

Geography of European Life Satisfaction

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Abstract The vast majority of studies analyze life satisfaction at individual and/or country level. This study contributes with analysis of life satisfaction at the (sub-national) province level across multiple countries. The purpose of this study is to call attention to spatial aspects of life satisfaction. Literature does not discuss the fact that life satisfaction in one province may be related to life satisfaction in other provinces. This study shows that there are well-defined happiness clusters in Europe, but also some outliers.

Keywords Life satisfaction · Spatial correlation · European provinces

1 Introduction

There is a body of literature about life satisfaction. Psychologists, in particular, have investigated life satisfaction at the individual level, with a methodology¹ that has certain consistent features. Typically, the dependent variable is operationalized as a self-reported rating of happiness.

Two major articles summarize this research, Myers (2000) and Diener and Seligman (2004). Myers concludes that happiness comes from three sources:

1. Personal characteristics/activities: traits and temperaments (e.g., extroversion) and, leisure, but not gender, age, or personal income (assuming that one can afford the necessities).

¹ Psychologists usually use Analysis of Variance (ANOVA) and economists use various regression techniques.

There is online appendix with Google map at <http://www.aok.us.to/papers/gesis/g1.html>. I am indebted to Yu Xue. All mistakes are mine.

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2. Characteristics of the collectivity: affluent culture, political freedom/rights, per capita gross national product (GNP) up to \$8,000.
3. The relationship between people and groups: social capital (e.g., friendship and religion).

Richard Easterlin initiated contemporary happiness research in economics when he published *Does Economic Growth Improve the Human Lot?* (Easterlin 1974). In this and subsequent works (Easterlin 1995, 2001, 2003, 2005), he argues that the happiness function is composed of aspirations and achievements. People have aspirations that they try to satisfy. Once aspirations are satisfied, happiness should follow. However, new achievements result in new aspirations, because through the process of hedonic adaptation people adapt to new circumstances, whether good or bad, quite rapidly; hence, their life satisfaction is impacted in the short run only, and the gains are lost as new aspirations open a gap with achievement. Thus, any increase in income increases satisfaction in the short run but leads to an increase in material aspirations in the longer term. Because happiness is positively correlated to income but negatively to aspirations, the two influences cancel out as time passes (Easterlin 2001; Lelkes 2006).

The majority of the studies to date analyze data at individual or country level. Few of the published studies acknowledge that there are national differences in the relationship between life satisfaction and its predictors by employing multilevel modeling (Bonini 2008; Schyns 2002; Haller and Hadler 2006). Similar differences may exist at province level.

There are few studies analyzing life satisfaction across (sub-national) provinces, but within one country only, and these include: Switzerland (Frey and Stutzer 2000), Great Britain (Clark 2003) and Italy (Rampichini and SchifiniD'Andrea 1998). In their unpublished manuscript, Aslam and Corrado (2007) examine life satisfaction across European provinces using multilevel modeling but they do not discuss spatial correlation and use sample of about 20,000 individuals, while this study uses a sample of more than 60,000 individuals. Number of observations plays a significant role for external validity as there are about 200 provinces.

Literature does not discuss the fact that life satisfaction in one province may be related to life satisfaction in other provinces in a similar way that say homicide in one county is related to homicide in other county (Baller et al. 2001). The first law of geography says: "Everything is related to everything else, but near things are more related than distant things" (Tobler 1970, p. 236)². What might produce spatial dependence? Through the mechanism of social comparison, people are likely to compare themselves to other people in the neighboring locations, such as bordering provinces. Also, determinants of happiness in a province are likely to be similar to the determinants in neighboring provinces. For instance, provinces in northern Italy are richer and have higher civic engagement than provinces in southern Italy (Putnam et al. 1993). If this occurs, there is dependence among province-level measures of life satisfaction.

Life satisfaction may be spatially correlated, that is, there may be clusters of happy and unhappy provinces. Examining such relationship requires spatially coded data at province level. Such data exists, it is Eurobarometer 44.2 Bis (so called Mega Eurobarometer).

