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Predicting the gross domestic product (GDP) of 289 NUTS regions in Europe with subjective indicators for human and social capital

Mikko Weckroth\textsuperscript{a*}, Teemu Kemppainen\textsuperscript{b} and Jens Fyhn Lykke Sørensen\textsuperscript{c}

\textsuperscript{a}Department of Geosciences and Geography, University of Helsinki, Helsinki, Finland; \textsuperscript{b}Department of Social Research, University of Helsinki, Helsinki, Finland; \textsuperscript{c}Danish Centre for Rural Research, University of Southern Denmark, Esbjerg, Denmark

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Most of the aggregate-level analyses of the relationship between objective and subjective measures for well-being have limited themselves to the measures of national gross domestic product (GDP) and mean life satisfaction. We develop this line of research by embedding the analysis into the context of 289 NUTS (Nomenclature des Unités Territoriales Statistiques) regions in Europe and replacing the simple life satisfaction measure with measures of active human functioning. We suggest that the measures of personal and social well-being, as they are operationalized in the 6th Round of the European Social Survey (ESS) questionnaire, can be treated as subjective indicators for social and human capital and, thereby, can be associated with the regional level GDP in cross-sectional analysis. The empirical analysis shows that the indicator for ‘social trust’ appears to have a positive and significant correlation with regional GDP. The analysis also distinguishes another form of social capital; ‘social contact and support’, reflecting the relative frequency and quantity of social support, which also shows a positive relationship with regional GDP. Concerning subjective human capital, the strongest predictor for regional GDP appears to be the aggregated sense of ‘competence and meaning’ in the regions. These effects proved robust after including the objective control variables (population density, intramural research and development (R&D) expenditure, share of tertiary-educated population and employment).

Keywords: human capital; social capital; subjective well-being; GDP; NUTS regions; informal institutions

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 unrelated. Following on from these broad statements, it can be said that ever since Richard Easterlin put out his thesis on the diminishing returns of economic growth (Easterlin, 1974), 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 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
co-variation between the objective and subjective measures of well-being. For this reason, this paper draws from the so-called eudaimonic tradition in empirical happiness studies. The field of empirical happiness studies is usually categorized according to three accounts and their related measures: (1) the life evaluations account (evaluative measures), (2) the hedonistic account (affect measures), and (3) the eudaimonic account (flourishing and functioning measures) (Kristjansson, 2010; Organisation for Economic Co-operation and Development (OECD), 2013). For some reason, however, current research on the geography of happiness, influenced heavily by so-called ‘happiness economics’, has limited itself mainly to the life evaluations account and its most commonly used measure of life satisfaction.

Through this enlargement of the conceptual toolbox at hand, the aim of this paper is to achieve a deeper and mutually beneficial integration of the economic geography and eudaimonic tradition in 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 that social well-being, as it is defined and operationalized in the well-being module of the latest 6th Round of European Social Survey (ESS), understands social well-being in terms of thick and thin social relations (Huppert, Marks, Siegrist, Vazquez, & Vitterso, 2014). Hence, social well-being overlaps significantly with the concept and measures of social capital used in economic analyses (Beugelsdijk & Van Schaik, 2005; Helliwell, 2003; Knack & Keefer, 1997; Sørensen, 2014a). Furthermore, we suggest that the other dimension of eudaimonic functioning measures in the ESS module, personal well-being, 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). Consequently, we test the predictive value of social and personal well-being measures in the 6th Round ESS data for regional economic performance while including objective ‘control’ measures, such as population density, aggregate tertiary education, research and development (R&D) expenditure and the European Quality of Government Index (EQI) as control variables in a linear regression model. In the final model we also control for the nuisance caused by the spatial autocorrelation in regional-level NUTS (Nomenclature des Unités Territoriales Statistiques) data. However, it needs to be clarified that the focus of this study is not on spatial econometrics or even on economic geography per se. Instead, it should be understood as an interdisciplinary attempt to understand economic reality from the perspective of subjective well-being research. We hope that an understanding of the variable structure of the indicators used in this cross-sectional analysis could be utilized in future research focusing on actual economic growth models.

