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Conference Paper

Predicting GDP of 289 NUTS Regions in Europe with 'Subjective' Indicators for Human and Social Capital

55th Congress of the European Regional Science Association: "World Renaissance: Changing roles for people and places", 25-28 August 2015, Lisbon, Portugal

Provided in Cooperation with:

European Regional Science Association (ERSA)

Suggested Citation: Weckroth, Mikko; Kemppainen, Teemu; Sørensen, Jens F.L. (2015) : Predicting GDP of 289 NUTS Regions in Europe with 'Subjective' Indicators for Human and Social Capital, 55th Congress of the European Regional Science Association: "World Renaissance: Changing roles for people and places", 25-28 August 2015, Lisbon, Portugal, European Regional Science Association (ERSA), Louvain-la-Neuve

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Introduction

It is widely acknowledged that economic well-being is not equivalent to subjective well-being. But what is also known is that they are not, either conceptually or empirically, completely nonrelated. These broad statements explicate that ever since Richard Easterlin put out his thesis on the diminishing returns of economic growth (Easterlin, 1974) the bivariate analysis on the relations between the most commonly used aggregate measures for objective and subjective well-being, Gross Domestic Product (GDP) and mean life satisfaction, has served as a framework for most of the later empirical analyses (Bonini, 2008; Deaton, 2008; Stevenson & Wolfers, 2008).

The study at hand does not, however, follow this line of research but instead suggests that focusing only on these two variables can mask important information in the covariation between the objective and subjective measures of well-being. Thereby, this paper draws from the so called *eudaimonic* tradition¹ in the empirical happiness studies which emphasizes the role of active *functioning* while defining and measuring the elusive concept of well-being. Through this enlargement of the conceptual toolbox at hand, the aim of this paper is on a deeper and mutually beneficial integration of the *economic geography* and regional studies and, on the other hand, the *eudaimonic* tradition and empirical happiness study. This convergence is pursued through first recognizing the common concepts and measures used by both traditions and then empirically linking them to economic performance on a cross-sectional data of 289 European NUTS regions.

Our conceptual framework is built on the notion of *social wellbeing*, as defined and operationalized in the wellbeing module of the latest 6th round of European Social Survey (ESS), which understands social wellbeing in terms of thick and thin social relations (Huppert, Marks, Siegrist, Vazquez, & Vitterso, 2014). Hence, social wellbeing overlaps significantly with the concept and measures of social capital used in economic analyses (Beugelsdijk & Van Schaik, 2005; J. F. Helliwell, 2003; Knack & Keefer, 1997; Sørensen, 2014). Furthermore, we suggest that the other dimension of *eudaimonic* functioning measures in the ESS module, *personal wellbeing*, can be treated as a subjective indicator for many of the concepts discussed in the human capital literature such as competence and resilience (Romer, 1990). Thereby, we test their predictive value for regional economic performance while including objective “control” measures such as population density, aggregate tertiary

education, R&D expenditure and European Quality of Government Index (EQI) as control variables in linear regression model. In a final model we control also for the “nuisance” caused by the spatial autocorrelation in regional level NUTS data. However, it needs to be clarified that the focus of this study is not on spatial econometrics or even in economic *per se*. Instead, it should be understood as an interdisciplinary attempt to understand the economic reality from the perspective of subjective well-being research. We hope that understanding the variate structure of the indicators used in this cross-sectional analysis could be utilized in a future research focusing on actual economic growth models.

We set off to this approach with recognition that both macroeconomic economic performance (GDP) and aggregated life satisfaction clearly have some validity as measures for wellbeing and development in international comparisons (J. Helliwell, Richard Layard, & Sacs Jeffrey, 2012). Even though their limitations are well known they have acclaimed themselves as dominant aggregate measures of objective and subjective indicators of well-being. The critique against the life satisfaction measure in the broader field of empirical happiness study is often based on its sensitivity to the effect of personal traits and expectations (Huppert et al., 2014; Keyes et al., 2002). What is also recognized is the role of reference groups and relativities where experienced life satisfaction is reflected upon (Morrison, 2014).

Furthermore, it should be acknowledge that individual life satisfaction is influenced by human capability to adapt to even rather extreme negative external conditions. For example it has been found that individuals living near absolute poverty can report relatively high life satisfaction (Biswas-Diener & Diener, 2001). These concerns to some extent question the validity of intergroup, -cultural and -national comparisons based on life satisfaction measures. As addition to this conceptual critique in the light of latest research the problem is increasingly an empirical one; a wide number of subnational analysis within countries have detected a negative relationship between the dense economically productive areas and mean life satisfaction (B. Berry & Okulicz-Kozaryn, 2011; B. J. L. Berry & Okulicz-Kozaryn, 2009; Easterlin, Angelescu, & Zweig, 2011; Glaeser, Gottlieb, & Ziv, 2014; Piper, 2014; Sørensen, 2014). We suggest that the answer to this mismatch might be embedded in the measure of life satisfaction itself as it has a tendency to emphasize passive continuity and routine (Vitterso, 2004; Vitterso, Soholt, Hetland A., Thorsen, & Roysamb, 2010). These characteristics are usually treated as negative elements in modern economic theory focusing on intangible assets such as innovations, human capital and social networks. Thereby, this study focuses on the subjective wellbeing measures which emphasize positive and active

functioning of individuals rather than passive *life evaluations* in order to predict regional GDP in cross sectional analysis. Hence, study connects to some extent to the endogenous growth theory in regional economics, as we treat the subjective measures of social and human capital as significant contributors to economic growth.

This article is structured as follows. In the opening chapter we briefly introduce the most commonly used objective and subjective aggregate measures for regional development. We describe the dependent variable GDP and its critique and then go through the different measures of subjective wellbeing and their assumed relationship and causality with GDP. The final chapter on the conceptual framework of this paper aims to relate the components of social wellbeing, as they are operationalized in the ESS data, to the concept of social capital and the corresponding items of personal wellbeing to human capital.

The results chapter begins with factor analyses run for all of the items in social and personal well-being modules and continues with the descriptive statistics for the derived components as well as “objective” control variables used in this analysis. These components are then presented in a scatter plot matrix together with the dependent variable, regional GDP. The chapter continues with visualization of the dependent variable and its two strongest predictors; *social trust* and *social contact and support* in 289 NUTS regions. The final part on the empirical analysis presents OLS –regression model treating logged GDP as dependent variable and introducing stepwise the social and human capital variables and objective control variables to the model. The final chapter closes with discussion, policy implications and suggestions for the future research.

Objective and subjective measures for wellbeing and development

We are living in an era of increasing quantification and measuring. One of the areas reflecting this trend is the growing academic interest for gathering and analyzing large databases of self-reported well-being of individuals themselves and simultaneous interest from the public sector to policy suggestions drawn from these results (Office for National Statistics, 2014). Probably the most influential indicator of this trend is the Stiglitz raport published in 2009 (Stiglitz, Sen, & Fitoussi, 2010). The report was written by several Nobel laureates in economics who defined GDP as an insufficient and *misleading* measure *for* a societal progress in a modern world. Furthermore, the report suggested time being ripe for national measurement systems to shift emphasis from measuring economic production to measuring people’s wellbeing.