² This law, however, may be less true today than in was 1970s due to globalization and IT revolution. I thank anonymous reviewer for bringing this to my attention.

2 Data

This study uses Eurobarometer 44.2 Bis Mega-Survey: Policies and Practices in Building Europe and the European Union, January March 1996, thereafter EB. These data allow to study life satisfaction at province level. By province level I mean NUTS units (Nomenclature of Territorial Units for Statistics). For details about NUTS units see http://www.ec.europa.eu/eurostat/ramon/nuts/home_regions_en.html. As noted in the codebook, which is quoted in the next paragraph, the

Eurobarometer 44.2 bis covers the population of the respective nationality of the European Union member countries, aged 15 years and over, resident in each of the Member States. The basic sample size of the 44.2 bis MEGA-survey is about 3,000 respondents in Belgium, Denmark, East Germany, Greece, Ireland, The Netherlands, Austria, Portugal, Finland, and Sweden; about 6,000 respondents in West Germany, Spain, France, Italy and Great Britain; about 600 and 1,000 respondents in Northern Ireland and Luxembourg respectively. Next to this basic sample an oversample of people working in the sector of agriculture, fishery or forestry was carried out. A minimum number of such interviews per region was imposed. A multistage, random (probability) basic sample design was applied in all Member States. In each EU country, a number of sampling points was drawn with probability proportional to population size (for a total coverage of the country) and to population density. For drawing the basic sample, sampling points were drawn systematically from all “administrative regional units”, after stratification by individual unit and type of area. They thus represent the whole territory of the Member States according to the EUROSTAT-NUTS II and according to the distribution of the national resident population of the respective EU-nationalities in terms of metropolitan, urban, and rural areas. In each of the selected sampling points a starting address was drawn at random. Further addresses were selected as every Nth address from the initial address by standard random route procedures. In each household the respondent was drawn at random.

In order to analyze spatial information contained in the survey, that is the relationship between geographical positioning of the provinces, the survey data need to be entered into Geographic Information System (GIS)³.

3 Life Satisfaction in European Nations

Eurobarometer life satisfaction question reads: “On the whole are you very satisfied, fairly satisfied, or not at all satisfied with life you lead?”. Responses were coded on a scale from 1(not at all satisfied) to 4(very satisfied), and aggregated to province-level means. The histogram of these means is shown in Fig. 1. It is clear that there are some outliers. All Danish provinces have life satisfaction greater than 3.5. On the other hand there are several provinces with life satisfaction lower than 2.65: French provinces of Limousin and Auvergne; Portugal Lisboa, Algarve and Italian Basilicata.

The distribution of life satisfaction is bimodal: there are two clusters of unhappy and happy provinces with cutoff around the mean life satisfaction of 3 as shown by the dotted

³ Data were merged with the GIS codes of European regions, so called NUTS (Nomenclature of Territorial Units for Statistics) shape file. Shape file contains spatial information, latitude and longitude that allows to display data in a map. In some cases it was unclear which regions are corresponding to each other, and these cases are shown in Table 1. In most cases EB regions are the same as NUTS second level regions. In case of Denmark and Finland NUTS I regions were aggregated to match EB regions.

Fig. 1 Histogram of life satisfaction across European regions



line in Fig. 1. The happy cluster consists of Austria, Belgium, Denmark, Finland, Great Britain, Southern and North-Western Germany, and Sweden. Unhappy cluster consists of Southern Italy, Portugal, Eastern Germany and Central France. There is no one best way to classify this information into bins, but several natural breaks can be identified. Two maps with four bins are shown in Figs. 2 and 3. First has cutoff points defined as natural breaks (jenks)⁴ at 2.82, 3.04, and 3.27, and the latter shows quantiles. Figure 3, which shows quantiles of life satisfaction, is slightly different from Fig. 2, but the story is similar: There are clusters of happiness and unhappiness, or in other words, there is positive spatial autocorrelation: happy regions tend to be surrounded by happy regions, and unhappy regions tend to be surrounded by unhappy regions.

