HORIZONTAL AND VERTICAL CONTEXTS ON EUROPEANS' WELL-BEING

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Abstract

This paper analyzes the economic and social contextual determinants of individual life satisfaction and happiness across Europe. We provide new theoretical and empirical arguments about the consequences of horizontal and vertical spatial dependences in multilevel models. Using individual European data, we estimate a random effects spatial lag of X (SLX) hierarchical model, which allows for local spillovers of contextual factors to neighboring regions defined at several aggregation levels. Our results not only confirm the role of regional contextual factors but the significance of their spatial lags, probably indicating the presence of clustered latent variables.

Keywords: Life satisfaction, happiness, social capital, multilevel model, spatial lag of X, spillovers.
JEL codes: C50, I31, Z13

1. Introduction

The recent boom of happiness studies among economists is probably due to the opportunity of testing empirically standard a priori assumptions on the relationship between the utility function and its arguments, one of the basic tenets of economic theory (Becchetti *et al.*, 2010). The empirical literature on well-being has followed three approaches. Firstly, adopting a micro level perspective (within neighborhoods). Secondly, adopting a macro perspective (between regions/countries). The third one is a mixed approach considering both micro and macro (contextual) levels, through hierarchical (multilevel) models. Among the determinants of happiness, the empirical literature has mainly focused on individual socio-demographic characteristics, and also addressed different aspects of the individual's interaction with society. The economic literature has studied determinants of well-being such as income or unemployment (Rodríguez-Pose and Berlepsch, 2014) and, more recently, the so-called *relational goods*.

Both types of explanations can be considered at an aggregate level as *contextual factors*, representing economic and social or cultural aspects of the individual's neighborhood that affect her perceptions and behavior. Until recently, the consideration of geography has received little attention, at least in analysis at the micro level, which have usually capture spatial differences by the use of dummy variables.

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Through multilevel modelling, some researches have included regional level variables to control for the effect of the economic or institutional environment on individual happiness: Pittau *et al.* (2010), Ballas and Tranmer (2012), Aslam and Corrado (2012), Wang and Wong (2014), Kouvo and Räsänen (2015) or Neira *et al.* (2018). Alternatively, Stanca (2010) and Puntscher *et al.* (2014) estimate spatial econometric models of happiness at the macro level, using aggregate data for countries or regions. Pierewan and Tampubolon (2014) mix both approaches in a spatial multilevel model of individual well-being.

The aim of this paper is to analyze, through a spatial lag of X (SLX) random effects multilevel model, the contextual factors conditioning the individual well-being of Europeans. The paper presents alternative multilevel specifications for personal life satisfaction and happiness contextual factors and it includes inter-regional spatial interactions at various aggregation levels. The paper emphasizes the role of social capital and other economic factors.

We follow Dong and Harris's (2015) distinction of vertical and horizontal dependences in multilevel models. Traditional multilevel models have focused on hierarchical (vertical) groups-territories in which individuals share similarities. Those different geographical groups create spatial heterogeneity. In addition, horizontal dependence may arise from permeable boundaries or shared contextual effects between neighboring regions. We build on Pittau *et al.*'s (2010) and Aslam and Corrado's (2012) vertical analysis and follow the research agenda proposed by Corrado and Fingleton (2012) for spatial multilevel modelling.

Using data from the European Social Survey, for first time in the literature alternative multilevel model of well-being are estimated with spatial lags of the explanatory variables at the macro level. The paper makes two additional contributions. Firstly, the contextual determinants of well-being, and their local spillovers, are studied at different macro levels as an answer to the challenge of identification of proper scales in multilevel modelling. Secondly, it proposed a reflection on the relationship between social capital and well-being and on the possible interpretation of horizontal dependences.

Our preliminary estimation of alternative multilevel models confirms the statistical significance of the contextual effects in the three macro levels studied. Additionally, the spatial lags of the contextual economic factors result to be significant in the explanation of individual well-being. We interpret this result as an indication of possible latent variables conditioning the spatial distribution of Europeans' well-being, such as cultural characteristics, types of welfare systems or other spatially autocorrelated social, economic and geographical features.

The remainder of this paper will deal with the following aspects. Section 2 summarizes the theoretical framework about well-being and happiness. Section 3 describes the data and the econometric multilevel strategy to study horizontal and horizontal contextual effects. Section 3 presents the results and a final section concludes.

2. Happiness and social capital

2.1. The concepts of well-being and social capital

The term *welfare* is not free from ambiguity. Gasper (2004) argued that welfare is identified in utilitarianism with pleasure (well-feeling), which in turn is reduced by current conventional economics to have a good finantial position (being well off, well-

having or having much). Meanwhile, in the Aristotelian tradition welfare is identified with living a good life (well-living), which, in turn, permits an inclusion of multiple aspects related to think or do (well-thinking, well-doing) (Travers and Richardson, 1993). Gasper (2004) and Easterlin (2001) use the construct of *wellness* "as a global notion (umbrella term)", an abstraction that refers to any aspects of life assessed in terms of welfare, satisfaction, utility or subjective well-being. Two different types of approaches are usually distinguished to measure this subjective well-being (Engelbrecht, 2009). One is associated with pleasant emotions of short duration or feeling good: hedonic wellness or *happiness*. The other one is related to the satisfaction resulting from feeling fulfilled in life, or living a good life: eudaimonic wellness or *life satisfaction*. Although acknowledging differences between these concepts, the words happiness, life satisfaction and subjective well-being are often used as interchangeable in the economic literature (Frey and Stutzer, 2002). It is worth noting that, given its subjective character, life satisfaction and happiness are generally seen as involving both cognitive and affective processes (Diener, 1984; Veenhoven, 1994; Diener *et al.*, 2003)[1].

The concept of social capital was established by Bourdieu (1986), Coleman (1990) and Putnam (1993), under different perspectives, what has been subject to intense criticism, as reviewed by Inaba (2013). The approach followed in the current paper is the one of this last author, who proposed an economic approach to social capital, emphasizing externalities: "trust, norms of reciprocity, and networks that are associated with externality effects which operate through perceptions and cognitions or in the minds of the actors". Inaba (2013) summarized the previous concepts of social capital in two dimensions (micro-macro and structural-cognitive). For instance, the trust and networks dimensions of social capital can be understood in terms of private goods (personal networks or connections), club goods (trust and connections among certain groups) and public goods (trust towards society as a whole), which exert differential effects in the micro, messo and macro levels. Additionally, Inaba distinguishes five characteristics of the intangible externalities of social capital: 1) The externalities function through perceptions and cognitions or in the minds of the actors; 2) the externalities exist in a social context; 3) the nature of social capital reflects one's position in the network; 4) if internalized, the value of social capital can be diminished; 5) spillover effects can be large.

Social capital is a multidimensional concept, usually understood in terms of three dimensions:

1) Trust in people (horizontal relationships) or institutional (vertical relationships) is the most studied dimension of social capital (Heliwell and Putnam, 2004; Bruni and Stanca, 2008). Trust others means sharing fundamental values, which creates links between people. In general, trust improves cooperation and efficiency in economic and social transactions. The empirical evidence shows a positive relationship between generalized social trust and well-being.
2) Norms and sanctions: Based on Coleman approach, this concept is related to norms and sanctions which create trustworthiness, and include the cultural habits,

[1] The empirical results from alternative measures of subjective well-being tend to be fairly consistent, even if the life satisfaction variable seems to be more reflective of one's whole life experience whereas the happiness measure is more related to one's current circumstances or mood.

morals and norms of a society. Coleman (1988, p. 104) mentions that "effective norms that inhibit crime make it possible to walk freely outside at night in a city". This dimension has been the less studied in happiness literature.