We set off on this approach with the recognition that both macroeconomic economic performance (GDP) and aggregated life satisfaction clearly have some validity as measures for well-being and development in international comparisons (Helliwell, Layard, & Sachs, 2012). Even though their limitations are well known they have been found to be 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, Shmotkin, & Ryff, 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 acknowledged that individual life satisfaction is influenced by the 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, intercultural and international comparisons based on life satisfaction measures.

In addition to this conceptual critique, in light of the latest research the problem is increasingly an empirical one; a wide number of sub-national analyses within countries have detected a negative relationship between the dense economically productive areas and mean life satisfaction (Berry & Okulicz-Kozaryn, 2009, 2011; Easterlin, Angelescu, & Zweig, 2011; Glaeser, Gottlieb, & Ziv, 2014; Sørensen, 2014b). 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 routines (Vitterso, 2004; Vitterso, Soholt, Hetland, 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. Consequently, this study focuses on the subjective well-being measures that emphasize positive and active functioning of individuals rather than passive life evaluations in order to predict regional GDP in cross-sectional analysis. Both dimensions in the comprehensive well-being module of the 6th Round ESS, social and personal well-being, could be regarded as part of the eudaimonic account in empirical happiness studies, but especially the questionnaire on personal well-being which emphasizes active and positive human functioning. The theoretical background of this module draws heavily on Ryan and Deci’s Self Determination Theory (SDT) (Ryan & Deci, 2001), which is concerned with supporting the natural or intrinsic tendencies of individuals. These tendencies would motivate individuals to behave in an effective way while also responding to basic psychological needs. Building on this, from the economic perspective this study tries to connect the eudaimonic account in empirical happiness studies to endogenous growth theory in economics, as we assume that that positive human functioning might work at the aggregate level as a contributor to economic activity.

This article is structured as follows. In the opening section 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 well-being and their assumed relationship and causality with GDP. The final part of the opening section aims to relate the components of social well-being, as operationalized in the ESS data, to the concept of social capital and the corresponding items of personal well-being to human capital.

The results section begins with factor analyses run for all the items in social and personal well-being modules and continues with the descriptive statistics for the derived components as well as the ‘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 section 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 regression models treating logged GDP as a dependent variable and introducing stepwise the social and human capital variables and objective control variables to the model. The final section closes with discussion, policy implications and suggestions for future research.

**Objective and subjective measures for well-being 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 in gathering and analysing large
databases of self-reported well-being among individuals themselves and the simultaneous interest from the public sector in the possible policy suggestions drawn from these measurements (Office for National Statistics, 2014). Probably the most influential indicator of this trend is the Stiglitz report published in 2009 (Stiglitz, Sen, & Fitoussi, 2009). The report was written by several Nobel laureates in economics who defined GDP as an insufficient and misleading measure for societal progress in the modern world. Furthermore, the report suggested that the time was ripe for national measurement systems to shift their emphasis from measuring economic production to measuring people’s well-being.

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 given to the direction of causality or reasoning on the cultural and institutional mechanisms operating between the two worlds of well-being (subjective and objective). In other words, what do GDP and life satisfaction actually measure and how might they be linked to each other theoretically? In this section we will make a brief enquiry into these questions and also offer a short overview of the assumed causalities between the two measures.

The first of these measures, gross domestic product (GDP), 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 into national accounting. As GDP was not intended to be used as a measure for the overall development of society, it is natural that it has received a fair share of critique from the very beginning (Kuznets, 1941). This critique can be categorized according to 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 a 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, and (6) it implicitly assumes an individual or household consumption as a comprehensive indicator for well-being.

As all of the above can be accepted as a valid critique, in this study we include GDP in the analysis as it is, that is, a rough measure for economic activity. What remains is the perennial question of how it relates to subjective well-being both conceptually and empirically. Even though usually not explicitly discussed in the empirical analyses in ‘happiness economics’, the assumption is that GDP increases well-being (life satisfaction) as it enables populations (consumers) to have access to a wider variety of products and services. Consequently, the linkage between GDP and life satisfaction is based mostly on hedonistic assumptions on human well-being. A simple life satisfaction measure also fits most easily to assumptions embedded in orthodox economic theory, which treats individuals as rational agents maximizing their well-being (life satisfaction) which economists subsequently try to model with various utility functions.