This statement has served as an initiative for many economists to study the interaction between the objective (economic) and the subjective (experienced) measures of well-being on aggregate levels (Bonini, 2008; Frank, 2009; Stevenson & Wolfers, 2008). However, the focus of these studies has been mostly on empirical analyses without much theoretical consideration on the direction of causality or reasoning on the cultural or institutional mechanisms operating between the two worlds of wellbeing (subjective and objective). In other word, what do GDP and life satisfaction actually measure and how they might be linked to each other theoretically. In this chapter we will make a brief enquiry into these questions and also offer a short overview on the assumed causalities between the two measures.

First one of these measures, Gross Domestic Product measures the combined value of services and products at a given time or period. It has been the preferred measure for national development since it was introduced to national accounting. As GDP was not intended to be used as measure for the overall development of the society, it is natural that it has received a fair share of critique from the very beginning (Kuznets, 1941). This critique can be categorized into the following arguments: 1) in GDP accounting it is difficult to separate costs and benefits, 2) GDP fails to recognize the value of unpaid work (domestic and voluntary work), 3) GDP does not make difference between desirable and undesirable economic activity and does not take into account non-material capital, 4) GDP measures only the sum of wealth and not its distribution 5), negative externalities such as pollution and unsustainable use of resources are not included in GDP 4) and finally it implicitly assumes an individual or household consumption as a comprehensive indicator for wellbeing

As all of the above can be accepted as a valid critique, in this study we include GDP into the analysis as it is and nothing else: a crude measure for economic activity. What remains is the perennial question on how it relates to subjective well-being both conceptually and empirically. Even though usually not explicitly discussed in the empirical analyses the assumption is that GDP increases wellbeing (life satisfaction) as it enables populations (consumers) to have access to wider variety of products and services. Thereby, the linkage between GDP and life satisfaction is based mostly on hedonistic assumptions on human wellbeing. Thereby, the life satisfaction measure also fits most fluently to the assumptions embedded in orthodox economic theory treating individuals as rational agents maximizing their wellbeing (life satisfaction).

However, the life satisfaction measure is not the only one used in the study of individual expressions of well-being. The field of subjective wellbeing research is often categorized into three accounts: (a) hedonistic, (b) life evaluations and (c) eudaimonic account (Kristjansson, 2010; OECD, 2013). As mentioned the critiques of hedonistic and life-satisfaction accounts are arguing them being inevitably relative and sensitive to both cultural context and personal traits while determining the gap between the expected and experienced reality (Huppert et al., 2014; Ryan & Deci, 2001). There have also been concerns on how well hedonistic and life satisfaction measures capture psychological wellbeing and human potential for optimal living (Ryff & Singer, 2008).

Thereby, in contrast to previous two, *eudaimonic* account (c) promotes that happiness can and should be measured objectively. Hence, it offers “objective lists accounts” (see also (Nussbaum & Sen, 1993; Sen, 2009) for evaluations on happiness drawing from classical writings of Aristotle and his *Nicomachean Ethics* (Aristoteles, 2011). Accordingly, *eudaimonic* well-being focuses on meaning, and self-realization and defines wellbeing in terms of living and functioning according to one`s individual potential and mental capacities (Ryff & Singer, 2008).

To sum up, as the measure of GDP is measuring the economic activity in a given place, at given time, it would seem reasonable to suggest that the counterpart should be also focusing on the active side in subjective well-being rather than passive life satisfaction. This study argues that the *eudaimonic* tradition, promoting competence, autonomy, agency and resilience, and the theories of human capital and endogenous growth have grown together without much knowledge of each other as the concepts and measures of social and personal wellbeing in the 6th round ESS data converge significantly with the concepts of social and human capital. Thereby, the assumed direction of causality would flow from wellbeing to economic activity as social and human capitals are often used as “input” variables in the endogenous growth theory (Romer, 1990). In the next chapter we conclude the conceptual framework for this analysis with relating social wellbeing to social capital and personal wellbeing to human capital.

Social wellbeing as social capital

Economic geography of the industrial era used to focus merely on the proximity of markets and materials and on transportation costs while trying to understand the location choices of industries and spatiality of economic activity (Weber, 1929). The economic geography of the

information age however focuses more on the role of knowledge based industries, innovations and entrepreneurship. Accordingly, the concepts of *social and human capital* have become important means of production and also as preconditions and fostering elements behind economic growth and resilience (Romer, 1990; Storper, 2013).

The appearance of the term 'social capital' in economic theory is usually traced back into the analysis of Putnam et al. concerning the causes behind the north-south divide in Italian economy (Putnam, Leonardi, & Nanetti, 1993). Putnam's thesis was that the communities in northern Italy were prosperous because of the norms of reciprocity embedded in the networks of civic engagement. Furthermore, Putnam et al. viewed the associational membership and attainment as a proxy and cause of more general social trust, which assumable has a positive effect to the society as a whole. In their original analysis Putnam et al. relied only on the degree of civic community membership as a measure of social capital. Later on, partly as a response to the critique on the ambiguousness of the concept, Putnam distinguished more explicit forms and measures for social capital (Putnam, 2000): *bonding* (connections within a given group) and *bridging* (links between different groups). This dichotomy has defined the framework of most empirical analyses ever since. Hence, in regional and national level analysis social capital is often measured through 'degree of general trust' (bridging) and 'density of associational activity' (bonding). Another way for formulate the two forms of social capital is to label them as thick and thin social network as was originally done by (Granovetter, 1973) who emphasized the importance of weak ties and intergroup connections.

One of the most significant empirical contributions to Putnam's thesis was made by Knack & Keefer (1997) who tested the effect of general trust and civic norms on national GDP with the World Values Survey data from a sample of 29 countries. They found that general trust (bridging social capital) has statistically significant positive effect to economic growth, whereas the membership in formal groups (bonding social capital) is not associated with economic performance. Later on Beugelsdijk and Van Schaik returned to subnational scale analysis with their study on the differences of social capital between 54 Western European regions (Beugelsdijk & Van Schaik, 2005). They did not however separate the two forms of social capital but built an index from the aggregate levels of social trust and group membership. Nonetheless, the analysis showed a strong positive relationship between their social capital index and Gross Regional Product in cross-sectional analysis. Their preliminary growth model also showed a significant and positive relationship between social capital and regional economic growth in the sample of 54 Western European regions.