3) Networks: The individual's relationship with her environment through social networks, including volunteer activities, tend to increase both individual and social well-being. However, the effect of networks in happiness and well-being depends largely on the type of networks analyzed. For instance, Olson's (1982)-type professional interest groups (political party, trade unions, and similar organizations) tend to maximize members' profit and might have negative social effects on happiness.

2.2. Determinants of well-being: economic and social factors

Among the determinants of happiness, the empirical literature has mainly focused on individual socio-demographic characteristics, economic factors and, to a lesser extent, on social and institutional variables. Regarding individual socio-demographic characteristics, there is a broad consensus about the effects of variables such as age, marital status, health, being religious or not, or living in urban-rural areas, whereas other variables such as gender, political affiliations or the levels of education show more ambiguous results.

The level of income is one the most commonly analyzed variables among the economic factors, with results that point to a positive association between income and subjective well-being. However, when considering aggregate variables and dynamics, the empirical results are not straightforward. For instance, the so-called *Easterline paradox* refers to Easterline's (1974) finding that the levels of well-being do not seem to increase as a society becomes richer. This apparent contradiction has been analyzed by other authors (Pittau *et al.*, 2010; Aslam and Corrado, 2012). Among the economic variables, unemployment, inflation or income inequalities have also attracted the attention of the happiness literature. Therefore, here we focus on the effect of social variables on the impact of social variables on well-being, which is still poorly understood and, in particular, on the effect of social capital.

Looking at the social and institutional variables, the literature appears to be somewhat blurred, with a mix of variables used to proxy institutional features that go from social trust or civic participation to governance indicators and institutional norms. A proper evaluation of the impact of social capital in well-being requires to jointly consider the three dimensions mentioned above (trust, norms and networks), as done by some recent studies, which show a positive effect of social capital on happiness and well-being: Aslman and Corrado (2012), Portela *et al.* (2013), Rodríguez-Pose and von Berlepsch (2014) or Neira *et al.* (2018). Social capital is based on interpersonal relationship, which exert different effects at the: micro level (interpersonal trust, informal networks), messo level (connections in a certain group of people) and macro level (institutional trust, norms). Studies of well-being from psychology and sociology have addressed different aspects of the individual's interaction with society, considering the role of institutions. Behavioural and experimental economics stressed the impact on economic decisions of interpersonal trust, fairness and reciprocity. More recently, the economic literature highlighted the importance of social relationship, often using the term *relational goods* (Uhlaner, 1989; Gui and Sugden, 2005; Bruni and Stanca, 2008).

The effects of social capital on happiness must be analyzed jointly with the effects of economic variables for three reasons. Firstly, the effects of income on life satisfaction depends on the role of peers and of reference group income (Becchetti *et al.*, 2010), which is closely related with social capital. Secondly, research about the Easterlin paradox shows that effects on income on well-being depend on the level of development, which can be associate to a particular social environment and level of aggregated social capital. Thirdly, Inaba's (2013) emphasis on social capital externalities involves considering individual transactions in collective contexts affecting their relationships and perceptions. Those contexts can be defined at different geographical aggregation levels.

In summary, social capital increases individual happiness when improves interpersonal relationships, in a group or even in a big geographical area (social trust, norms). This process produces peers' compassion and externalities affecting peer relationships, perceptions and well-being of other individuals. Therefore, the analysis of economic or social determinants of happiness requires to contextualize the individual in her environment(-s).

2.3. Geographical contexts

The geographical perspective allows studying the relevance of those environmental factors for well-being. This geographical approach to well-being has two dimension (Pierewan and Tampubolon, 2014). Firstly, the evidence shows that different geographical areas present different levels of observed well-being. This fact might be explained by social and contextual effects (Manski, 1993). For instance, Rampichini and D'Andrea (1997) have noted that individuals from the same region share common socio-economic, political and culture environments, which could determine their happiness. Veenhoven (2009) focused on the effects of public institutions on well-being. However, there is still little evidence about the contextual determinants of the spatial distribution of well-being and the mechanism by which those factors affect individual perceptions. Secondly, the geographical units share common borders, which are permeable to social interactions. Additionally, those units are affected by contextual factors operating at higher levels of geographical aggregation. Spatial analysis has shown strong similarities of well-being in neighboring areas from different countries. Analyzing a possible determinant of happiness, trust, Fazio and Lavecchia (2013) concluded that the "*forces* of regional proximity may be stronger than those of national borders, which in broad terms may include formal institutions and national cultural identity". Those horizontal and vertical spatial relationships are still not well understood.

Moreover, in spite of the contributions to the happiness literature from different disciplines, the cross-fertilization of literatures is constrained by the lack of geographically referenced data. In summary, defining the relevant *spaces* to evaluate the effects of different contextual factors is one of the outstanding issues in the geography of happiness. Studies of happiness and well-being considering geographical aspects have been treated at the macro level by aggregation for countries or regions (Stanca, 2010; Puntscher *et al.*, 2014). Pittau *et al*. (2010) and Ballas and Tranmer (2012) pioneered the analysis of vertical dependences among hierarchical geographical units using multilevel models. Pittau *et al.* (2010) modeled both random intercepts and slopes to study the effects of economic factors on reported well-being. They found that, once personal characteristics are accounted for, the unexplained regional-level variability of estimated life satisfaction

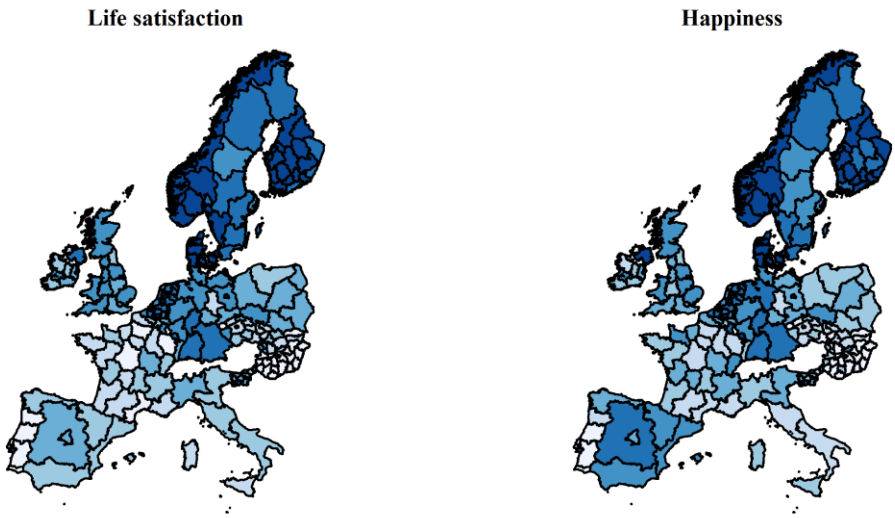
remained high, suggesting an important role of geography in explaining well-being. Alternatively, Aslam and Corrado (2012) approached this unexplained regional variability by considering individuals' position in social and economic variables relative to their regional mean, while Neira *et al.* (2018) focused in contextual regional factors of social capital. Pierewan and Tampubolon (2014) estimated spatial multilevel models of well-being to conclude that happiness can be explained by unobserved factors in neighboring regions.

