increases (Figure 5). So it is safe to say that owning a house is a big contribution to happiness, although the  $r^2$  (linear regression) is not a high value, when compared with the other variables results it is the second highest.



**Figure 5 - Homeownership**

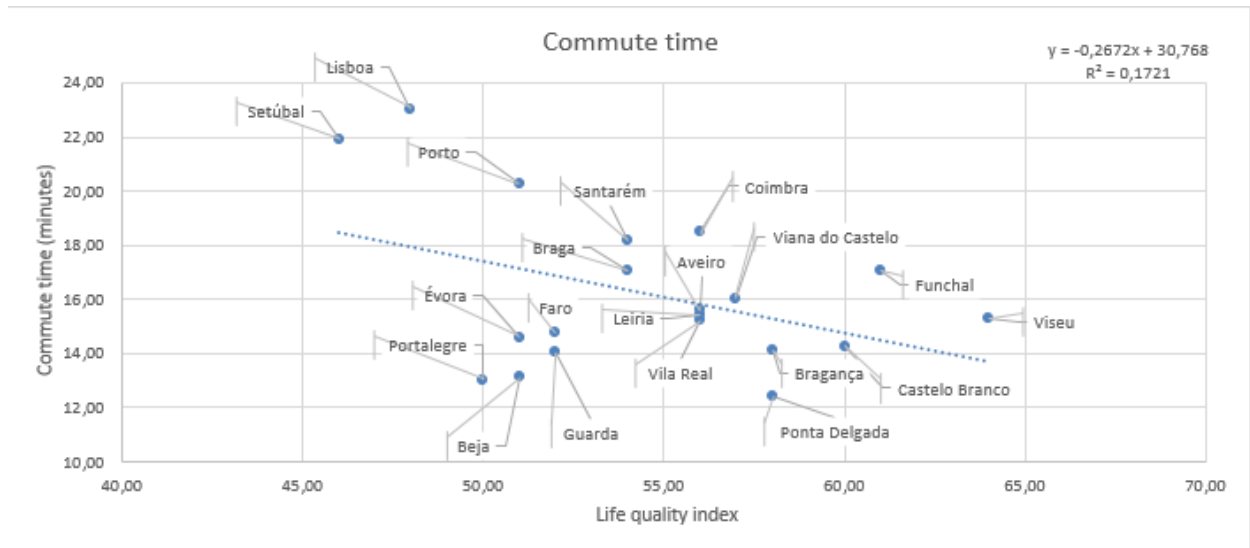
Other results worth pointing out are the non-existing correlation of any of the variables related to Education (*Illiteracy rate, High Education population and School dropout rate*). People grow up hearing that they should study to be able to fulfill their dreams but according to these results there is no kind of association between happiness or, as it is translated in this study, *Life Quality Index* and any kind of education variable.

Another interesting factor in the correlation results between *Population density* and *Life Quality Index*. The correlation coefficient is -0,363 and it is a medium inverse correlation that means that the lower the population density is, the higher the life quality gets. This can be translated easily to urban policy, since it is said that increasing urban density is more sustainable but one has to question if is it what people want and what makes them happy? It seems that in Portuguese cities it is preferred to live where the population density is lower.



**Figure 6 – Population density**

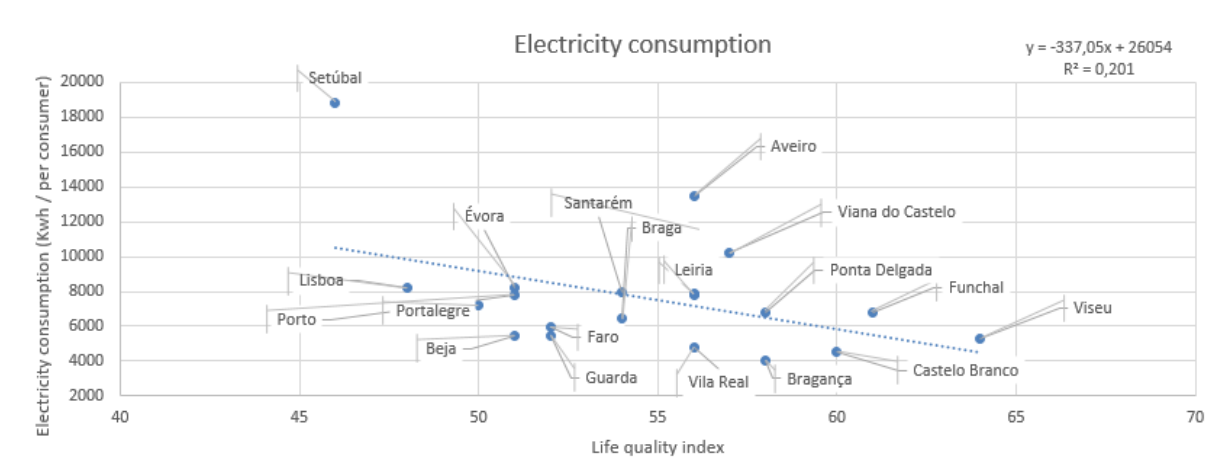
It can be seen that both variables comprehended in the *Transport* group present a medium inverse correlation (*Commute time: -0,415; Passengers using ground transportation: -0,334*). It was expected: it means that the less time people have to commute, the happier they are.