One more recent theoretical contribution to the social capital literature was made by Michael Storper with his seminal book 'Keys to the City' (Storper, 2013). Storper (2013) also supported the separation of two types of social capital, bridging and bonding, which he defined as inter- and intragroup social networks. Furthermore, he argued against their contradictory role in terms of economic performance and suggested that they both play a major role in regional growth. In his framework the regions characterized with both high bridging and bonding social capital are gaining through a mixture of both autonomy and responsibility, as well as through good balance of voice and agency. These elements facilitate confidence, conflict resolution, and sustainable distributional tradeoffs which all end up nurturing the growth in economic activity. Storper's argument is supported by empirical analysis by (Callois & Aubert, 2007) who found that both bridging and bonding social capital have positive effect on economic development of rural areas. However, they note that 'bonding' capital seems to have an upper limit when it comes to its impact, whereas the effect of 'bridging' appears more robust and linear.

The subjective well-being module in 6th round ESS questionnaire sees social well-being as composing of subjective measures of social capital, including both bonding ('thick' ties to individuals you know well) and bridging capital ('thin' ties to people and organizations with whom one comes into contact). ESS module also differentiates various forms of social well-being (capital) such as reciprocity of social change, generalized social trust and participation to civic organizations. This enables us to test many of the thesis presented above by comparing their aggregate values to corresponding levels of regional economic performance.

Personal wellbeing as human capital

If the literature on social capital has for a long been on a quest for conceptual coherence and valid measures the case is even more evident in the literature of human capital. In general, human capital has been understood as an aggregate collection of knowledge, talents, skills, abilities, experience, intelligence, training, judgment and competence embedded in individuals in a population but treated as a collective good (Romer, 1990). The relevancy of human capital to economic theory is usually expressed with justifications for investment in human capital (often via education), which results in economic development through increased innovation and competence.

As the concept of human capital is not clearly defined there is also no consensus on the most valid measure of human capital. However, in most of the empirical analyses it is measured

through level of educational attainment. Thereby, the indicator for an aggregate level human capital has usually been either the share of tertiary educated individuals or alternatively the average number of years spent in full time study (OECD, 2001).

In this study we suggest that the components of personal wellbeing in ESS wellbeing module represent the subjective dimension of the concept of general human capital. Evaluations of the individual themselves can hence be seen as (primary) measure of actualized human capital rather than relying only on objective (secondary) measures such as educational attainment. In the ESS wellbeing module, personal wellbeing is composed of the following sub-concepts: *'resilience'*, *'meaning and purpose'*, *'sense of autonomy and control'*, *'engagement'*, *'sense of competence'* and *'experienced vitality'*. At glance, there are several common concepts familiar to economics and some which are overlapping directly with the components of human capital. First, the concept of *'competence'* is one of the central themes in human capital literature as well. In ESS module the term competence refers to a sense of general capability (e.g. managing life well), as well as cognitive capability (ability to think, concentrate, and make decisions). From the economic point of view, an aggregated level of these characteristics in a population can work as a valuable assets and have a positive effect in nations or regions ability to produce goods and services. Another familiar term is *'resilience'* which has been a topical concept in regional economics in recent years referring to the regional economies -or cities- ability to adapt and recover from economic (usually external) shocks. In the ESS wellbeing module the concept *'resilience'* refers to a rather similar entity but focuses on individuals themselves and links the concept into subjective wellbeing. And again this can be treated as a collective good in an aggregate level analysis and thus work as a driver behind economic performance.

Thereby, in this study we have interest to test how much these components of subjective well-being, understood as a subjective form of human and social capital, can explain of the variance of regional GDP in cross-sectional data from 289 NUTS regions. The full list of the survey item included in the analysis is presented in Tables (1a) and (1b).

Data and method

Data on regional economic performance (GDP) is derived from the Eurostat database (Eurostat, 2014) and is from the year 2011². Gross domestic product (GDP) is adjusted to current market prices and expressed as Euro per inhabitant. In the regression analysis GDP is transformed into logarithmic form in order to match to assumption of the normal distribution

of the dependent variable. The control variables used in the regression models (population density, 'population aged 25-64 with tertiary education', 'total intramural R&D expenditure' and 'employment rate') were also from Eurostats Regional statistics webpage. The European Quality of Government Index (EQI) data was collected by Charron, Dijkstra, & Lapuente (2014) and was downloaded from the webpages of the author.

The data for the subjective wellbeing is from the 6th round European Social Survey collected during 2012. The European Social Survey (ESS) is an academically driven cross-national conducted every two years across Europe since 2001. ESS is based on strict random probability methods at every stage and the data is representative of all persons aged 15. Each round of the ESS has a national sample size of 1,500 or 800 in countries with ESS populations of less than 2 million after discounting for design effects in the ESS.

The whole dataset in 6th round ESS data contained 54 673 individual responses from 29 countries. For this study we the confined the analysis to include only the countries which used some level of NUTS nomenclature as a subnational level location indicator. Thereby, after excluding Austria, Croatia, Greece, Latvia, Romania, Israel, Kosovo, Russia, Ukraine and Turkey we were left with 37 956 responses from 24 countries. These individual responses were then aggregated to present a total of 297 NUTS regions³. Further on, we excluded 'islands' (regions without neighbors) in order to match the requirements of the spatial analysis. At the end we were left with total 289 NUTS (either level 2 or 3) regions with 37 956 individual responses.

Results

We begin this chapter with exploratory factor analysis run for the 28 survey items included in social and personal wellbeing questionnaire in 6th round ESS data. The factor analysis was run separately for both dimensions of the functioning measures, social and personal wellbeing. Although, there is obvious overlapping between the two, social wellbeing refers to interpersonal and societal-level experiences whereas personal wellbeing relates to personal psychological traits and assets possessed by individuals (Huppert et al., 2014).

The analysis was conducted with orthogonal Varimax rotation. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis with KMO value with .789 for the social wellbeing items and .905 for the personal wellbeing. On social wellbeing (Table 1a), the scree plots and Kaiser's criterion for Eigenvalues (four components over 1) suggested

four components which were retained into the final analysis. On personal wellbeing (Table 1b), we ended up also with four components even though the fourth component had an Eigenvalue below 1 (.92) but it was decided to be included on theoretical grounds as the resulting four components refer to more coherent concepts than three components. The summary for the factory analysis is presented in the following tables.