3. Multilevel econometric strategy

3.1. The data

We use the sixth wave (year 2012) of the European Social Survey (ESS), which is an academically driven cross-national survey that has been conducted every two years across Europe since 2001. The survey includes two major parts: a *core* module, constant from round to round, and one or more *rotating* modules which are repeated at intervals. The core module covers a wide range of socio-economic variables, such as those referred to individual well-being, used as dependent variable in the present research, and to different social, political, demographic and economic factors, which are used as control variables and to build social capital dimensions here.

Figure 1. Life satisfaction and Happiness (7 quantiles for lower level regions)



The identification of geographical categories for the ESS data allows working at three different levels of aggregation: individuals, regions and countries. We use data for 18 countries that can be disaggregated at the regional level using Eurostat NUTS[2] hierarchical classification and that present available data for all the individuals and territories.

This results in 195 European regions defined at three different aggregation levels: NUTS 1 (5 countries), NUTS 2 (8) and NUTS 3 (5). This is going to be the lower level regional data used in this work (see Figure 1, darker colors represent higher well-being). As will be explained below, later empirical estimations will also work with data at higher

[2] Nomenclature of territorial units for statistics.

levels of aggregation. Appendix A provides more details about the sample and the variables.

Dependent Variables

Two measures of well-being are used to take account for both the eudaimonic and hedonic dimensions of subjective well-being, life satisfaction and happiness, which are evaluated by the ESS. The question asked to assess happiness in the ESS is as follows: "Taking all things together, how happy would you say you are?", with answers on a scale from zero (extremely unhappy) to ten (extremely happy). Regarding life satisfaction, the question asked is the following: "All things considered, how satisfied are you with your life as a whole nowadays?", with answers ranking from zero (extremely dissatisfied) to ten (extremely satisfied).

Covariates

We analyse three dimensions of individual social capital considered by Neira *et al.* (2009): trust, social norms and social networks. Following Portela *et al*. (2013), in order to measure these dimensions of social capital we have selected several ESS variables and perform a principal component analysis (see further details in A). The results obtained from the principal component analysis about the trust dimension show that these variables load onto two underlying components: one referred as *institutional trust* and the other one closer to the idea of interpersonal trust, which has been named *social trust*. With regard to the networks dimension, we also obtained two components named as *social networks* (also comprising virtual and support networks) and *formal networks*. Finally, we obtained a single component in the dimension of social norms, called *civic engagement* here.

A number of control variables at the micro level are also considered, representing other socio-demographic determinants, such as age, gender, education, religiosity, political orientation or health, among others. Additionally, we also use regional Eurostat statistics about gross domestic product per capita (GDPpc) in purchasing power standards (PPS) and unemployment rates.

3.2. Vertical spatial dependence and contextual effects: Aslam and Corrado (2012)

Owen *et al.* (2015) summarized the advantages of multilevel modelling to analyze neighborhood or contextual effects (macro level) while keeping the individual (micro level) as an object of study. In this way these models can "avoid the ecological fallacy of drawing conclusions at the individual level from relationships studied at a more aggregate scale". This traditional way of understanding multilevel models is related with what Dong and Harris (2015) call vertical dependence. Individuals are nested in different hierarchical geographical areas and all the individual sharing the same area are impacted by the same contextual effects. This top-down group dependence due to shared similarities (regional effects) creates spatial heterogeneity

One possible way of capturing contextual effects is using means of the X_{ij} variables measured for individuals i defined in the same territory j. This approach presents the problem of possible correlation between X_{ij} and $\bar{X}_j$, which can be solved by within-group centering, i.e., using $X_{ij} - \bar{X}_j$ and $\bar{X}_j$ as covariates, particularly if random slopes are not considered (Snijders and Bosker, 2012, chap. 4 and 5). Therefore, $X_{ij} - \bar{X}_j$ captures relative individual effects with respect to the mean value in the same geographical

group.

Aslam and Corrado (2012) note that this is also a way of solving the problem highlighted by Mundlack (1978) for random effects models, i.e. models with unobserved heterogeneity, at the regional level in our case. This type of models is preferred here over traditional fixed effects models because allows analyzing the between group variation. Models such as those with fixed effects which "control out, rather than explicitly model, context and heterogeneity offer overly simplistic and impoverished results that can lead to misleading interpretations" (Bell and Jones, 2015). On the contrary, "*random effects* and *unexplained variability* are two ways of saying the same thing" (Snijders and Bosker, 2012, p. 46), meaning that the random coefficient model allows for unexplained between-group variability and, therefore, to tests if this variability can be explained by group-level variables. However, in random effects models is assumed that the random effects at the regional and individual level are independent of the observed covariates. Aslam and Corrado (2012) remind that omitted region-specific covariates can induce correlation between the regressors and the regional random effects, generating the unexplained group-level variation recorded by Pittau *et al.* (2010). This residual correlation can be removed by including $\bar{X}_j$ as a separate explanatory variable.

Aslam and Corrado's (2012) model of life satisfaction with contextual effects is as follows:

$$y_{ijk} = \beta_{000} + \delta_{100} C_{ijk} + \beta_{100}\left(X_{ijk} - \bar{X}_{jk}\right) + \beta_{010}\bar{X}_{jk} + v_{ook} + u_{ojk} + e_{ijk} \quad (1)$$

$e_{ijk} \sim \mathrm{N}(0, \sigma_e)$ and $u_{ojk} \sim N(0, \sigma_u)$

$i = 1, \ldots, N \quad j = 1, \ldots, J \quad k = 1, \ldots, K$

where i refer to individuals, j to regions, k to countries and C_{ijk} are individual level control variables. v_{ook} denotes country fixed effects and the random effects are decomposed at the group level, u_{ojk}, and individual level, e_{ijk}. β_{000} is the overall intercept, δ_{100} and β_{100} are the within group coefficients and β_{010} is the between-group coefficients. Following Manski (1993), Aslam and Corrado's (2012) explanation for these coefficients is the following:

- if $\delta_{100} \neq 0$ or $\beta_{100} \neq 0$, exogenous individual factors exert a direct impact on individual well-being;
- if $\beta_{010} \neq 0$, contextual (exogenous) group effects occur when the individual's behavior tends to be affected by the underlying characteristics of the group (region) where the individual belongs to, which have been exogenously determined;
- if $\sigma_u \equiv Cov\left(u_{0jk}, u_{0j'k}\right) \neq 0 \; \forall \, j \neq j'$, correlated effects occur when individuals in the same group tend to behave similarly because they share similar individual characteristics, for example, ability, propensity to be happy, etc., and then, correlated effects are expressed by the unobservable component u_{0jk}.

In spite of the previous arguments about group variability, Aslam and Corrado (2012) assume country fixed effects (v_{ook}) due to an insufficient number of countries to include the third national level as a random effect. However, those fixed effects absorb part of the variability at the regional level. Alternatively, our specifications omit national fixed effects in order to analyze how contextual economic variables and their spatial lags can capture the between-region variation, as will be shown below.