We can formally measure the degree of association between life satisfaction in neighboring provinces using Moran’s *I*, which is very similar to Pearson’s correlation coefficient, just measures correlation over space. Moran’s *I* is based on a weight matrix, which is a mathematical representation of the spatial relationship in data. I will use queen contiguity matrix.⁵ For each province its neighbors (contiguous provinces) are coded as 1 and all other provinces as 0. This matrix is then row-standardized so that each row sums up to one. For instance, if there were only 3 provinces, and province 1 was contiguous to province 2 and 3 and both provinces 2 and 3 only contiguous to province 1, then a weight matrix would have the following form:

$$W = \begin{bmatrix} 0 & .5 & .5 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix} \tag{1}$$

Moran’s *I* is given by:

$$I = \frac{n}{\sum_{i=1}^n \sum_{j=1}^n w_{ij}} \frac{\sum_{i=1}^n \sum_{j=1}^n w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^n (x_i - \bar{x})^2} \tag{2}$$

⁴ GIS ArcMap software defined them. ArcMap picks break points that best group similar values and maximize the differences between classes.

⁵ Rook contiguity matrix makes less sense here, where the four neighbors of each cell in the cardinal directions are given the value 1, all others 0. I also experimented with distance-based matrices that produced similar results.

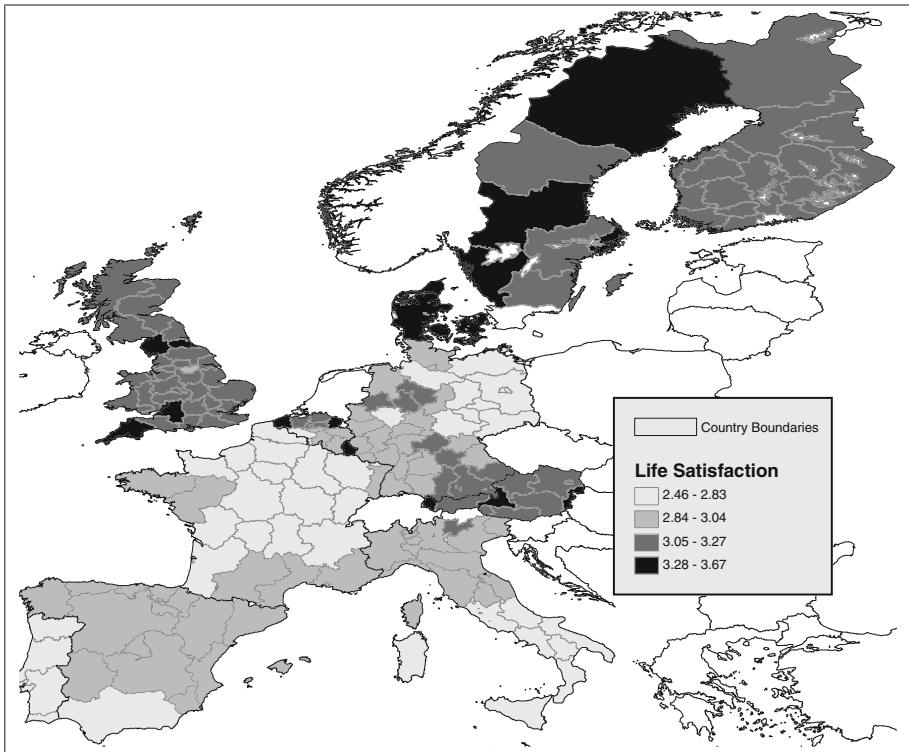


Fig. 2 Life satisfaction across European regions (natural breaks (jenks))

where w_{ij} is a weight between i th and j th provinces. Moran's I is .66 and is significant at .01 level of significance, which indicates quite strong positive correlation.⁶ Moran's scatter plot of lagged⁷ standardized life satisfaction against standardized life satisfaction is set down in Fig. 4.