However, as mentioned above, the life satisfaction measure is not the only one used in the study of individual expressions on well-being. The field of subjective well-being research is often categorized into three accounts and their related measures: (1) the life evaluations account (evaluative measures), (2) hedonistic account (affect measures), and (3) the eudaimonic account (flourishing and functioning measures) (Kristjansson, 2010;
OECD, 2013). The first, life evaluations, account is concerned only with overall life satisfaction. Thereby, it is formulated into a single-item question such as: ‘Taking all together, how satisfied you currently are with your life as a whole these days?’ scaling from 0 to 10. Because of its apparent simplicity and cost-efficiency as a survey item, life satisfaction is the most frequently used measure of subjective well-being in social sciences. The second, hedonistic, account defines happiness and well-being in terms of pleasure attainment, pain avoidance and overall satisfaction with life. Although there are different self-reporting measurements of hedonistic accounts, the threefold structure consisting from negative feelings, positive feelings and overall satisfactions is common for all.

Critiques of the life evaluations account argue that they are inevitably relative and sensitive to both cultural context and personal traits when determining the gap between the expected and the experienced reality (Huppert et al., 2014; Ryan & Deci, 2001). There have also been concerns about how well hedonistic and life satisfaction measures capture psychological well-being and the human potential for optimal living (Ryff & Singer, 2008). Thereby, in contrast to the previous two, the eudaimonic account promotes the notion that happiness can and should be measured objectively. Hence, it offers ‘objective lists accounts’ (see also Nussbaum & Sen, 1993; Sen, 2009) when evaluating happiness, drawing from the classical writings of Aristotle and his Nicomachean Ethics (Aristotle, 2011). Accordingly, eudaimonic well-being focuses on meaning and self-realization and defines well-being 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 concerns measuring the economic activity in a given place, at a given time, it would seem reasonable to suggest that the counterpart should also focus on the active side in subjective well-being rather than on passive life satisfaction. This study argues that the eudaimonic tradition, promoting competence, autonomy, agency and resilience, and theories of human capital and endogenous growth have grown together without much knowledge of each other. In fact, the concepts and measures of social and personal well-being in the 6th Round ESS data converge significantly with the concepts of social and human capital. Also the assumed direction of causality would flow from well-being to economic activity as social and human capitals are often used as ‘input’ variables in the endogenous growth theory (Romer, 1990). In this cross-sectional analysis we cannot confirm any assumptions on the direction of causality, but theoretically this kind of framework would differ from the conventional logic that higher GDP leads to higher life satisfaction in a form of material affluence. In the next section we offer a more detailed discussion for this kind of framework by relating social well-being to social capital and personal well-being to human capital which could work as contributors for economic activity.

Social well-being 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 the 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 have also been 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 to Putnam et al.’s analysis concerning the causes behind the north-south divide in the Italian economy (Putnam, Leonardi, & Nanetti, 1993). Putnam et al.’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 presumably has a positive effect on 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 critiques concerning 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 the ‘degree of general trust’ (bridging) and the ‘density of associational activity’ (bonding). Another way to formulate the two forms of social capital is to label them as thick and thin social networks 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 et al.’s thesis was made by Knack and Keefer (1997), who tested the effect of general trust and civic norms on national GDP with the World Values Survey data covering a sample of 29 countries. They found that general trust (bridging social capital) has a statistically significant positive effect on economic growth, whereas membership in formal groups (bonding social capital) is not associated with economic performance. Later on Beugelsdijk and Van Schaik returned to sub-national scale analysis with their study on differences in 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 a 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 also supported the separation of two types of social capital, bridging and bonding, which he defined as inter- and intra-group 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 by both high bridging and bonding social capital are gaining through a mixture of both autonomy and responsibility, as well as through a good balance of voice and agency. These elements facilitate confidence, conflict resolution and sustainable distributitional tradeoffs, which all end up nurturing growth in economic activity. Storper’s argument is supported by empirical analysis by Callois and Aubert (2007), who found that both bridging and bonding social capital have a positive effect on economic development. 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 the 6th Round ESS questionnaire sees social well-being as composed of subjective measures of social capital, including both bonding (‘thick ties’ to individuals one knows well) and bridging capital (‘thin ties’ to people
and organizations with whom one comes into contact). The ESS module also differentiates various forms of social well-being (capital) such as reciprocity of social change, generalized social trust and participation in civic organizations. This enables us to test many of the theses presented above by comparing their aggregate values with corresponding levels of regional economic performance.