3.3. Horizontal spatial dependence, Corrado and Fingleton (2012) and the SLX model

Traditional multilevel models try to capture contextual (macro level) effects in terms of the neighborhood-region of the individual. Therefore, the challenge is to identify the spatial scale relevant to study the particular contextual effects analyzed by the researcher, the proper hierarchical levels. However, in a similar way to the classical modifiable areal unit problem (MAUP), there are at least three reasons hindering the definition of suitable contexts (Owen *et al.*, 2015): 1) data availability or differences in the definition of groups affect the possibilities of the analysis (as in our case, with fairly aggregated and heterogeneous regional units); 2) observed or omitted variables can be creating contextual effects at multiple spatial contexts; and 3) spatial interactions between neighborhoods may be relevant. This last issue is what Dong and Harris (2015) call horizontal dependence. Common regional effects may arise from permeable boundaries but also from shared contextual effects between neighboring regions. Additionally, it is not easy to distinguish if measured spatial interactions among neighboring regions are due to substantial contextual effects or to a spatial distribution of the variables, explained only for reasons outside the problem under study. That is a general problem in Spatial Econometrics and will be relevant in our interpretations below. Whatever the case, Owen *et al.* (2015) emphasized that multilevel modeling has entered a mature phase when working with geographical hierarchical data sets. The levels analysis (layers) are not any more *containers* (*places*, to quote Arcaya *et al.*, 2012), but spaces that can be vertical and horizontally related.

Some authors (Orford, 2000; Paredes, 2013) have argued that a proper specification of spatial heterogeneity in multilevel modelling allows capturing the possible spatial autocorrelation created by the misspecification of spatial effects. However, other authors (Morenoff, 2003; Elhorst and Zeilstra, 2007; Chasco and Le Gallo, 2012) found persistent evidence of spatial interactions in multilevel models. Given the reasons explained above, and depending on the available data, we think that horizontal dependence might be rather the rule than the exception, regardless of the specification for spatial heterogeneity.

Corrado and Fingleton (2012) set up a framework to include spatial interdependence in hierarchical modelling and proposed a research agenda embodying differential spatial dependence within and between groups. This challenge has also being addressed by Elhorst and Zeilstra (2007), Gelfand *et al.* (2007), Savitz and Raudenbush (2009), Ren *et al.* (2013), Pierewan and Tampubolon (2014) or Dong and Harris (2015).

During the last years, part of this last literature has been exploring the multilevel possibilities of the spatial autoregressive (SAR) model, also known as spatial lag model, which includes an endogenous interaction effect, as in Corrado and Fingleton's (2012) model. However, we do not follow Corrado and Fingleton's (2012) proposal for two reasons. Firstly, their particular specification is devoted to solve Manski's (1993) reflection problem in the context of a SAR multilevel model including $\bar{X}_{jk}$ contextual terms. Secondly, it is not easy to justify inter-regional spillovers of happiness. Indeed, Pierewan and Tampubolon (2014) estimation of SAR and SEM spatial multilevel models for European's well-being makes them to conclude that the results may only be explained by spatial externalities (generated by observed or unobserved explanatory variables), not diffusion (generated by a SAR process). If a *global* spillover specification such as a SAR

model is not implied by theoretical or substantive aspects of the problem, LeSage (2014) recommends a *local* spillover specification. In particular, in order to study contextual effect we focus on the spatial lag of X model (SLX)[3], which allow for local spillovers to neighboring regions through spatial lag terms for the contextual explanatory variables ($\bar{X}_{jk}$ or other Z_k variables) through a neighborhood weights matrix W ($W\bar{X}_{jk}$ or WZ_k). In section 4.1 we will present a macro (regional) SAR model in order to provide further arguments for our SLX multilevel model.

Before explaining our W matrix, it is necessary to clarify that we do not use a classical division of European hierarchical levels, as it was mentioned in section 3.1. Our level 1 is individuals and we consider three types of level 2 (macro) variables. Our regional arrangement of individuals, due to ESS limitations, mixes geographical areas at various aggregations in terms of NUTS classification (see Appendix A). That regional organization is called *lower (regional) level* in the left map of Figure 2 in Appendix A. Given that mix of NUTS levels, and in order to explore different possibilities of spatial interactions, we have created a *higher* aggregation of regions, as appearing in the right map of Figure 2. It is built with the higher NUTS level available for each country starting from our lower regions. For some countries, such as United Kingdom or Spain, that higher level is the whole country (NUTS 0) but, for other ones the higher level is subnational (NUTS 1 for France or Sweden, and NUTS 2 for Finland or Czech Republic). Finally, a third level 2 aggregation, nesting the previous ones, corresponds to the NUTS 0 classification.

This distinction between possible macro contexts is not only relevant in terms of vertical relationships but allows testing different horizontal relationships. In order to capture spatial interactions through a SLX model, we have used a standardized weights matrix to the 4 nearest neighbors. Figure 3 in Appendix A represents the 4 relationships created by this W matrix from each regional centroid to the centroids of its neighbors. Those are the regional links between the geographical centers of the regions mapped in Figure 2 for this particular W matrix. The advantage of this representation is that allows for interaction between more heterogeneous territories. For instance, at the *higher* aggregation level, Spain is connected with a country, Portugal, but also with three NUTS 1 French regions, instead of France as a country. Therefore, for this latter case, a WZ_j variable would capture a Southwestern European effect in a better way that if the j areas were only countries. It should be noted that this W matrix creates a clear separation between Western and Eastern Europe, though at a lower aggregation level the neighborhood relationships are also due to proximity.

For a Z_j variable such as the logarithm of GDP per capita, what does a WZ_j effect on individual happiness mean? We should start wondering about what a contextual effects of regional log GDPpc on happiness means. When the individual effects are controlled by a variable of individual income, regional per capita income might capture levels and quality of basic facilities and services (Pittau *et al.*, 2010). However, as it can be

[3] Here we do not analyze the spatial Durbin error model. An advantage of the SLX model is that the regression estimates should not be biased even if the true model contain global diffusion of shocks through a spatial autoregresive process in the disturbances. Spatial dependence in the disturbances represents only an efficiency problem (LeSage, 2014).

observed in the left map of Figure 2 (Appendix A) for GDPpc in log form, the European regional spatial distribution of economic activity follows a core-periphery pattern, with just a few high income regions outside the geographical center of Europe and the so called *blue banana*, particularly those in Nordic countries (Bruna *et al.*, 2014, 2016). That spatial distribution might be due to a number of historical and geographical reasons, as studied by the economics of agglomeration. This type of factors might have shaped a particular European spatial distribution of latent variables not considered in the model but that could affect well-being: legal systems, Protestantism-Catholicism, types of welfare states or, more generally, *culture*. It can also be related with purely exogenous factors, such as the climate or geographical characteristics. The joint consideration of Z_j and WZ_j might be a way of proxying all those macro level determinants of happiness that play a role at different levels of aggregation and create similar characteristics between proximate regions. Different authors have shown that the Europena regional income per capita presents spatial autocorrelation. Similarly, Fazio and Lavecchia (2013) show that regional trust is characterized by a positive, and increasing over time, spatial association. Trust is a variable related to economic development and institutions, and also related to well-being, as we have reviewed. Therefore, considering contextual effects in a model of well-being through economic variables and their spatial lags and using different aggregation levels can be a way of testing the presence of latent variables shared across regions and horizontal dependences on the macro determinants of happiness.