Table 1(a). Summary of exploratory factor analysis results for the social wellbeing items (N= 37 956)

<i>Item</i>	<i>Rotated Factor Loadings</i>			
	<i>Social trust</i>	<i>Reciprocity</i>	<i>Local recognition</i>	<i>Social contact and support</i>
Most people can be trusted, or that you can't be too carefull in dealing with people	,757			
Most people would try to take advantage of you if they got a chance, or they would try to be fair	,754			
Most of the time people try to be helpful or that they are or they are mostly looking out for themselves	,656			
To what extent do you receive help and support from people you are close to when you need it		,753		
To what extent do you provide help and support to people you are close to when they need it		,662		
To what extent do you feel appreciated by people you are close to		,563		
How much of a time during the past week you felt lonely		-,281		-,224
To what extent you feel that people in your local area help one another			,839	
To what extent you feel close to the people in local area			-,491	
To what extent you feel people treat you with respect		,343	,479	
Compared to other people of your age, how often would you say you take part in social activities				,613
How often do you socially meet with friends, relatives or colleagues				,579
How many people, if any, are there with whom you can discuss intimate and personal matters				,434
In past 12 months, how often did you get involved in work for voluntary or charitable organisations				-,302
Initial eigenvalues	3,56	1,73	1,41	1,21
% of variance	25,4	12,4	10,1	8,6

Note: factor values over .40 appear in bold

Table 1(b). Summary of exploratory factor analysis results for the personal wellbeing items (N=37 956)

<i>Item</i>	<i>Rotated Factor Loadings</i>			
	<i>Engagement</i>	<i>Competence and meaning</i>	<i>Resilience</i>	<i>Autonomy and control</i>
How much of the time would you generally say you are <i>absorbed</i> in what you are doing	,858	,201		
How much of the time would you generally say you are <i>enthusiastic</i> about what you are doing	,765	,260		,230
How much of the time would you generally say you are <i>interested</i> in what you are doing	,752	,252	,218	,224
I generally feel that what I do in life is valuable and worthwhile	-,204	-,670		
Most days I feel a sense of accomplishment from what I do	-,200	-,528	-,211	-,230
There are lots of things I feel I am good at		-,493		
I feel that I am free to decide how to live my life		-,344		-,315
To what extent do you feel that you have a sense of direction in your life	,300	,339	,312	,332
To what extent do you make time to do things you really want to do	,234			,454
When things go wrong in my life it generally takes me a long time to get back to normal			,623	
How difficult or easy do you find it to deal with important problems that come up in your life?			,475	,296
In my daily life I get a very little chance to show how capable I am			,368	
How much of the time during the past week you had lot of energy		,270	,326	
To what extent you learn new things in life	,255	,308	,322	
Initial eigenvalues	4,98	1,27	1,03	0,92
% of variance	35,6	9,1	7,4	6,6

Note: factor values over .40 appear in bold

First, on the social wellbeing (Table 1a) the first three survey items form a comprehensive indicator for *social trust* which is symmetrical with general trust measure in the literature of social capital (Knack & Keefer, 1997; Putnam, 2000; Sørensen, 2014). The second component seems to represent subjective form of intragroup *reciprocity* which is also widely discussed in the social capital literature (Storper, 2013). Third component is labeled as *local recognition* as it seems to be reflecting the respect and relatedness experienced among the people in one's local area. The fourth component reflects quantified form of social capital related to intergroup connections and thin ties. It combines the relative frequency of

social contacts and sense of social support derived from them. This component is thereby labelled as *'social contact and support'*.

On personal wellbeing (Table 1b) the first component *'engagement'* forms a rather solid concept with strong factor loadings. According the ESS module description this concepts assesses the extent of feeling engaged in everyday life through the feelings of enthusiasm, interest and absorbedness in day-to-day life (Huppert et al., 2014). The second component combines survey items measuring individual sense of *'competence and meaning'*. In the *eudaimonic* tradition the experiences of general sense of competence, successful achievement and meaning are key elements for all psychological wellbeing enabling positive and healthy human functioning. The third component, *'Resilience'*, describes individual capability for stress resistance and ability to bounce back from disturbing experiences. It seems plausible that individual ability to sustain adaptive functioning under difficult circumstances and to respond to challenges in external conditions leads to good human functioning but may also work as a predictor for economic activity in individual and aggregate levels.

Next we present the descriptive statistics for the components described above together with the dependent variable, GDP and the objective indicators of population density, objective human capital (share of tertiary educated), R&D expenditure and the European Quality of Governance EQI index.

Table 2. Descriptive statistics

	Mean	Std. Deviation	Minimum	Maximum	N
Regional GDP	22941	14295	2600	72600	289
GDP log	4,2513	0,342	3,41	4,86	289
Engagement	-,03	,278	-1,051	,706	289
Competence and meaning	,01	,226	-1,026	,644	289
Resilience	,02	,232	-,750	,521	289
Autonomy and control	,00	,161	-,530	,385	289
Social trust	,00	,421	-1,584	,792	289
Reciprocity	,05	,234	-,787	,671	289
Local recognition	,02	,224	-,576	,778	289
Social contact and support	,02	,281	-,734	,614	289
Population density	252,5	679,7	1	7131	289
Tertiary educated (% of total population)	26,53	8,65	9,9	55,7	272
RD expenditure	448,8	490,2	4	2962	282
EQI index	,170	1,021	-2,48	1,90	282
Employment rate	64,2	7,7	39,4	81,8	272
Valid N (listwise)					258

The following figures show a scatter plot matrixes of all the components of subjective human capital (Figure 1a) and social capital (Figure 2a) together with the dependent variable in this study, the log of regional GDP.