There is an overall strong positive spatial correlation. This means that provinces are surrounded by provinces with similar mean life satisfaction; X axis shows mean life satisfaction for a province and Y axis shows (weighted) mean life satisfaction for its neighbors. Solid line with positive slope shows the correlation. Again, there may be similar determinants of happiness in neighboring provinces and/or happiness in one province may be related to happiness in another province. This paper's goal is modest and it is to demonstrate this pattern. It remains for the future research to determine the mechanism producing this pattern.

There are several outliers worth noting. First, in the top-right portion of the graph there are two Danish provinces, Copenhagen area and Sjælland, Lolland-Falster. They both have high life satisfaction values and high lagged life satisfaction values. This is simply due to the fact that these provinces neighbor each other only and both have high mean life

⁶ As a robustness check I also calculated distance-based weight matrix with cutoff set at 200 km. Using this alternative matrix specification, Moran's I is also .66 (significant at .01).

⁷ Spatially lagged variable is simply a variable multiplied by weight matrix.

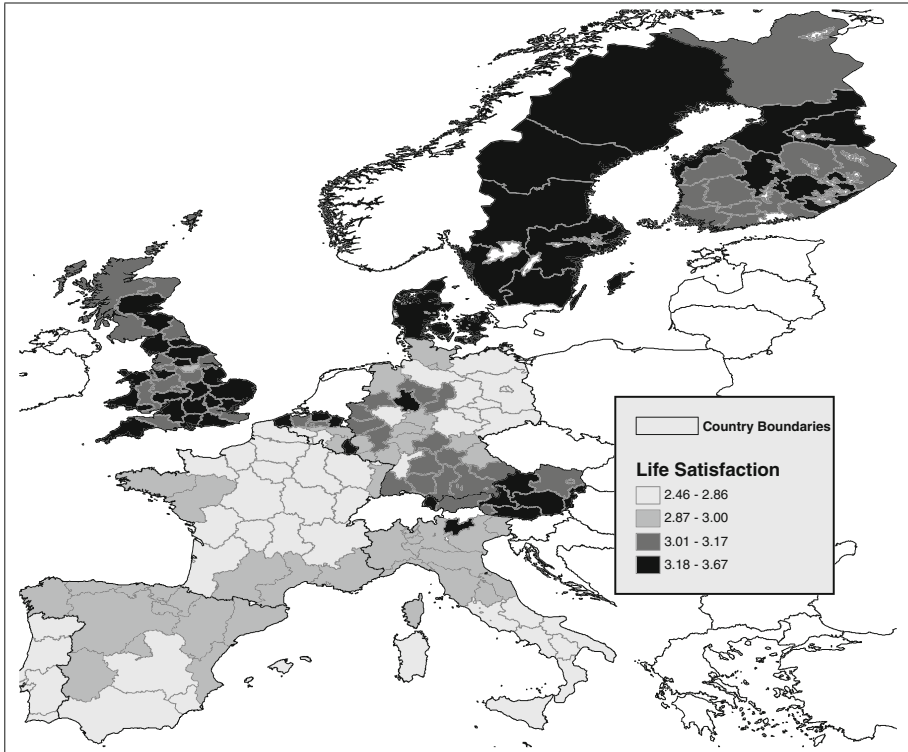


Fig. 3 Life satisfaction across European regions (quantiles)

satisfaction, and hence lagged life satisfaction in this case is simply the life satisfaction for the other province. Sjaelland, Lolland-Falster is also the province with highest life satisfaction in Western Europe, 3.7. All Danish provinces are happiest provinces in Western Europe. Austrian Vorarlberg stands out as a relatively satisfied province surrounded by much less satisfied other Austrian provinces.⁸ Danish Fyns Amt is an island and hence lack of spatial correlation. On the other hand, Danish Jylland borders with not so happy Germany and hence the negative spatial autocorrelation. In the bottom-right portion of the scatterplot Luxembourg borders with much less happy provinces. Belgian West-Vlaanderen is the happiest Belgian province surrounded by less happy French and Belgian provinces. Again, this pattern requires further research: Why there are some happy (unhappy) provinces surrounded by unhappy (happy) provinces.