**Personal well-being 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 justified in terms of 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 the level of educational attainment. Thereby, the indicator for 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 well-being in the ESS well-being module represent the subjective dimension of the concept of general human capital. Evaluations of the individuals themselves can hence be seen as a (primary) measure of actualized human capital rather than relying only on objective (secondary) measures such as educational attainment. In the ESS well-being module, personal well-being is composed of the following sub-concepts: ‘resilience’, ‘meaning and purpose’, ‘sense of autonomy and control’, ‘engagement’, ‘sense of competence’ and ‘experienced vitality’. At first glance there are several common concepts familiar to economics and some which overlap 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 the ESS module the term ‘competence’ refers to a sense of general capability (e.g. managing life well), as well as cognitive capability (the 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 asset and have a positive effect on a nation’s or a region’s ability to produce goods and services. Another familiar term is ‘resilience’, which has been a topical concept in economic geography, referring to the ability of regions or cities to adapt and recover from economic (usually external) shocks. In the ESS well-being module the concept of ‘resilience’ refers to a rather similar entity but focuses on individuals themselves and links the concept to subjective well-being. Again, this can be treated as a collective good in an aggregate-level analysis and thus work as a driver behind economic performance.

In this study we have been interested to test how much these components of subjective well-being, understood as a subjective form of human and social capital, can explain the variance of regional GDP in cross-sectional data from 289 NUTS regions.
Data and methodology

Data on regional economic performance (GDP) are derived from the EUROSTAT database (EUROSTAT, 2014) and are from 2011. GDP is adjusted to current market prices and expressed as euros per inhabitant. In the regression analysis GDP is transformed into a logarithmic form in order to match the 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 derived from EUROSTAT’s regional statistics webpage. The European Quality of Government Index (EQI) data were collected by Charron, Dijkstra, and Lapuente (2014) and were downloaded from the webpages of the author, Nicholas Charron.

The data for subjective well-being are from the 6th Round European Social Survey (ESS) collected during 2012. The ESS is an academically driven cross-national survey conducted every two years across Europe, since 2001. It is based on strict random probability methods at every stage and the data are representative of all persons aged 15 years and over. Each round of the ESS has a national sample size of 1500 or 800 in countries with ESS populations of less than 2 million after discounting for design effects in the ESS.

The whole data set in the 6th Round ESS data contained 54 673 individual responses from 29 countries. For this study we confined the analysis to include only the countries that used some level of NUTS nomenclature as a sub-national level location indicator. Thus, 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 regions. Further on, we excluded ‘islands’ (regions without neighbours) in order to match the requirements of the spatial filtering procedure. At the end we were left with a total of 289 either level 2 or 3 NUTS regions.

Results

We begin this section with an exploratory factor analysis run for the 28 survey items included in the social and personal well-being questionnaire in the 6th Round ESS data. The factor analysis was run separately for both dimensions of the functioning measures, namely social and personal well-being. Although there is an obvious overlap between the two, social well-being refers to interpersonal and societal-level experiences, whereas personal well-being 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 a KMO value of 0.789 for the social well-being items and 0.905 for personal well-being. On social well-being (Table 1a), the scree plots and Kaiser’s criterion for eigenvalues (four components over 1) suggested four components which were retained in the final analysis. On personal well-being (Table 1b), we ended up also with four components even though the fourth component had an eigenvalue below 1 (0.92) but it was decided to include it on theoretical grounds as the resulting four components refer to more coherent concepts than three components.

First, for social well-being (Table 1a) the first three survey items form a comprehensive indicator of ‘social trust’ which is symmetrical with general trust measures in the literature of social capital (Knack & Keefer, 1997; Putnam, 2000; Sorensen, 2014a).
The second component seems to represent the subjective form of intra-group ‘reciprocity’ which is also widely discussed in the social capital literature (Storper, 2013). The third component is labelled ‘local recognition’ as it seems to reflect the respect and relatedness experienced among people in one’s local area. The fourth component reflects the quantified form of social capital related to intergroup connections and social support. It combines the relative frequency of social contacts and the sense of social support derived from them. This component is therefore labelled ‘social contact and support’.