Scatter plot matrix

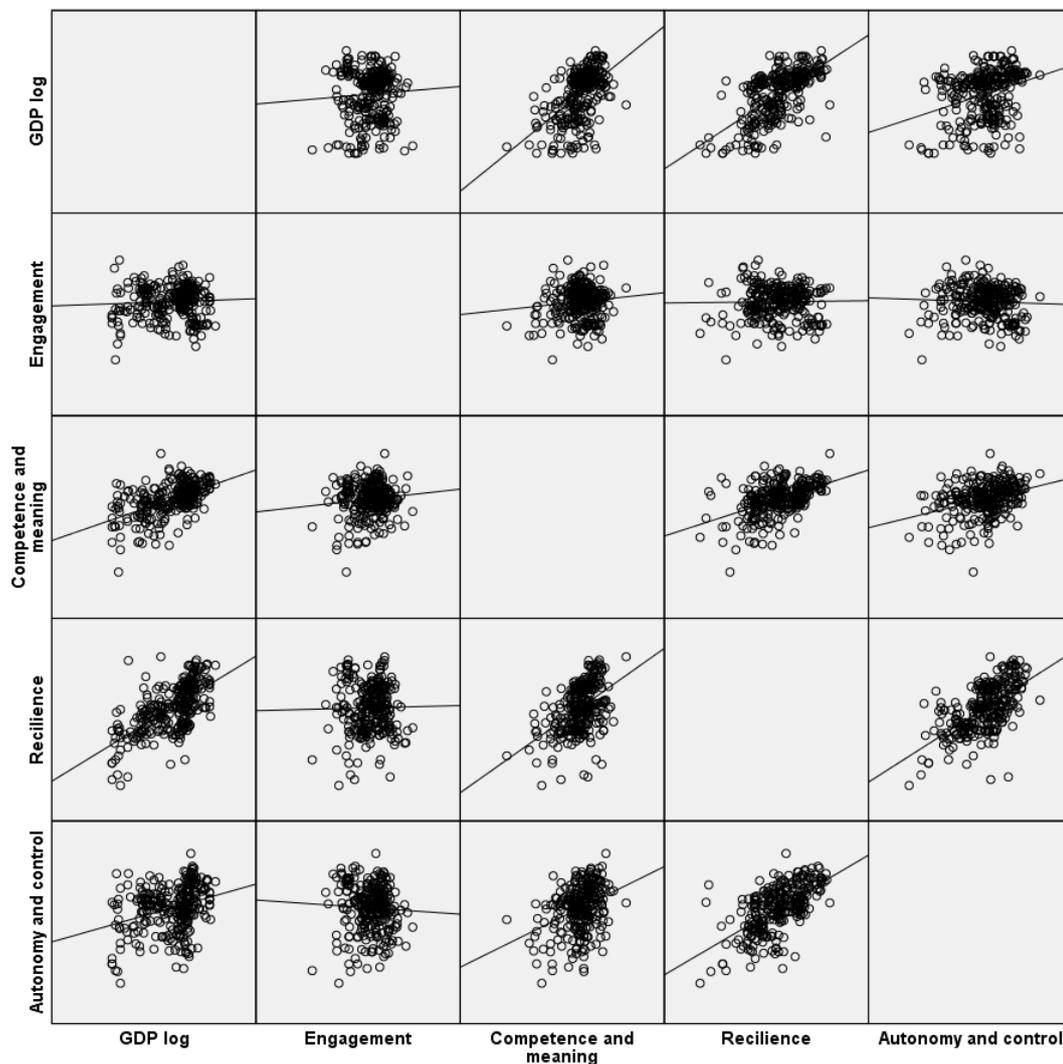


Figure 1a. Scatter-plot matrix of the regional GDP (log) and four components of personal wellbeing.

Main interest here is on the first row showing the correlation of regional GDP log against the components of human capital. The scatterplots indicate that while there is not significant bivariate correlation between GDP and 'engagement' or GDP and 'autonomy and control' both 'competence and meaning' and 'resilience' have strong positive correlation with regional GDP (.526** with 'competence and meaning' and .637** for 'resilience').

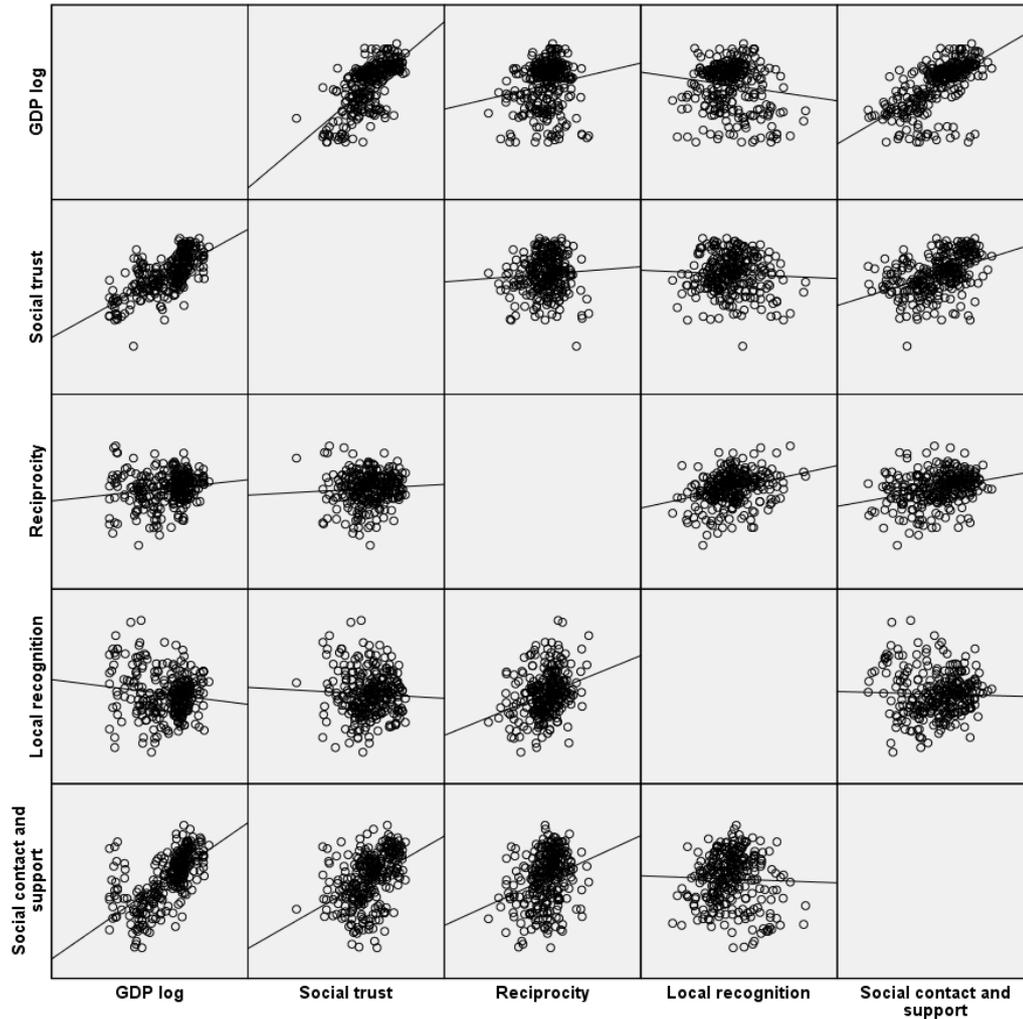


Figure 1b. Scatter-plot matrix of the regional GDP (log) and four components of social wellbeing.

Again, the main interest is on the first line showing GDP log correlation against the components of social capital. As expected the component for 'social trust' appears to have the strongest and rather linear bivariate correlation (.681 **) with the GDP log. The other variable with positive correlation (.643 **) to GDP log is the 'social contact and support' in which the scatter dot also reveals cluster of regions characterized by low GDP log but reasonably high 'social contact and support'. A closer examination reveals these regions to consist from NUTS regions in Bulgaria. This notion is interesting on its own but also calls for the controlling the spatial autocorrelation in the regression model.

The following figures 2, 3 and 4 illustrate the spatial variation of non-logged form of the dependent variable, GDP (Figure 2) and its two strongest correlates 'social trust' (Figure 3) and 'Social contact and support' (Figure 4) in 289 NUTS regions.