3.4. Empirical specification of SLX multilevel models with contextual effects

Our dependent variables, reported life satisfaction and happiness, are categorical, ranging from 1 to 10. They are modeled without standardization in order to study the between-group variability. Standardizing tends to reduce variability at different levels (Heck and Thomas, 2008), which is unappropriated when studying contextual effects at the hierarchical level and the geographical level. Since the dependent variables are intrinsically ordinal, the natural way to treat it in an econometric model should be by ordered logit or probit equations. However, in practical terms, ordinality or cardinality of life satisfaction scores makes little difference (Frey and Stutzer, 2002; Ferrer-i-Carbonell and Frijters, 2004; Pittau *et al.*, 2010; Rodríguez-Pose and Berlepsch, 2014; Aslam and Corrado, 2012). As explained above, our purpose is to explain unobserved regional heterogeneity through alternative random effects multilevel models with contextual effects[4] and without country fixed effects.

In order to study contextual factors, we start from Aslam and Corrado's (2012) model, including individual control variables (C_{ijk}) and regional means of the social capital variables ($\bar{X}_{jk}$). It is worthy to repeat their multilevel specification in order to formulate additional possibilities:

$$y_{ijk} = \beta_{000} + \delta_{100}C_{ijk} + \beta_{100}\left(X_{ijk} - \bar{X}_{jk}\right) + \beta_{010}\bar{X}_{jk} + v_{00k} + u_{0jk} + e_{ijk} \quad (1)$$

It would be possible to add additional level 2 contextual variables (Z_{jk}). Additional level 3 variables (Z_{jk}) may replace or accompany the country fixed effects (v_{00k}).

[4] Capturing contextual effects should reduce the Intraclass Correlation Coefficient (ICC) in Tables 2 and 3. The ICC is the ratio between the unobserved regional random effect (residual) variability (σ_u^2, between-group) and the total unobserved variability ($\sigma_u^2 + \sigma_e^2$).

Moreover, contextual variables at levels 2 and 3 can include spatial lags of other contextual variables in the form of $W\bar{X}$ and $W\bar{Z}$. However, multicollinearity makes impossible to introduce such amount of contextual effects. Therefore, first we get rid of the country fixed effects in order to increase the need of explaining regional variability. Again, multicollinearity hinders the joint consideration of $\bar{X}_{jk}$ and Z_{jk}.

Therefore, an alternative three level settings without regional means and without country fixed effects might be the following.

$$y_{ijk} = \beta_{000} + \delta_{100}C_{ijk} + \beta_{100}X_{ijk} + \gamma_{010}Z_{jk} + \gamma_{001}Z_k + u_{0jk} + e_{ijk}$$

Given that our regions of lower aggregation are already fairly aggregated for some countries, again there are multicolinearity problems, particularly when analyzing spatial horizontal relationships[5]. Therefore, our final two-level model is the following:

$$y_{ij} = \beta_{00} + \delta_{10}C_{ij} + \beta_{10}X_{ij} + \gamma_{01}^{1}Z_j + \gamma_{01}^{2}WZ_j + u_{0j} + e_{ij}$$

Table 1. Specifications and hierarchical levels in Tables 3 and 4 of results

Equation	Levels 2 and 3	Contextual variables	Columns in Tables 3 and 4
(1)	*j* regions, *k* countries	$\bar{X}_{jk}$ = Regional mean of social capital	1
0	*j* countries	Z_j = Log GDPCpc or unemployment rate	2-3
	j higher level regions	Z_j and WZ_j	4-5
	j lower level regions	Z_j and WZ_j	6-7

However, in order to highlight the importance of contextual factors at different aggregation levels, we estimate equation 0 for three level 2 types of neighborhoods. In alternative estimations *j* refers to regions at the lower level of aggregation, at the upper level of aggregation or to countries. Table 1 presents a summary description of the estimated models to be presented in section 4.2.

4. Results

4.1. Spatial inter-group effects with data aggregated at the regional level

As was mentioned in section 3.3, here we briefly present a regional model of life satisfaction, using the lower aggregation level, in order to provide further arguments about horizontal dependence.

Given that the individual data is not georeferenced, spatial autocorrelation only can be evaluated after regional aggregation. In order to get a first impression of possible inter-regional effects, an OLS model has been estimated for life satisfaction considering the regional means of the individual variables. Using a standardized weights binary matrix to the four nearest neighbors, the zero p-value of Moran's I in the OLS column of Table 2 shows that the residuals are spatially autocorrelated.

Table 2. Life satisfaction for 195 regions: OLS and ML estimation of a SAR model

	OLS	*MLS*	*Direct*	*Indirect*	*Total*
rho		0.448***			
		(0.057)			

[5] Using the individual data, the correlation of the national log of GDPpc and the same *lower* level regional variable is 0.64 and increases to 0.79 when compared with the spatial lag of the regional variable.

(Intercept)	5.038***	2.020			
	(1.266)	(1.086)			
Institutional trust	0.237*	0.092	0.097	0.070	0.167
	(0.112)	(0.098)			
Social trust	0.489***	0.243*	0.255	0.185	0.441
	(0.116)	(0.098)			
Social network	0.660***	0.440***	0.462	0.336	0.798
	(0.112)	(0.097)			
Formal networks	-0.559***	-0.337*	-0.354	-0.257	-0.610
	(0.166)	(0.137)			
Subjective general health	0.729***	0.493**	0.518	0.376	0.894
	(0.184)	(0.152)			
Religiosity	0.757***	0.578***	0.607	0.441	1.047
	(0.151)	(0.124)			
Gender female	-1.795**	-1.070*	-1.124	-0.816	-1.940
	(0.645)	(0.527)			
Household's net income decile	0.725***	0.623***	0.654	0.475	1.129
	(0.147)	(0.120)			
R-squared	0.766				
Adj. R-squared	0.756				
Log likelihood	-110.75	-79.61			
p-value Moran's I	0.000	0.009			
Moran's I residuals	0.491	0.105			
Sum squared errors	35.55	24.71			

Note: Table displays coefficients: * significant at 10% level; ** at 5% level; *** at 1% level. Standard errors are in brackets.

Therefore, following a general-to-specific approach, several spatial econometric models has been estimated. The spatial lag of *Social network* is significant when it is added to the OLS model. However, it does not solve the residual autocorrelation and becomes insignificant when the spatial lag of the dependent variable is added to the model. Using likelihood ratio tests, the selected specification is the Spatial Autoregressive (SAR) model, which is shown in the ML column of Table 1, together with the estimated impacts of the explanatory variables. Though the estimated spatial parameter is significant, the SAR model does not solve the residual spatial autocorrelation in this case, but it has done it in other estimations not reported here.

Apart from the problem of extracting conclusions for individuals using aggregated data (ecological fallacy), it is not easy to justify that the life satisfaction in one region spills over the neighboring regions. It would be possible to interpret that the global spillover captures the joint effect of the social capital variables in the neighboring regions. However, this global spillover can also be capturing omitted variables, such as common cultural and institutional features. Whatever the case, this evidence shows that there is substantial empirical spatial dependence in the regional model of life satisfaction. Given that a global spillover specification cannot be justified by substantive aspects of life satisfaction, following LeSage's (2014) advice, in the next section we estimate a local spillover hierarchical specification, the random effects SLX multilevel model.

4.2. Multilevel models of well-being with contextual variables

In order to measure the three dimensions of social capital, the present research started working with 5 variables of social capital buillt through principal components analysis of survey answers. However, we found several problems. First, some of the correlations

between those factors variables and regional income are not easy to explain and different specifications show that not all the 5 variables are significant or present the expect sign of the effect. Second, economic contextual variables measured by regional income per capita in purchasing power parities can be introduced in models including individual income decile. However, multicollinearity makes more difficult to introduce 5 social capital individual variables and 5 social contextual variables measured as regional means of the previous ones. Third, this last problem is exacerbated by the additional consideration of economic contextual variables and/or spatial lags of the social capital regional means. Given that the focus of this paper is on spatially lagged contextual variables at various hierarchical levels, here we emphasize GDP per capita and unemployment rate.