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

| Item                                                                 | Rotated factor loadings |
|----------------------------------------------------------------------|-------------------------|
| Most people can be trusted, or you can’t be too careful in dealing with people | 0.757                   |
| Most people would try to take advantage of you if they got a chance, or they would try to be fair | 0.754                   |
| Most of the time people try to be helpful or they are mostly looking out for themselves | 0.656                   |
| To what extent do you receive help and support from people you are close to when you need it? | 0.753                   |
| To what extent do you provide help and support to people you are close to when they need it? | 0.662                   |
| To what extent do you feel appreciated by people you are close to? | 0.563                   |
| How much of the time during the past week did you feel lonely? | -0.281 -0.224           |
| To what extent do you feel that people in your local area help one another? | 0.839                   |
| To what extent do you feel close to the people in the local area? | -0.491                  |
| To what extent do you feel people treat you with respect? | 0.343 0.479            |
| Compared to other people of your age, how often would you say you take part in social activities? | 0.613                   |
| How often do you socially meet with friends, relatives or colleagues? | 0.579                   |
| How many people, if any, are there with whom you can discuss intimate and personal matters? | 0.434                   |
| In the past 12 months, how often did you get involved in work for voluntary or charitable organizations? | -0.302                  |
| Initial eigenvalues | 3.56 1.73 1.41 1.21 |
| Percentage of variance | 25.4 12.4 10.1 8.6 |

Note: Factor values over .40 appear in bold.
On personal well-being (Table 1b) the first component ‘engagement’ forms a rather solid concept with strong factor loadings. According to the ESS module description this concept 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 an individual sense of ‘competence and meaning’. In the eudaimonic tradition the experiences of a general sense of competence, successful achievement and meaning are key elements for all psychological well-being enabling positive and healthy human functioning. The third component, ‘resilience’, describes the individual capability for stress resistance and the ability to bounce back from disturbing experiences. It seems plausible that the individual ability

| Item                                                                 | Engagement | Competence and meaning | Resilience | Autonomy and control |
|----------------------------------------------------------------------|------------|------------------------|------------|----------------------|
| How much of the time would you generally say you are absorbed in what you are doing? | .858       | .201                   |            |                      |
| How much of the time would you generally say you are enthusiastic about what you are doing? | .765       | .260                   | .230       |                      |
| How much of the time would you generally say you are interested 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                 |
| In my daily life I get very little chance to show how capable I am   |            |                        | .368       |                      |
| How much of the time during the past week did you have a 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
Percentage of variance 35.6 9.1 7.4 6.6

Note: Factor values over .40 appear in bold.
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 on the individual and aggregate levels.

In Table 2 we present the descriptive statistics for the components described above, the dependent variable, GDP, and the objective indicators of population density, objective human capital (share of tertiary educated), R&D expenditure and the EQI index.

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

In Figure 1a, the main interest is on the first row, showing the correlation of the regional GDP log against the components of human capital. The scatterplots indicate that while there is not a significant bivariate correlation between GDP and ‘engagement’ or GDP and ‘autonomy and control’, both ‘competence and meaning’ and ‘resilience’ have a strong positive correlation with regional GDP (.526 with ‘competence and meaning’ and .637 for ‘resilience’).

In Figure 1b, the main interest is again on the first line, showing the GDP log correlation against the components of social capital. As expected, the component for ‘social trust’ appears to have the strongest and a rather linear bivariate correlation (.681) with the GDP log. The other variable with a positive correlation (.643) to the GDP log is ‘social contact and support’ in which the scatter dots also reveal a cluster of regions characterized by a low GDP log but reasonably high ‘social contact and support’. A closer examination reveals that these regions are NUTS regions in Bulgaria. This notion is interesting on its own but also calls for the spatial autocorrelation in the regression model to be controlled.