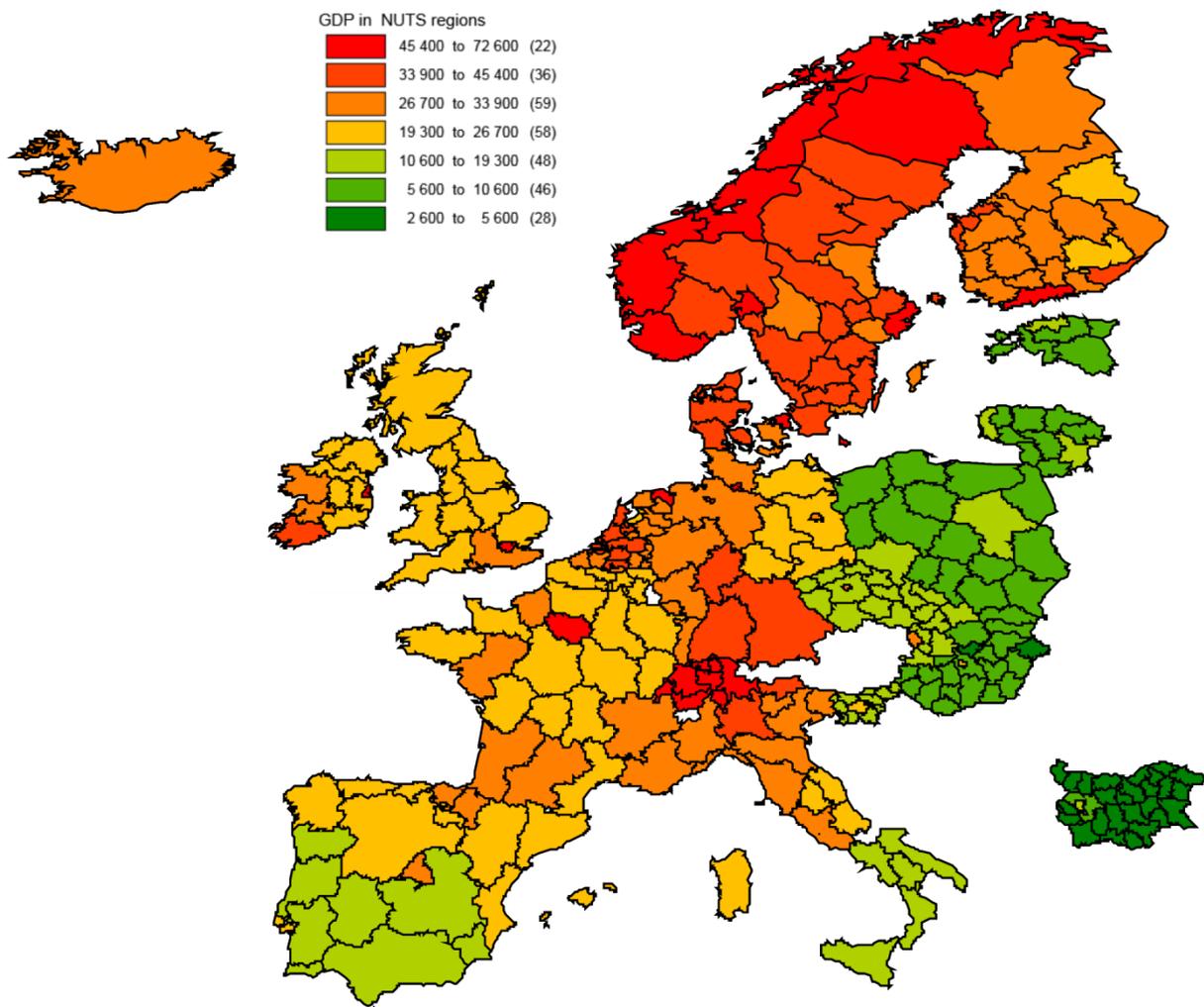


Figure 2. GDP in 289 the NUTS regions

Note 1. Based on a 'natural breaks' classification.

Note 2. Data from 2011.

The map above shows rather strong contrast between the Central Western Europe and the transition economies. What can also be seen is that the subnational variation appears stronger in Eastern European countries with sharp contrast between few capital regions and rest of the country (for example Bratislava and Sofia regions). Instead in Nordic countries the economic performance is spatially more equally distributed.

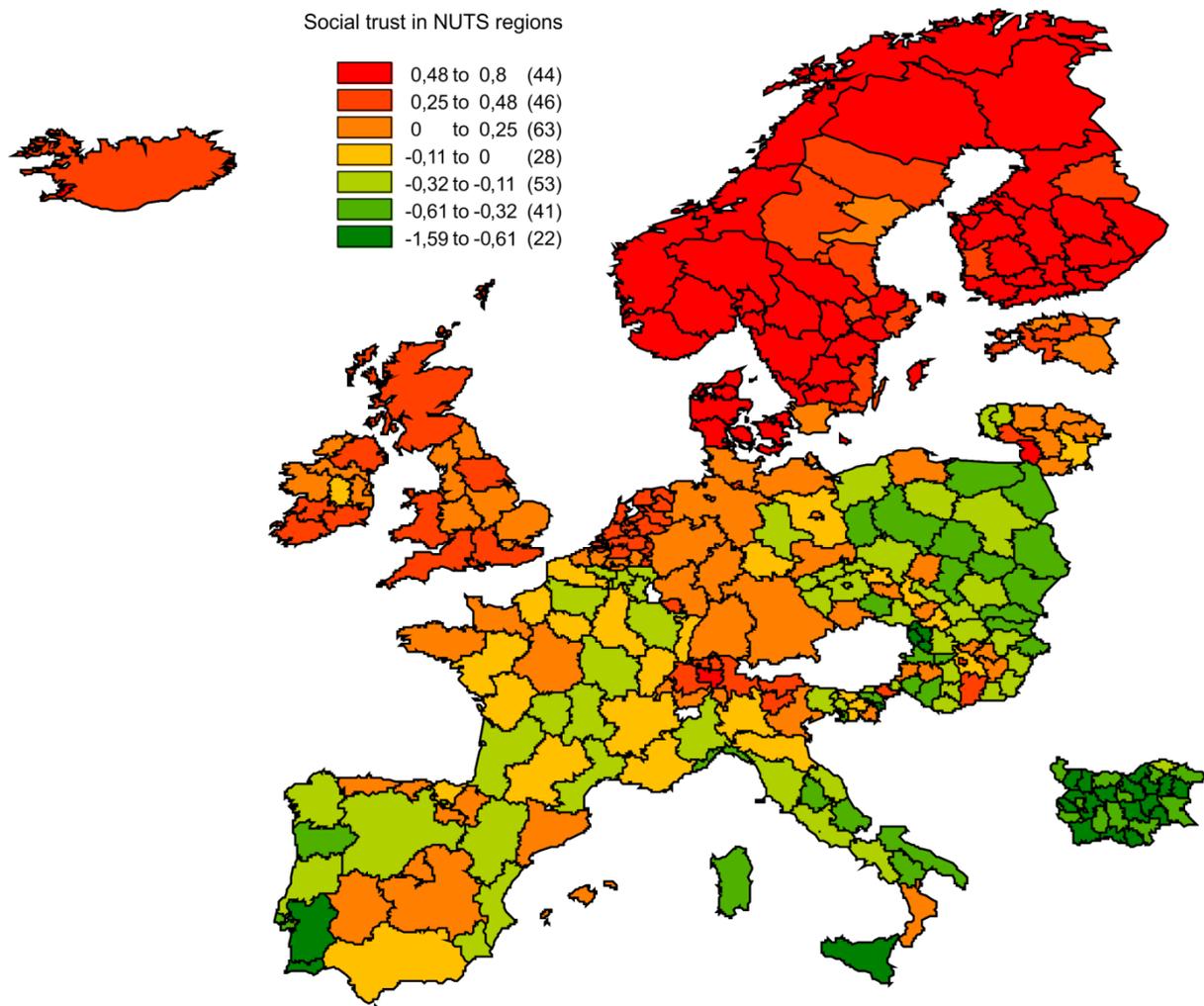


Figure 3. 'Social trust' in the 289 NUTS regions

Note. Based on a 'natural breaks' classification.