Table 3 in Appendix B presents the estimation results of the specifications summarized in Table 1 for reported life satisfaction, while Table 4 presents the analogous for happiness. Column (1) show an Aslam and Corrado (2012)-type specification (see section sections 3.2), with similar results: the contextual effects measured by the regional means of the social capital variables (X_{ijk}) are higher than the individual effects ($X_{ijk} - \bar{X}_{jk}$). This model includes country fixed effects (v_{ook}) that are omitted in columns (2) to (7). The results of ICC for column (1) show that the regional means of the social capital variables capture a high proportion of the regional variability when country fixed effects are controlling for unobserved heterogeneity. However, our purpose is to model those contextual effects in space. Therefore, the ICC in column (1) is not comparable with the one in the rest of columns.

We are interested on testing horizontal dependence (local spillovers) through spatial lags of the contextual (macro) variables at several aggregation levels. However, as introduced in section 3.3, the regional means of the social capital variables are spatially autocorrelated, which implies correlations above 0.8 between the means and their spatial lags. This results in significance problems when the three dimensions of social capital are measured through 5 variables and their spatial lags are also considered. Additionally, the economic and social factors are also highly correlated. Therefore, if the regional means of social capital and regional economic variables are jointly considered there are significance problems. Therefore, columns (2) to (7) of the tables focus on the role of contextual economic variables (macro level) when controlling for individual social capital (micro level).

In columns (2) and (3) the country fixed effects are replaced by income per capita and the unemployment rate. Both variables are significant and present the expected sign for life satisfaction and happiness. These estimations are the benchmark for the models presented in columns (4) to (7), which include spatial lags of the two economic variables. As explained in sections 3.3 and 3.4, we test two different types of regional aggregation in order to analyze the role of horizontal spatial dependence in explaining regional heterogeneity.

The results show a significant role of the spatial lags of the economic variables for both aggregation levels and dependent variables. For the same column, the results are not robust when comparing the models for life satisfaction and the models for happiness. However, the general conclusion of the tests is that the spatial lags of the variables are relevant even at very high aggregation levels. Moreover, in columns (5) to (7) the spatial lags are more significant than the own region variable. Only in column (4) of Table 3

the spatial lag of the log of GDP per capita is not significant for life satisfaction at a higher regional aggregation level.

Appendix C, on line, shows the results for the individual control variables, which are similar to those in previous literature. High levels of income increase the probability of being happy and enjoying greater satisfaction with life. Subjective well-being shows a U-shaped relationship with age, it is positively correlated with subjective health levels and women tend to be more satisfied than their male counterparts. Regarding individuals' political orientation, religion and marital status, we found that those who declare themselves as being right-wing, following a religion, and those who are married seems to be happier and enjoy greater satisfaction with life than those being left-wing, declaring not being a religious person and not married. Contrary to what was expected, educational level seems not to show a significant effect on happiness. Finally, regarding residence, results show that living in a small town or in the countryside implies greater subjective well-being than living in a big city.

5. Conclusions

This paper presents new evidence of the mechanisms by means of which contextual factors influence well-being. Previous research on multilevel models of well-being has found that the effects of contextual economic and social factors can be even higher than the effects of those factors at the individual level.

We have added a new dimension in the assessment of contextual factors, which is the horizontal relationship between regional European contexts, considered at two different aggregation levels. However, the joint consideration of social and economic contextual factors presents multicollinearity problems, which increase if spatial lags of the macro variables are also included. Therefore, we have focused on a simplified specification using economic contextual variables, income per capita and the unemployment rate.

It was shown that a random effects spatial lag of X multilevel model enables to capture the economic and social factors shared among neighboring regions and probably to capture latent variables that would be otherwise ignored. The spatial lag of the contextual variables is generally significant at various levels of regional aggregation, confirming our hypothesis that the contextual factors of neighboring areas are relevant to explain individual life satisfaction and happiness. We interpret this result as a possible indication of clustered latent variables conditioning the spatial distribution of Europeans' well-being.

These results open a number of questions for ongoing research. Additional effort must be undertaken to improve our understanding of horizontal dependences between contextual variables explaining individual perception and behavior.

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Appendix A.Data description

A.1 Sample

Country	Number of regions	Observations	Region size			Level
			MIN	MAX	MEAN	
BE	11	1.869	51	305	203	NUTS2
CZ	14	2.009	64	252	167	NUTS3
DE	16	2.958	11	473	275	NUTS1
DK	5	1.650	190	455	365	NUTS2
ES	6	1.824	169	476	356	NUTS1
FI	19	2.197	14	581	242	NUTS3
FR	21	1.968	25	301	138	NUTS2
GB	12	2.286	82	303	209	NUTS1
HU	20	2.014	26	319	147	NUTS3
IE	8	2.628	185	610	381	NUTS3
IT	5	960	167	261	198	NUTS1
NL	12	1.845	21	326	226	NUTS2
NO	7	1.624	117	345	265	NUTS2
PL	6	1.898	175	408	336	NUTS1
PT	5	2.151	70	870	673	NUTS2
SE	8	1.847	93	432	289	NUTS2
SI	12	1.257	26	299	169	NUTS3
SK	8	1.847	182	279	236	NUTS2

A.2 Variables

Level 1: Individuals	
Age	
Age square	
Gender	1 Male, 2 Female
Placement on left right scale	1 Left, 2 Center, 3 Right
How religious are you	1 Low, 2 Medium, 3 High
Legal marital status	1 Married/Couple 2, Separated/Divorced 3, Widowed 4, Never married
Highest level of education	1 Lower secondary education completed (ISCED I-II), 2 Upper secondary education completed (ISCED IIIb-IIIa), 3 Post-secondary non-tertiary education completed (ISCED IV), 4 Higher tertiary education (ISCED V1, V2)

Domicile		1 A big city, 2 Suburbs or outskirt of big city, 3 Town or small city, 4 Country village, 5 Farm or home in countryside
Subjective general health		1 Very good, 2 Good, 3 Fair, 4 Bad, 5 Very bad
Household's total net income		1 Low, 2 Medium, 3 High
Social capital dimensions		
Trust	Result of Principal Component Analysis on:	
	Institutional trust	Trust in politicians
		Trust in country's parliament
		Trust in political parties
		Trust in the European Parliament
		Trust in the United Nations
		Trust in the legal system
		Trust in the police
	Social trust	Most people can be trusted, or you can't be too careful
		Most people try to take advantage of you, or try to be fair
		Most of the time people helpful or mostly looking out for themselves
Networks	Result of Principal Component Analysis on:	
	Social network	Take part in social activities compared to others of same age
		How many people with whom you can discuss intimate and personal matters
		Involved in work for voluntary or charitable organizations, how often past 12 months
	Formal network	Worked in political party or action group last 12 months
		Worked in another organization or association last 12 months
		How often socially meet with friends, relatives or colleagues
Norms	Result of Principal Component Analysis on:	
	Civic engagement	Boycotted certain products last 12 months
		Taken part in lawful public demonstration last 12 months
		Signed petition last 12 months
		Worn or displayed campaign badge/sticker last 12 months
		Contacted politician or government official last 12 months
Level 2: Region, with a lower or higher aggregation level		
Institutional trust		Regional mean
Social trust		Regional mean
Social network		Regional mean
Formal network		Regional mean
Civic engagement		Regional mean
Log GDPpc		Log of GDP at regional level in Purchasing Power Standard per inhabitant
Regional Unemployment		% of unemployment at regional level (15 years or over)
Level 3: Country		
Log GDPpc		Log of GDP at country level in Purchasing Power Standard per inhabitant
Unemploy-ment		% of unemployment at country level (15 years or over)

A3. Figures 2 and 3.

