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Measuring Wellbeing: Individual Based Approach

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Abstract

Output based measures of economic development, such as GDP and GNI per capita, measure only one relatively narrow aspect of wellbeing: value of goods and services produced or consumed over a given period. This has a number of well-known shortcomings. We propose an alternative measure based on objective individual-level determinants of wellbeing. We proceed in two steps. First, we identify factors that are associated with individual-level happiness. In this way, we obtain a happiness production function, relating individual happiness to a broad range of objectively measurable individual, regional and national determinants. Then, we use the resulting relation to construct an indicator of 'predicted happiness'. The resulting indicator is closely correlated with the actual happiness but can be decomposed into the contributions of the various determinants. Furthermore, although happiness is a highly subjective and abstract concept, our indicator is constructed entirely based on objective and measurable factors.
Keywords: Happiness; Life satisfaction; Wellbeing.
JEL Codes: I31; D63; J18; O57.

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1 Introduction

Since the seminal study by Kuznets (1934), the gross domestic/national product (GDP/GNP) per person has been the preferred and most commonly used indicator for measuring economic development and national wellbeing. However, it was never intended as such (Costanza et al., 2009), and its use as a measure of welfare has received much criticism. By measuring the market-value of economic activities, GDP ignores natural, social, and human capital and fails to measure key aspects of quality of life (Costanza et al., 2009; Van den Bergh, 2007). In particular, GDP only imperfectly accounts for the size of the informal economy, does not include the value of household production, does not reflect the improvements in quality of products (unless these are reflected in rising prices), and includes inefficient output (e.g. prisons and security guards) and output associated with sizeable negative externalities (Gundacker, 2016).

A number of alternative indices have been proposed to complement or replace GDP per capita in its role of measure of wellbeing. Yang (2014) mentions basic characteristics of 101 composite measures of human progress and wellbeing. Among the best known among them are the Human Development Index (HDI), Happy Planet Index (HPI), Genuine Progress Indicator (GPI), Weighted Index of Social Progress (WISP), Measure of Domestic Progress (MDP), and Index of Economic Well-being (IEW). Boarini et al. (2006) distinguish between monetary, non-monetary, and pseudo-monetary indices of wellbeing. They highlight the possibility to measure wellbeing using subjective measures of happiness and life satisfaction. Such subjective measures are based on surveys that ask people about their satisfaction with life and their happiness. These surveys also contain wide range of information about respondents, including many sociodemographic and socioeconomic factors, which allows an analysis of determinants of wellbeing. According to Frey et al. (2009), subjective wellbeing is an adequate and valid approximation for individually experienced welfare and reported data about wellbeing can be used to assess individuals' preferences for public goods or externalities. Frey and Stutzer (2002) propose also the use of happiness studies in economic policy decision making. Fleurbaey (2008) and Van den Bergh (2007) consider measurement of individual wellbeing to be a promising alternative to GDP.

Most of the recent studies that use subjective wellbeing data focus on individual characteristics that affect happiness: Veenhoven (2016) surveys the results of about 2000 studies and lists hundreds of factors that correlate with happiness. Many studies similarly consider factors at the regional and/or national level. Happiness was found to be affected by inflation and unemployment (Di Tella et al., 2001; Alesina et al., 2004; Wolfers, 2003; Clark and Oswald, 1994), air pollution (Welsch, 2002; Luechinger, 2009; Cuñado and de Gracia, 2013), income equality (Alesina et al., 2004; Graham and Felton, 2006; Fahey and Smyth, 2004; Haller and Hadler, 2006; Verme, 2011), democracy (Frey and Stutzer, 2000), corruption (Tavits, 2008), life expectancy (Heukamp and Arino, 2011; Ovaska and Takashima, 2006), government expenditures (Ott, 2010), terrorism (Frey et al., 2009), to name just some of the most prominent results.

Despite the fact that GDP is used as a measure of welfare, its role as a determinant of happiness is not clear. The discussion about the effect of GDP or GNP per capita on happiness started with Easterlin (1974), who points out that increases in GNP in the United States between 1946-1970 were not systematically accompanied by greater happiness. This result came to be known as the Easterlin paradox. However, Hagerty and Veenhoven (2003) come to a different conclusion. According to them, increases in GDP per capita do lead to increases in happiness. Stevenson and Wolfers (2008), likewise, find a positive relationship between GDP per capita and wellbeing across countries and also within European Union and Japan, but they cannot find this relationship for the USA.

All of these findings support the efforts to develop a more comprehensive indicator for measuring wellbeing at the regional and national level that would include relevant factors beyond GDP. In this paper, we propose an alternative measure based on objective individual-level determinants of wellbeing. We proceed in two stages. First, we identify objective factors that are associated with individual-level happiness. In this, we combine individual, regional and national factors, which together form a 'production function of happiness'. Then, we use these results to construct a

measure of 'predicted wellbeing'. This measure has the advantage that we can directly identify which factors contribute positively or negatively to individual or regional happiness. Similarly, the estimated functional form can be used to evaluate the likely outcomes of policy interventions for the purposes of impact analysis. Last but not least, since our production function of happiness contains only objectively measurable variables, it is relatively straightforward to use it to construct the predicted-happiness indicator for any level of regional aggregation for which the required data are available.