The component 'social trust' reveals stronger subnational variation within the countries than the GDP log variable. This is visible especially in the Baltic States and Poland. But what remains is the homogenous spatial pattern among the countries belonging to the Nordic welfare state regime.

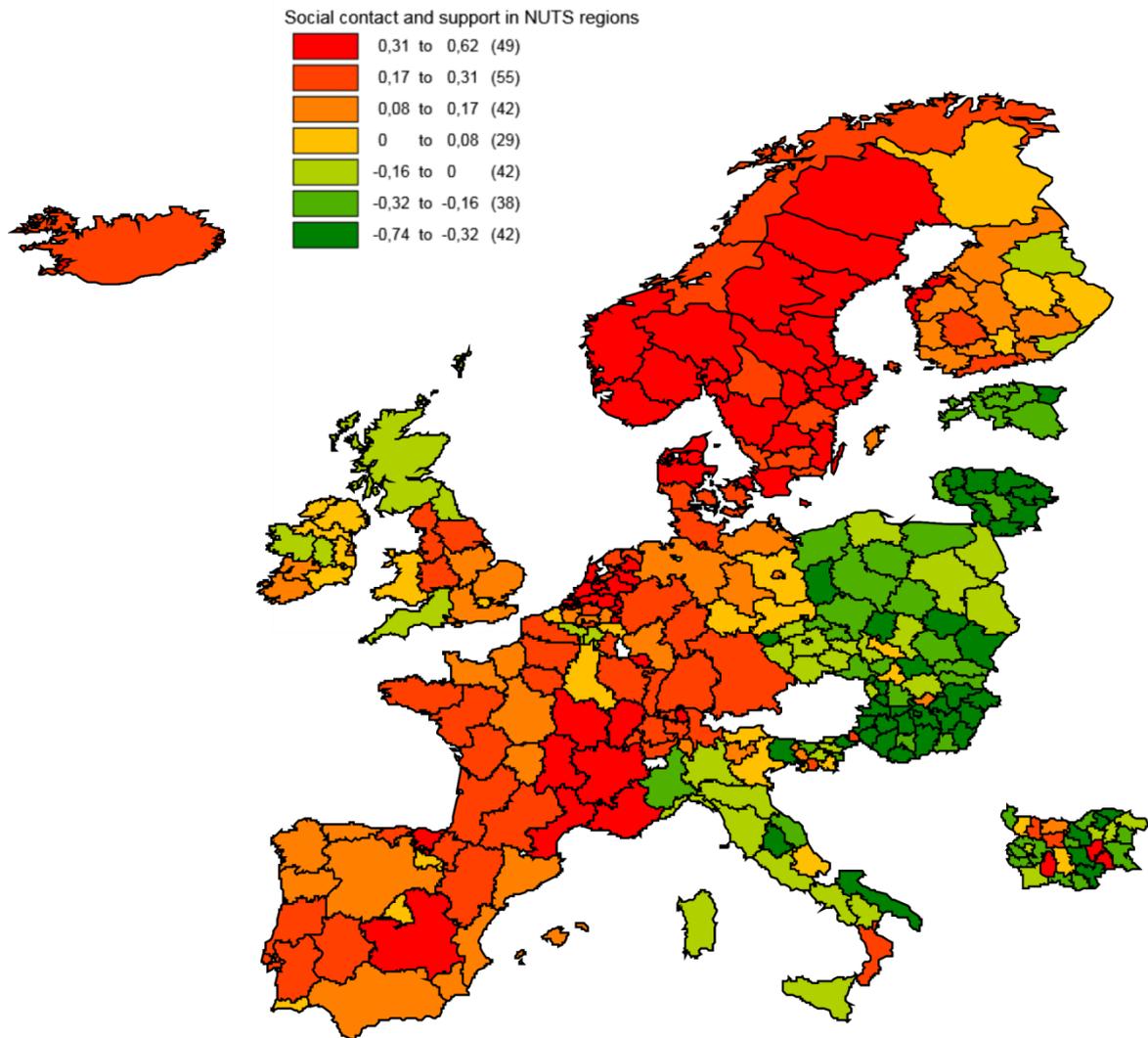


Figure 4. 'Social contact and support' in the 289 NUTS regions

Note. Based on a 'natural breaks' classification.

The final map reveals another pattern where the Central- West vs. Eastern Europe division is no longer that evident. Especially the comparison between Finland and Sweden shows difference between the nations whereas in previous maps they have been rather symmetrical. The map also confirms the observation made in the scatter dot analysis regarding the 'social contact and support' variable; in Bulgaria there seems to be significant subnational variation which is however not associated with higher regional GDP as it is in the rest of the dataset.

The final part of our empirical analysis presents a linear regression models (OLS) with regional GDP log as dependent variable and components of social and human capitals and independent variables. First column (model 1) shows the bivariate standardized coefficients, models 2 and 3 the components of social and human capital shows their effect alone, model 4

included them both in the model and final model (5) has also the objective control variables in included in the model.

Table 3. Parameter estimates for human and social capital and control variables

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	SF (6)
Constant		1.470 ***	4.238 ***	2.878 ***	2.589 ***	2.589 ***
Human capital						
<i>Engagement</i>	0.069		0.062	-0.003		
<i>Competence and meaning</i>	0.815 ***		0.274 ***	0.155 ***	0.167 ***	0.167 ***
<i>Recilience</i>	0.944 ***		0.371 ***	0.097 +		
<i>Autonomy and control</i>	0.663 ***		-0.428 ***	-0.199 **	-0.162 **	-0.162 ***
Social Capital						
<i>Social trust</i>	0.569 ***		0.334 ***	0.118 ***	0.150 ***	0.150 ***
<i>Reciprocity</i>	0.237 *		-0.047	0.014		
<i>Local recognition</i>	-0.210 *		-0.151 *	-0.037		
<i>Social contact and support</i>	0.786 ***		0.408 ***	0.221 ***	0.234 ***	0.234 ***
Control variables						
Population density (log)	0.131 ***	0.077 ***		0.078 ***	0.078 ***	0.078 ***
Tertiary education (log)	1.360 ***	-0.027		-0.203 **	-0.212 **	-0.212 ***
RD expenditure (log)	0.464 ***	0.345 ***		0.302 ***	0.323 ***	0.323 ***
Employment rate (log)	4.413 ***	1.025 ***		0.434 +	0.576 **	0.576 ***
EQI index	0.263 ***	0.051 **		0.022		
Adjusted R	0.434	0.796	0.690	0.858	0.857	0.927
N	289	289	289	289	289	289

Dependent variable: log GDP

* Statistically significant at 0.05 level; ** at 0.001 level; *** at 0.0001 level (+ at 0.1 level)

Note1: Model 1; each variable independently in the model, Model 2; Only control variables included, Model 3; Only social and human capital variables included., Model 4; All control, human and social capital variables included, Model 5 Compressed model, Model 6 Compressed model with spatial filtering procedure .