Observations marked with big shaded circles on the left-hand side are mostly islands that do not have neighbors and hence appear as outliers. These are Portuguese Regiao Autonoma dos Acores and Regiao Autonoma dos Madeira; Italian Sicilia and Sardegna; Spanish Illes Balears and Canarias; French Corse; and two German provinces, which are not islands: unhappy Arnsberg and Karlsruhe that are surrounded by relatively happier provinces.

⁸ Note that data for Norway, The Netherlands, Switzerland, and Eastern Europe are missing and hence it influences results for neighboring provinces.

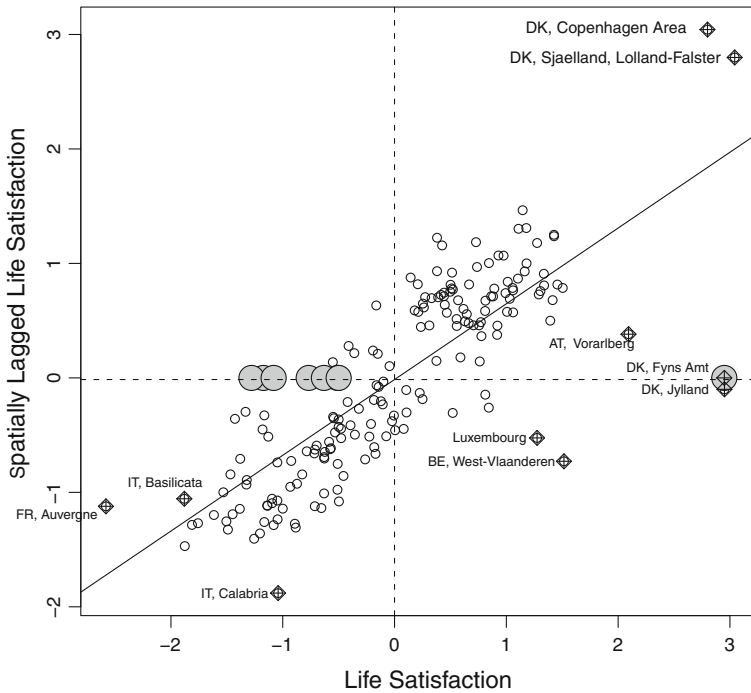


Fig. 4 Moran's scatter plot

In the bottom-left corner: the least happy province in France, Auvergne, is surrounded by much happier neighbors. Auvergne is also the least happy province in Western Europe with mean life satisfaction of 2.46. Second least happy province in Europe, Italian Basilicata is surrounded by slightly happier provinces, including Calabria, which also appears as another outlier.

In some cases outliers border provinces from other countries and negative spatial correlation is due to the fact that some countries are in general happier than others; And so Danish Jylland is much happier than german Schleswig-Holstein and Luxembourg is happier than Belgium, Germany and France. Austrian Vorarlberg and Belgium West-Vlaanderen are both happier than bordering national and international provinces. On the other hand, some outliers are located in the middle of the countries: Italian Basilicata and French Auvergen are both much less happy than their national neighbors.

Another interesting measure is life satisfaction inequality, which like income inequality measures disparity. I will use standard deviation of life satisfaction by province as a measure of inequality (percentiles do not make much sense as life satisfaction is measured on scale from 1 to 4). Map of life satisfaction inequality is set down in Fig. 5.