Figure 2. Logarithm of GDP per capita in PPS for two aggregation levels (7 quantiles)

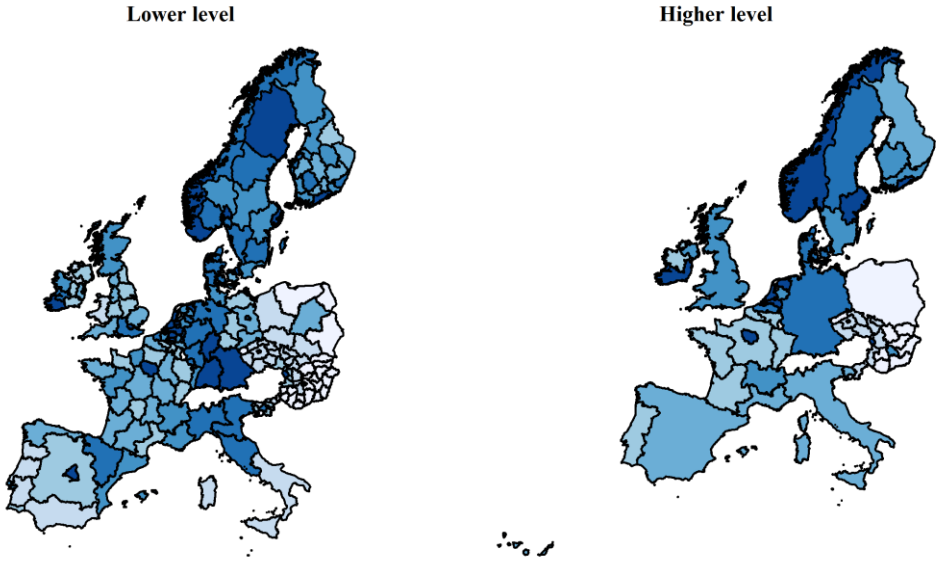
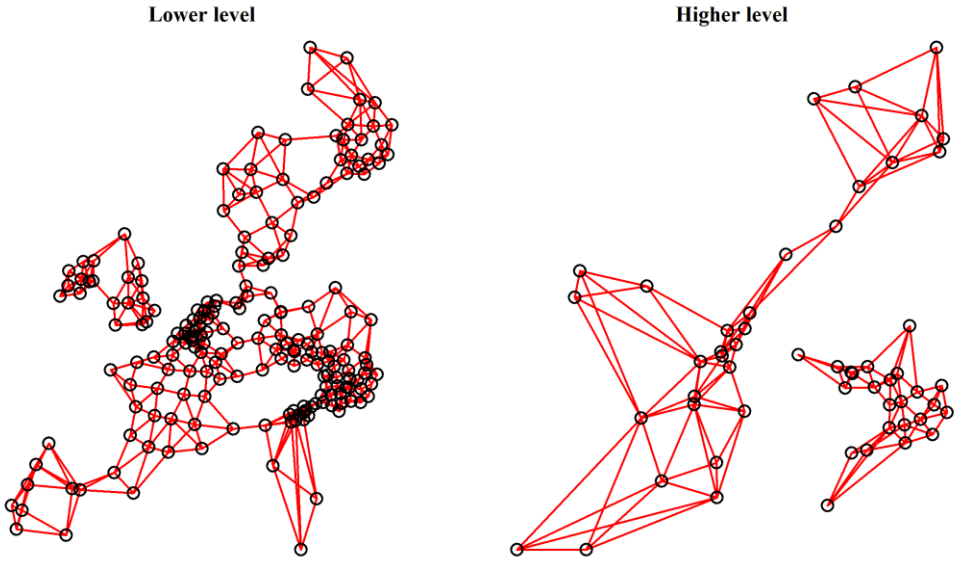


Figure 3. Links between regions through the *W* weights matrix for two aggregation levels



Appendixes B and C on line at the journal Website: http://www.usc.es/economet/eaat.htm

Appendix B. Multilevel models

Table 3. Results for life satisfaction (22,111 observations for 195 European regions)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Individual social capital (X_{ijk})							
Institutional trust		0.358***	0.362***	0.359***	0.359***	0.359***	0.361***
		(0.0140)	(0.0140)	(0.0140)	(0.0140)	(0.0140)	(0.0140)
Social trust		0.418***	0.423***	0.419***	0.420***	0.419***	0.422***
		(0.0141)	(0.0140)	(0.0140)	(0.0140)	(0.0140)	(0.0140)
Social network		0.264***	0.268***	0.263***	0.267***	0.263***	0.268***
		(0.0135)	(0.0135)	(0.0135)	(0.0135)	(0.0135)	(0.0135)
Formal net-work		-0.0411***	-0.0427***	-0.0416***	-0.0415***	-0.0414***	-0.0425***
		(0.0123)	(0.0123)	(0.0123)	(0.0123)	(0.0123)	(0.0123)
Civic engage-ment		0.0304*	0.0266*	0.0299*	0.0276*	0.0305*	0.0270*
		(0.0128)	(0.0128)	(0.0128)	(0.0128)	(0.0128)	(0.0128)

(1) Centered variables ($X_{ijk} - \bar{X}_{jk}$)	
Institutional trust	0.355***
	(0.0141)
Social trust	0.415***
	(0.0141)
Social network	0.262***
	(0.0136)
Formal network	-0.0378**
	(0.0123)
Civic engagement	0.0292*
	(0.0128)

(1) Regional means ($\bar{X}_{jk}$)	
Institutional trust	0.478***
	(0.0969)
Social trust	0.483***
	(0.0867)
Social network	0.792***
	(0.120)
Formal network	-0.177
	(0.135)
Civic engagement	0.0442
	(0.121)

Country effects (v_{ook})	Yes	No	No	No	No	No	No
Other contextual variables (Z_{jk}, WZ_{jk})							
Log GDPpc (country)		1.026***					
		(0.145)					
Unemployment (country)			-0.0394***				
			(0.00939)				
Log GDPpc (higher)				0.721***			
				(0.140)			
WLog GDPpc (higher)				0.277			
				(0.166)			
Unemployment (higher)					-0.00174		
					(0.00984)		
WUnemployment (higher)					-0.101***		
					(0.0168)		

Log GDPpc (lower)						0.371** (0.128)	
WLog GDPpc (lower)						0.674*** (0.163)	
Unemployment (lower)							-0.00457 (0.0124)
WUnemployment (lower)							-0.0552*** (0.0166)
σ_u	0.0124*** (0.00420)	0.203*** (0.0255)	0.238*** (0.0297)	0.189*** (0.0239)	0.188*** (0.0247)	0.183*** (0.0233)	0.219*** (0.0277)
σ_ϵ	2.975*** (0.0284)	2.973*** (0.0284)	2.973*** (0.0284)	2.973*** (0.0284)	2.974*** (0.0284)	2.973*** (0.0284)	2.973*** (0.0284)
$ICC = \sigma_u/(\sigma_u + \sigma_\epsilon)$	0.00416	0.0640	0.0740	0.0599	0.0594	0.0579	0.0686
Log-likelihood	-43507.4	-43654.3	-43668.9	-43648.9	-43651.7	-43646.2	-43662.3

Note: Table displays coefficients: * significant at 10% level; ** at 5% level; *** at 1% level. Standard errors are in brackets. The estimates for the overall intercept (β_{000}) and individual control variables (C_{ijk}) are omitted (see Appendix C, on line). In column (1) j is regions and k is countries. There is no k level in columns (2) to (7). j is countries in columns (2) and (3), higher level regions in columns (4) and (5) and lower level regions in columns (6) and (7). Contextual variables at a higher level of aggregation are means of the same variables at a lower level of aggregation (see the text in section 3.3).