Figures 2–4 illustrate the spatial variation of the 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 shows a rather strong contrast between Central Western Europe and the transition economies. What can also be seen is that sub-national variation appears

| Table 2. Descriptive statistics. |
|----------------------------------|
|                                | Mean   | SD     | Minimum | Maximum | N     |
|----------------------------------|--------|--------|---------|---------|-------|
| Regional gross domestic product (GDP) | 22.941 | 14.295 | 2600    | 72,600  | 289   |
| GDP log                          | 4.2513 | 0.342  | 3.41    | 4.86    | 289   |
| Engagement                      | −0.03  | 0.278  | −1.051  | 0.706   | 289   |
| Competence and meaning          | 0.01   | 0.226  | −1.026  | 0.644   | 289   |
| Resilience                      | 0.02   | 0.232  | −0.750  | 0.521   | 289   |
| Autonomy and control            | 0.00   | 0.161  | −0.530  | 0.385   | 289   |
| Social trust                    | 0.00   | 0.421  | −1.584  | 0.792   | 289   |
| Reciprocity                     | 0.05   | 0.234  | −0.787  | 0.671   | 289   |
| Local recognition               | 0.02   | 0.224  | −0.576  | 0.778   | 289   |
| Social contact and support      | 0.02   | 0.281  | −0.734  | 0.614   | 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                       | 1.70   | 1.021  | −2.48   | 1.90    | 282   |
| Employment rate                 | 64.2   | 7.7    | 39.4    | 81.8    | 272   |
| Valid N (list-wise)             |        |        |         |         | 258   |
stronger in Eastern European countries with a sharp contrast between a few capital regions and the rest of the country (e.g. the Bratislava and Sofia regions). By contrast, in the Nordic countries the economic performance is spatially more equally distributed.

In Figure 3, the component ‘social trust’ reveals stronger sub-national 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.

The final map (Figure 4) reveals another pattern where the Central–West versus Eastern Europe division is no longer that evident. Especially the comparison between Finland and Sweden shows a difference between the nations, whereas in the 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 sub-national variation which is, however, not associated with as high a regional GDP as it is in the rest of the data set.
The final part of our empirical analysis (Table 3) presents a linear regression model (ordinary least squares – OLS) with a regional GDP log as a dependent variable and components of social and human capitals as independent variables.

The first column (1) indicates that five variables from the components of social and human capital appear to have a positive and significant association with \( (p < 0.001) \) the dependent variable. At this stage all the control variables also 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 in the model indicates that the 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 a negative. Model (5) introduces a reduced OLS model with only the strongest and statistically significant variables from the previous models included.

Figure 1b. Scatter-plot matrix of the regional gross domestic product (GDP) (log) and four components of social well-being.
The residuals of the reduced OLS (5) model showed a 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 to the final reduced OLS model, with the exception that the standard errors are somewhat smaller. In addition to spatial autocorrelation, we also checked the standard diagnostics of the reduced OLS model (5), using the ‘gvlma’ package available for R. On link functions and heteroskedasticity 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...
289 European NUTS regions. First, the results give further validation to previous research (Callois & Aubert, 2007; Knack & Keefer, 1997; Putnam et al., 1993), indicating that general social trust is strongly associated with economic performance. This component was shown to have a robust and independent association with the dependent variable in both the OLS and the spatial filtering models. However, while contributing to the previous literature this research distinguishes another form of social capital, ‘social contact and support’, which also had a positive relationship with regional GDP. This component reflects the relative frequency and quantity of social network. Additionally, the results of this analysis back up the arguments claiming that close intergroup affiliations, reciprocity, local recognition and belonging are not strongly associated with economic performance, or might even have a negative effect.

Concerning the measures of personal well-being 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 reflects the general abilities needed to function in late modern labour markets, which furthermore results in aggregate economic activity. However, from the perspective of personal well-being there seems to be some sort of trade-off in some elements of objective and subjective well-being; individual ‘autonomy and control’ seems to be negatively correlated with economic performance.
Ultimately, the objective control variables retained their robust positive association with regional GDP but the mentioned elements in the 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 the ‘Quality of Governance Index EQI’, the latter lost its significance in the full model. However, as the analysis was based on a cross-sectional analysis we cannot say much about the causality chains between these two or their possible mutually reinforcing effects.

**Discussion and policy suggestions**

The idea that the economic performance of nations or regions is related to the well-being of their population is not a new one. One of the first scholars to formulate this thesis was the Swedish economist Gunnar Myrdal, who suggested that circular and cumulative causation was a driver for national economies (Myrdal, 1957). In essence, the idea behind cumulative causation suggests that investments in non-economic factors would turn into increased social and human capital and thus provide positive feedback in the form of economic development.