There are again some clusters of similar values. Most of the France has high inequality, while Denmark, Sweden, and North Italy are more equal. Then France is not only unhappy, but also unequal in happiness, and North Italy, Sweden and especially Denmark are happy and equal in happiness. There are also some provinces in most countries that have high (low) inequality and are surrounded by low (high) inequality provinces. In other words there is local negative spatial autocorrelation, which is stronger than in case of life

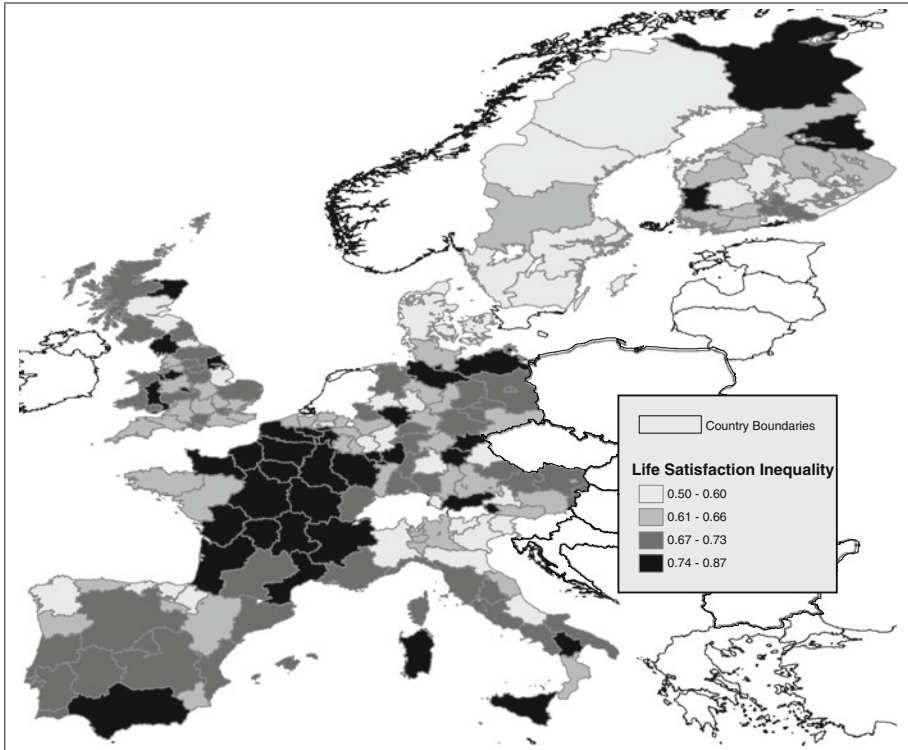


Fig. 5 Life Satisfaction Inequality (Standard Deviation)

satisfaction. This local local negative spatial autocorrelation weakens overall positive spatial autocorrelation, which is 0.19, significant at 0.01 level of of significance. This is much lower than autocorrelation of 0.66 in case of life satisfaction.

Figure 6 shows Moran scatter plot for life satisfaction inequality. In bottom-left quadrant Belgian Brussels have low life satisfaction inequality and is surrounded by even lower life satisfaction inequality in Belgian Prov. Vlaams-Brabant. In bottom-right quadrant Finnish Lappi with high life satisfaction inequality is surrounded by less unequal Swedish Norrbottens lan and Finnish Pohjois-Pohjanmaa. Also, unequal Austrian Tirol is surrounded by more equal German Bayern and Oberbayern, Austrian Vorarlberg, Salzburg, and Karnten, and Italian Veneto. In top-left quadrant, Belgian Prov. West-Vlaanderen is more equal than French Nord-Pas-de-Calais and Belgian Prov. Hainaut. In the same quadrant, Italian Calabria borders more equal Basilicata.