Note 2: The control variables except the EQI index in the model were included in their common base -10 logarithm form.

Note 3. The data for the human and social capital are from the year 2012, EQI index from 2010 and all the other control variables from the year 2011.

Note 4. Due to the relative small number of cases as well as non randomly distributed missing cases (for example EQI index was missing from Norway, Tertiary education from Latvia etc.) we replaced the missing values with mean. We do recognize the problematic of this method but made this decision for the above reasons.

The first column (1) indicates that five variables from the components of social and human capital appear to have positive and significant association with ($p < 0.001$) the dependent variable. At this stage also all of the control variables have a significant and positive effect. The OLS model with all the control variables included (2) explains 79.6 % of the variance of

the dependent variable, whereas both social and human capital variables (3) counted for 69.0 % alone. The full OLS model (4) with all the variables included to the model indicates that subjective variables '*social trust*', '*social contact and support*', '*competence and meaning*' and '*autonomy and control*' retain their relationship after the control variables have been included. However, the effect of '*autonomy and control*' turns into negative. The model (5) introduces a reduced OLS model with only the strongest and statistically significant variables from the previous models included.

The residuals of the reduced OLS (5) model showed significant spatial autocorrelation of 0.32, which implies that the OLS results should be interpreted with caution. The literature on spatial analysis suggests alternative approaches to approach spatial autocorrelation but there seems to be no consensus on the most appropriate method (Mauricio Bini et al., 2009). In the case of spatial autocorrelation of the residuals, one may apply Moran Eigenvector spatial filtering in order to move the autocorrelation into the model. We applied the procedure of spatial filtering as described by Bivand et al. (2008), based on the 'SpatialFiltering' procedure of the package 'spdep' in R. The model with spatial filters yields essentially similar results than the final reduced OLS model, with the exception that the standard errors are somewhat smaller. In addition to spatial autocorrelation, we checked also standard diagnostics of the reduced OLS model (5), using the 'gvlma' package available for R. On link functions and heteroscedasticity the general assumptions for OLS modelling were acceptable but the distributions of residuals suffered significantly from skewness and kurtosis.

Summary

This paper set out to explore the relationship between regional level economic performance (GDP) and the aggregate measures of subjective social and human capitals in the 289 European NUTS regions. First, the results give further validation to the previous research (Callois & Aubert, 2007; Knack & Keefer, 1997; Putnam et al., cop. 1993) indicating that general social trust is strongly associated with economic performance. This component was shown to have robust and independent association with the dependent variable in both OLS and spatial filtering models. However, adding on to the previous literature this research distinguishes another form of thin ties or intragroup relations; '*social contact and support*', which also had a positive relationship to regional GDP. This component is reflecting the relative frequency and quantity of 'bridging' social network and thin social ties. Additionally, the results of this analysis back up the arguments claiming that close intergroup affiliations, reciprocity and local recognition and belonging are not strongly associated (or might even have negative effect) to economic performance. Overall, in this analysis only the bridging social capital variables are positively related to GDP whereas the bonding ones do not have this effect.

On the subjective human capital the strongest predictor for regional GDP appears to be the aggregated sense of '*competence and meaning*'. It seems theoretically plausible that the frequency of these experiences among populations reflect the general abilities needed to function in late modern labor markets which furthermore results in aggregate economic activity. However, from the perspective of personal wellbeing, there seems to be some sort of

tradeoff in some elements of objective and subjective wellbeing; individual '*autonomy and control*' seems to be negatively correlated to economic performance.

At the end the objective control variables retained their robust positive association with regional GDP but mentioned elements in subjective form of social and human capital made a significant and independent contribution as well. It is however noteworthy that regarding the measures for informal and formal institutions; 'social trust' and 'Quality of governance index EQT', the latter lost its significance in the full model. However, as the analysis based of cross-sectional analysis we cannot say much about the causality chains between these two or their possible mutually reinforcing effect.

Discussion and policy suggestions

The idea that economic performance of nations or regions is related to well-being of their population is no more new than it seems obvious. One of the first scholars to formulate this thesis was a Swedish economist Gunnar Myrdal who suggested the circular and cumulative causation as a driver for national economies (Myrdal, 1957). In essence, the idea behind the cumulative causation suggests that investments in non-economic factors would turn into increased social and human capital and thus feedback positively as economic development.

However, the results of this study are also hoped to contribute to literature on more recent theories and discussion on regional economic development. This study offers some new insight to the instrumentalization and measuring of social and human capital. The subjective indicators used in this study are reflecting the quality of both human and social capital without retaining only to the objective quantity such as educational (human capital) or associational (social capital) attainment. Thereby, the results of this study also resonate with the recent discussion on the role of formal and informal institutions in economic development (Rodríguez-Pose, 2013). The results presented here give tentative support to bottom-up policies facilitating local capacity building through supporting the psychological and social wellbeing and positive functioning in regions.

Having said this it needs to be admitted that the limitations and deficiencies of this study are evident. First, the cross-sectional framework limits significantly the possibility for any policy suggestions as we cannot confirm the assumptions on causalities embedded in the analysis. Hence this study suffers from problems related to temporal autocorrelation of various time lag orders and time lag structures. Second, related to the previous one, this analysis suffers from insufficient data availability. The comprehensive subjective wellbeing data used in this data was included only in the 6th round ESS data from 2012 which prevents us from building any multiple equation time series models. Also the objective control variables did not often have specific enough location indicator (NUTS) in order to be included to the analysis. Thereby, the results of this study could also be understood as a call for building a longitudinal database on subjective well-being and economic indicators on subnational regional scales.

To conclude, this study has produced new more detailed information on the relationship between the objective and subjective aggregate measures of well-being and can thus inspire new interdisciplinary enquiries on this field of research.

Notes:

¹ The description of this tradition and its relation to other accounts is the empirical happiness research is presented for example in the following papers: (Huppert, 2013; Keyes, Shmotkin, & Ryff, 2002; Ryff & Singer, 2008)

² At the time this article was written the data from 2012 was not yet available. As this is a cross-sectional analysis *per se* we do not believe that the one year gap in the measures between GDP and survey data affects the analysis significantly.

³ In instances where we had the regional level indicator for the ESS survey data in NUTS 3 level but the corresponding objective data from the Eurostat (R&D expenditure, educations etc.) was only available at NUTS2 level we used the NUTS 2 data as an overlay to cover the regions lower on the hierarchy.

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