Figure 4. ‘Social contact and support’ in the 289 NUTS regions. Data are based on a ‘natural breaks’ classification.
However, it is also to be hoped that the results of this study will contribute to literature on more recent theories and discussion on economic geography. This study offers some new insights concerning the instrumentalization and measuring of social and human capital. The subjective indicators used in this study reflect the quality of both human and social capital without retaining only one objective quantity such as educational (human capital) or associational (social capital) attainment. Consequently, 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 psychological and social well-being and positive functioning in regions.

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***| 2.589***|
| **Human capital**        |         |         |         |         |         |        |
| Engagement               | 0.069   | 0.062   | −0.003  |         |         |        |
| Competence and meaning   | 0.815***| 0.274***| 0.155***| 0.167***| 0.167***|        |
| Resilience               | 0.944***| 0.371***| 0.097+  |         |         |        |
| Autonomy and control     | 0.662***| −0.428***| −0.199**| −0.162**| −0.162***|        |
| **Social capital**       |         |         |         |         |         |        |
| Social trust             | 0.569***| 0.334***| 0.118***| 0.150***| 0.150***|        |
| Reciprocity              | 0.237*  | −0.047  | 0.014   |         |         |        |
| Local recognition        | −0.210* | −0.151* | −0.037  |         |         |        |
| Social contact and support| 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-squared       | 0.434   | 0.796   | 0.690   | 0.858   | 0.857   | 0.927  |
| N                        | 289     | 289     | 289     | 289     | 289     | 289    |

Notes: Dependent variable: log GDP.
*Statistically significant at 0.05 level; **at 0.001 level; ***at 0.0001 level (+ at 0.1 level).
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.
The control variables except for the EQI index in the model were included in their common base −10 logarithm form.
Data for the human and social capital are from 2012, the EQI index is from 2010, and all the other control variables are from 2011.
Due to the relative small number of cases as well as non-randomly distributed missing cases (e.g. the EQI index was missing from Norway, tertiary education from Latvia etc.), we replaced the missing values with the mean. We recognize problems with this method but made this decision for the above reasons.
This study is, of course, subject to some limitations which can, however, be considered areas for future research. First, the cross-sectional framework significantly limits 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 the temporal autocorrelation of various time lag orders and time lag structures. Second, and related to the previous point, this analysis suffers from insufficient data availability. The comprehensive subjective well-being data used in this data were included only in the 6th Round ESS data from 2012, which prevents us from building any multiple equation time-series models. Also, some alternative control variables did not have a specific enough location indicator (NUTS) in order to be included in the analysis. Thus, the results of this study could also be understood as a call to build a longitudinal databases on both subjective well-being and economic indicators on sub-national regional scales.

The data set used in this study contains information and variables which would deserve further exploration. For example, the relationship between the formal (EQI index in this study) and informal (social capital) institutions should be further examined. Another issue is that Bulgaria appears as an anomaly in this study regarding the relationship between ‘social contact and support’ and regional GDP. This analysis was unable to explain why higher levels of ‘social contact and support’ were not associated with an increase in the GDP in the case of Bulgaria as it was in the overall data. Adding neighbouring countries to the data set would allow one to examine whether this is a country-specific effect or something related to the overall economic structure of the region.

To conclude, this study has produced novel and versatile information on the relationship between the objective and subjective measures of well-being. It has demonstrated that utilizing the measures in the eudaimonic tradition in empirical happiness studies could reveal a much more detailed and complex relationship between experienced and economic well-being than earlier studies focusing only on a simple measure of life satisfaction. It is thereby hoped that this study will inspire new interdisciplinary enquiries in this highly topical field of research.

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No potential conflict of interest was reported by the authors.

Notes
1. At the time of writing, the data from 2012 were 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.
2. In instances where we had the regional level indicator for the ESS survey data at the NUTS-3 level but the corresponding objective data from the EUROSTAT (R&D expenditure, educations etc.) were only available at the NUTS-2 level, we used the NUTS-2 data as an overlay to cover the regions lower on the hierarchy.
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