4 Conclusion

This study demonstrates that there is a substantial positive spatial correlation of life satisfaction among European regions. Happy and unhappy places do not necessarily overlap with national boundaries, and there are some significant outliers within countries. This

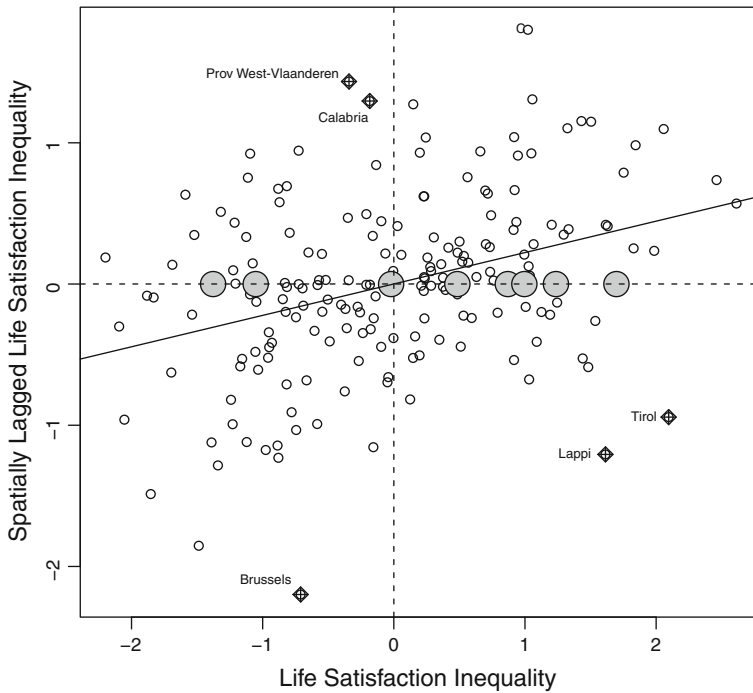


Fig. 6 Life Satisfaction Inequality (Standard Deviation)

study provides a detailed description of life satisfaction across European regions. There is also a large variation in life satisfaction inequality: Denmark being most equal and France least equal country. In case of inequality there are many outliers within countries, but there is also some overlap across country borders.

Much further research is needed, however. Spatial correlation may be incorporated into regression models using spatial lag or spatial error techniques. There are many intriguing questions to be answered. For instance, why people are so unhappy in French Auvergne and Limousin and Germany Arnsberg, while they are relatively happier in neighboring provinces. Finally, there is a need for better data collection. European countries are by no means uniform. There are great within-country differences, and hence, research will benefit from more disaggregated data. While this study improves over existing research using NUTS-2 regions, these regions are still diverse themselves. Again, there is a need for data collection at local level.

Appendix

See Table 1.

Table 1 Eurobarometer (EB) regions and corresponding nomenclature of territorial units for statistics (NUTS) (only problematic cases shown)

EB	NUTS	EB ID	NUTS ID
Grampian	North Eastern Scotland	34	UKM1
Borders, Central, Fife, Lothian, Tayside	Eastern Scotland	31	UKM2
Dumfries- Galloway, Strathclyde	South Western Scotland	32	UKM3
Clwyd, Dyfed, Gwynedd, Powys	West Wales and The Valleys	29	UKL1
Gwent, Mid-S-W Glamorgan	East Wales	30	UKL2
Nord Wurttemberg	Stuttgart	81	DE11
Nord-Baden	Karlsruhe	82	DE12
Sudbaden	Freiburg	83	DE13
Sud Wurttemberg	Tubingen	84	DE14
Hovedstadsområdet (Copenhagen area)	Kobenhavn og Frederiksberg kommuner	1	DK001
Sjælland, Lolland- Falster	Kobenhavns amt, Frederiksborg amt, Roskilde amt, Vestsjællands amt, Storstrøms amt	2	DK002 DK003 DK004 DK005 DK006
Jylland	Sonderjyllands amt, Ribe amt, Vejle amt, Ringkøbing amt, Århus amt, Viborg amt, Nordjyllands amt,	04	DK009 DK00A DK00B DK00C DK00D DK00E DK00F
Hame	Kanta-Hame	4	FI184
Vaasanrannikkoseutu	Pohjanmaa	14	FI195

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