**Figure 7 – Commute time**

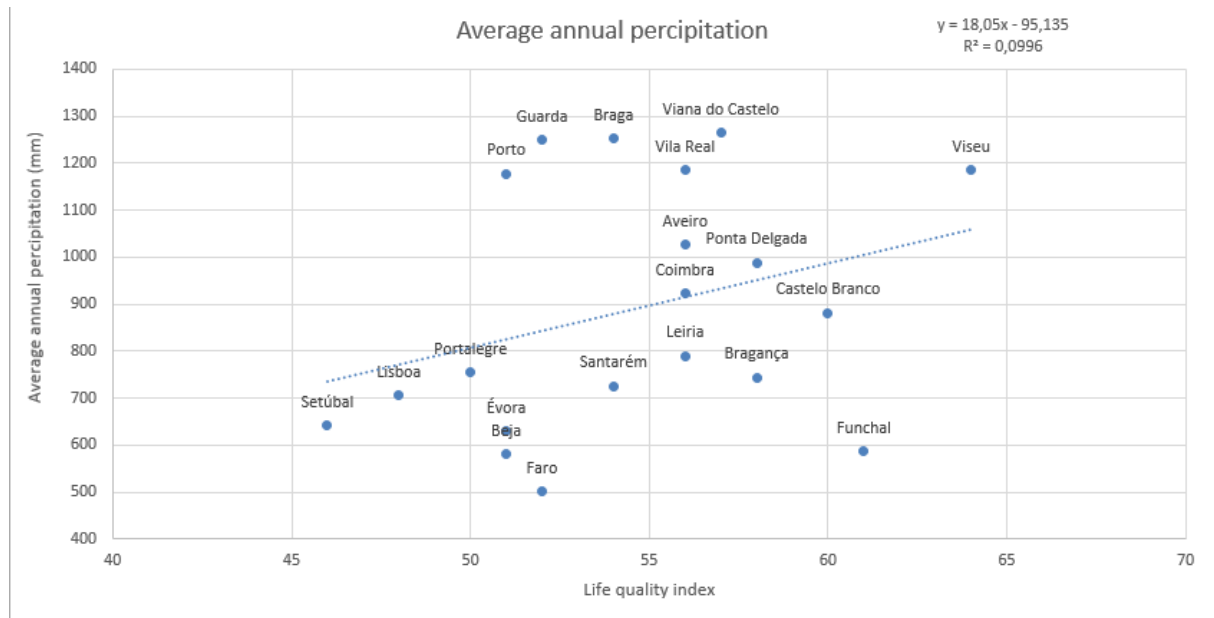
When looking at the variable *Passengers using ground transportation* we see that the less people use them, the happier they are as well. It could be inferred that public transports do not excel in quality and people prefer to take the individual car when getting around.

As it can be seen, both variables *Residents selected urban waste* and *Electricity consumption* are medium inverse correlated to *Life Quality Index*, being the latter one probably explained by the costs of energy since the results show that the less energy is consumed, the higher the *Life Quality Index* is (Figure 8).



**Figure 8 – Electricity Consumption**

To better understand the limits of the correlation method and what it can be inferred of its results it can be made a reflection when looking at the correlation coefficient of *Average annual precipitation* (0,316) in figure 9. At a first glance it can be said that in Portuguese cities the more it rains, the higher the *Life Quality Index* but it can as well mean that happier people live in place with higher precipitation and this can happen cause by a third or fourth factor.



**Figure 9 – Average annual precipitation**

After analyzing the correlation and linear regression results it was needed to understand not only the influence of each variable in the Life Quality Index (LQI) as well the influence of the group they are in using a multiple regression, i.e. to understand if the happiness (represented in this study by LQI) is, for example, more influenced by economic factors or environmental factors.

**Economy**

This group has the only variable on this study that has a strong correlation (*Wages*) although it is an inverse correlation. Considering Florida’s study (2013) and findings about the U.S. cities we did not expect to see that in Portugal the less you earn, the happier you are, the higher quality of life you experience.

All three independent variables in this group – *wages*, *income* and *unemployment rate* – have a significant correlation with the Life Quality Index ( $r < -0,3$ ) as seen before.

In an attempt to understand how the dependent variable (LQI) is related to two or more independent variables it was decided to apply the multiple regression technique. Using this method it could be understood if economic variables play a big role when we speak about life quality (62%).