Table 4. Results for happiness (22,111 observations for 195 European regions)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Individual social capital (X_{ijk})							
Institutional trust		0.206*** (0.0123)	0.211*** (0.0123)	0.207*** (0.0123)	0.210*** (0.0123)	0.207*** (0.0123)	0.211*** (0.0123)
Social trust		0.349*** (0.0123)	0.355*** (0.0123)	0.350*** (0.0123)	0.353*** (0.0123)	0.350*** (0.0123)	0.354*** (0.0123)
Social network		0.295*** (0.0119)	0.298*** (0.0119)	0.294*** (0.0119)	0.298*** (0.0118)	0.294*** (0.0119)	0.298*** (0.0119)
Formal network		-0.0326** (0.0108)	-0.0343** (0.0108)	-0.0333** (0.0108)	-0.0335** (0.0108)	-0.0331** (0.0108)	-0.0342** (0.0108)
Civic engagement		0.0161 (0.0112)	0.0126 (0.0112)	0.0152 (0.0112)	0.0133 (0.0112)	0.0157 (0.0112)	0.0130 (0.0112)
Centered variables ($X_{ijk} - \bar{X}_{jk}$)							
Institutional trust	0.203*** (0.0124)						
Social trust	0.349*** (0.0124)						
Social network	0.291*** (0.0119)						
Formal network	-0.0296** (0.0108)						
Civic engagement	0.0166 (0.0113)						
Regional means ($\bar{X}_{jk}$)							
Institutional trust	0.396*** (0.0957)						
Social trust	0.141 (0.0862)						
Social network	0.582***						

	(0.118)						
Formal network	-0.255						
	(0.136)						
Civic engagement	0.0177						
	(0.121)						
Country effects (v_{ook})	Yes	No	No	No	No	No	No
Other contextual variables (Z_{jk}, WZ_{jk})							
Log GDPpc (country)		0.914***					
		(0.116)					
Unemployment (country)			-0.0205**				
			(0.00790)				
Log GDPpc (higher)				0.479***			
				(0.115)			
WLog GDPpc (higher)				0.379**			
				(0.136)			
Unemployment (higher)					0.00570		
					(0.00869)		
WUnemployment (higher)					-0.0660***		
					(0.0148)		
Log GDPpc (lower)						0.147	
						(0.104)	
WLog GDPpc (lower)						0.727***	
						(0.132)	
Unemployment (lower)							0.0114
							(0.0105)
WUnemployment (lower)							-0.0504***
							(0.0140)
σ_u	0.0195***	0.125***	0.167***	0.122***	0.147***	0.117***	0.154***
	(0.00492)	(0.0163)	(0.0212)	(0.0161)	(0.0192)	(0.0156)	(0.0198)
σ_ϵ	2.292***	2.290***	2.290***	2.290***	2.291***	2.290***	2.290***
	(0.0219)	(0.0219)	(0.0219)	(0.0219)	(0.0219)	(0.0219)	(0.0219)
$ICC = \sigma_u/(\sigma_u + \sigma_\epsilon)$	0.00843	0.0516	0.0678	0.0506	0.0602	0.0484	0.0630
Log-likelihood	-40605.7	-40707.4	-40731.8	-40707.3	-40722.7	-40703.7	-40725.5

Note: See Table 3.

Appendix C. Models with control variables and country fixed effects

	Life Satisfaction	**Happiness**
Age of respondent	-0.0568***	-0.0415***
	(0.00421)	(0.00369)
Age^2	0.000650***	0.000450***
	(0.0000406)	(0.0000356)
Gender		
Female	0.0319	0.107***
	(0.0240)	(0.0211)
Political position		
Center	0.0793*	-0.000406
	(0.0372)	(0.0327)
Right	0.443***	0.244***
	(0.0466)	(0.0409)
Religiosity		
Medium	-0.0130	0.00582

	(0.0281)	(0.0246)
High	0.218***	0.265***
	(0.0374)	(0.0328)
Marital status		
Separated/Divorced	-0.486***	-0.532***
	(0.0407)	(0.0358)
Widowed	-0.404***	-0.743***
	(0.0511)	(0.0449)
Never married	-0.343***	-0.462***
	(0.0349)	(0.0307)
Education level		
ISCED III	0.0445	0.0188
	(0.0327)	(0.0287)
ISCED IV	0.0133	-0.0690
	(0.0419)	(0.0368)
ISCED V, VI	-0.0526	-0.106**
	(0.0385)	(0.0338)
Place of residence		
Suburbs or outskirts of big city	0.0407	0.0300
	(0.0446)	(0.0392)
Town or small city	0.0202	0.0140
	(0.0381)	(0.0334)
Country village	0.121**	0.0976**
	(0.0389)	(0.0341)
Farm or home in countryside	0.213***	0.185***
	(0.0556)	(0.0488)
Subjective health		
Very good	2.484***	1.976***
	(0.120)	(0.105)
Good	2.161***	1.658***
	(0.117)	(0.103)
Fair	1.686***	1.274***
	(0.117)	(0.103)
Bad	0.994***	0.711***
	(0.125)	(0.110)
Level of income		
Medium	0.339***	0.268***
	(0.0295)	(0.0259)
High	0.550***	0.399***
	(0.0343)	(0.0301)
Individual social capital (X_{ijk})		
Institutional trust	0.365***	0.214***
	(0.0140)	(0.0123)
Social trust	0.425***	0.356***
	(0.0140)	(0.0123)
Social network	0.269***	0.299***
	(0.0135)	(0.0119)
Formal network	-0.0431***	-0.0346**

	(0.0123)	(0.0108)
Civic engagement	0.0269*	0.0128
	(0.0128)	(0.0112)
Constant (β_{000})	5.717***	6.454***
	(0.170)	(0.149)
σ_u	0.262***	0.173***
	(0.0325)	(0.0219)
σ_ϵ	2.973***	2.291***
	(0.0284)	(0.0219)
$ICC = \sigma_u/(\sigma_u + \sigma_\epsilon)$	0.0808	0.0701
Log-likelihood	-43677.4	-40735.1

Note: Table displays coefficients: * significant at 10% level; ** at 5% level; *** at 1% level. Standard errors are in brackets. 22,111 observations for 195 European regions. Reference categories: Gender (Male), Political position (Left), Religiosity (Low), Maristal status (Married), Education level (ISCED I-II), Place of residence (A big city), Subjective health (Very bad), Level of income (Low).