<b>R Square</b>	0,623	62%
		<i>P-value</i>
Wages		0,002
Income		0,654
Unemployment		0,007

**Table 4 – Multiple regression analysis economic variables**

When looking at the Table 4 above we can now only consider *Wages* and *Unemployment* since their p-value is lower than 0,05 and ignore *Income* since a p-value higher than 0,05 knowing that the p-value helps us to determine the significance of the results.

We can for now conclude that the economic variables play a big role in the LQI but not in the way we expected as it shows that they indirectly related. We could see in this analysis that

regression analysis shows how variables are related and correlation analysis show us the degree to which variables are related (Wonnacott & Wonnacott, 1970).

**Housing**

As results of the multiple regression relating these two variables comprehended in the *Housing* group theme we understand that there is a high influence of this factor in the Life Quality Index (44%) since both of the variables are significant (p-value < 0,05) as seen in the Table 5.

<b>R Square</b>	0,442	44%
		P-value
Housing costs		0,025
Homeownership		0,002

**Table 5 – Multiple regression analysis housing variables**

**Demography**

When analyzing the multiple regression association demographic factors with *Life Quality Index* it can be observed that neither of the variables validate this result since their *p-value* is higher than 0,05.

<b>R Square</b>	0,276	28%
		P-value
Pop. Density		0,141
0-14		0,594
15-64		0,598
65 +		0,595

**Table 6 – Multiple regression analysis demographic variables**



**Education**

No multiple regression comprehending the variables *Illiteracy rate*, *High education population* and *School dropout rate* since the results of the correlation made beforehand showed no kind of association between this variables and the *Life Quality Index*.

**Transports**

Again we can observe in this multiple regression that the results cannot be statistically validated since both *p-values* are above 0,05.

<b>R Square</b>	0,188	19%
		P-value
Commute time		0,254
Passengers		0,970

**Table 7 – Multiple regression transport variables**

**Environment**

As seen on the correlation results, *Energy consumption* is a very important variable to consider when speaking of *Life Quality Index* and as it can be confirmed by the multiple regression in the table 8 below. Looking at the values of *p* we can see that this variable (*Energy consumption*) is the only one considered valid for this association and the value of *r<sup>2</sup>* says that Environment plays an important role when defining life quality and happiness (35%).

<b>R Square</b>	0,345	35%
		P-value
Urban Waste		0,070
Energy consumption		0,024

**Table 8 – Multiple regression analysis environment variables**

**Geography**

Geographic components are not very significant, in spite of the *Precipitation* result when using the correlation method; it can be observed that geographic components influence only 10% of the dependent variable variation. Once again the variables *p-value* show us that this is not a statistically valid result and that is a constant in this study.

<b>R Square</b>	0,106	10%
		P-value
Temperature		0,740
Precipitation		0,219

**Table 9 – Multiple regression geography variables**

*Other multiple regressions*

As it was observed that several multiple regression made previously could not be validated for the variables *p-value* was not below 0,05, there was need to try some different associations and try to understand it the chosen variables could be associated despite of their group themes.

It was made a multiple regression using the variables with the higher association values (*wages, unemployment, homeownership, electricity consumption*) as it can be seen in table 10 and once again we could see that the economic component plays an important role in the *Life Quality Index*.

<b>R Square</b>	0,627	63%
		P-value
Wages		0,008
Unemployment		0,044
Homeownership		0,637
Electricity consumption		0,817

**Table 10 – Multiple regression analysis LQI most influenced variables**

It was made a second test multiple regression gathering all the variables that were chosen for this study to integrate *Life Quality Index* and happiness (Table 11). Though there are not significant results ( $p\text{-value} > 0,05$ ), it can be seen that the economic and human capital factors stand out as it was expected by empirical knowledge as well as by examining Florida’s study (2013) of the U.S. cities.

<b>R Square</b>	0,978	98%
		<i>P-value</i>
Wages		0,050
Income		0,063
Unemployment		0,114
Housing Costs		0,195
Homeownership		0,416
Population Density		0,207
Illiteracy		0,535
High education population		0,971
School dropout rate		0,080
Commute time		0,765
Passengers using ground transportation		0,579
Urban waste		0,647
Electricity consumption		0,109
Average annual temperature		0,906
Average annual precipitation		0,767

**Table 11 – Multiple regression analysis ‘happiness’ reference variables – our selected indicators**

## Conclusion

The statistical analysis to the factors of happiness in Portuguese cities came out with unexpected results that only go against the estimated effects in other similar analysis (Florida, 2013) but that also contradict basic economics principles.

These results launch doubt on the Life Quality Index' capacity as a proxy of cities happiness and on the quality of our sample (only 20 observations for each variable, while Florida used 160).

Another possibility is that Portuguese people haven't still adopted free market values, continuing to be clinging to pre-capitalist, traditional values where the connection with the family place of birth, traditional activities and culture are still highly rated.

All the above are excellent reasons to further research on this intriguing subject.

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