2 Data and methodology

The objective of this paper is to analyze, and construct a new measure of, wellbeing at the level of European regions. To this effect, our source of data on subjective wellbeing is the European Social Survey (ESS) database. The ESS has been conducted across Europe every two years since 2002 to 2014. Data from more than 280,000 respondents surveyed during the seven rounds conducted during this period are currently available. The question of interest for us is the following: "Taking all things together, how happy would you say you are?" The scale of answers is from 0 (extremely unhappy) to 10 (extremely happy). We use the answers to this question as a measure of subjective happiness of respondents.

In the first instance, we consider individual variables that influence happiness. The ESS contains a host of information about the respondents. Based on the results of earlier studies (Di Tella et al., 2001; Alesina et al., 2004; Haller and Hadler, 2006; Caporale et al., 2009; Pittau et al., 2010; Rodríguez-Pose and Maslauskaite, 2011; Cuñado and de Gracia, 2013; de Vroome and Hooghe, 2015), the following variables were chosen:

- Gender,
- Age,
- Partner (Lives with husband/wife/partner at household grid or not),
- People in household (Number of people living regularly as member of household),
- Education (Years of full-time education completed),
- Main activity (Main activity in the last 7 days: employed, student, unemployed but looking for work, unemployed and not looking for work, sick or disabled, retired, in military or community service, housework, and other),
- Ratio of household income to national income average (Household's total net income divided by the average net income of household in the country),
- Minority (Belong to a minority ethnic group in country),
- Pray (Pray at least every day or not),
- Health (Self reported health),
- Discrimination (Would you describe yourself as a member of a discriminated group?),
- Safety (How safe would you feel walking alone in this area after dark?),
- Trust and satisfaction.

Respondents with a missing answer to any of these question or with answer Don´t know were removed from our dataset. Note that the last four variables are subjective in nature: these were used in the initial stages of our analysis and the results featuring them are reported for the sake of comparison but they are not used in the final model used to construct predicted happiness.

One of the most important variables in the study of happiness is household income. This variable was changed after the third round of ESS: while originally, it featured as 12 (nationally-defined)

categories, from the 3rd wave onwards it has been replaced by income deciles. The newer variable is clearly and unambiguously defined, unlike the original income thresholds. The categorization of respondents into deciles of income is not available for the first three rounds of ESS so our analysis only relies on data from 2008 to 2014. These four rounds together cover approximately 180 000 respondents.

The household income to national income ratio was computed as the average of income category (decile) divided by average net income of household in the country.

For the Last variable, trust and satisfaction, we use the first component resulting from principal component analysis of 9 questions about trust and satisfaction (trust in: parliament, legal system, police, politicians; and satisfaction with: economy, government, democracy, education, health services).

An important issue in the happiness literature is endogeneity. Many personal variables are potentially endogenous in happiness (Di Tella et al., 2003). Happiness has an impact on marital status (Stutzer and Frey, 2006), probability of being unemployed (Marks and Fleming, 1999), and many other outcomes such as income (Lyubomirsky et al., 2005). We see the problem of endogeneity as more serious in the case of subjective variables. Happiness makes people healthier (Sabatini, 2014; Rodríguez-Pose and Maslauskaite, 2011) and more optimistic. Therefore we dropped 4 individual subjective variables (health, discrimination, safety, trust and satisfaction) from our initial model and focused mainly on objective determinants of happiness.

In the next step, regional variables were added to the model. One of the problems we face is multicollinearity between some of these variables. For example, a cross-regional correlation between life expectancy and GDP per capita is around 0.6 and between life expectancy and infant mortality it is approximately -0.7. This problem is mentioned also by Boarini et al. (2006), who find strong cross-country correlations between GDP per capita and several social indicators. Therefore, we selected indicators that are not too closely correlated with each other but have significant impact on happiness so as to be responsible for the differences in the average levels of happiness different regions. We identified the following regional variables as having a significant impact on happiness:

- Average disposable income of household in the region divided by the average net income of household in the country,
- Redistribution of income: Current taxes on income and wealth paid by households divided by net disposable income of households,
- Life expectancy at birth,
- Percentage share of households with access to the internet at home (in %),
- NEET rate - share of young people not in employment, education or training (in %).

Two other regional variables were included in some models but not in the final model:

- GDP per capita (in thousands of €),
- Unemployment rate (in %).

Regional data were obtained from the regional database of Eurostat.

The last independent variable in our model is the sum of the Worldwide Governance Indicators (WGI) produced by Kaufmann and Kraay (2016). The WGI are aggregate indicators of six broad dimensions of governance: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption. These indicators are calculated at the national level. The sum of WGI is the only national-level variable in our model.

The final model has been estimated by OLS and can be written as follows:

$$Happiness_{i,r,c,t} = \alpha_0 + \sum \beta \, Individual f_{i,r,c,t} + \sum \gamma \, Regional f_{r,c,t} + \delta \, WGI_{c,t} + \mu_{i,r,c,t} \quad (1)$$

where i represents the individual i who lives in the region r in the country c at time t. *Individual* f and *Regional* f are vectors of individual and regional factors mentioned above, β, γ, and δ are vectors of estimated coefficients.

The β coefficients of individual factors are the same for all individuals and across all regions. We assume that the these factors affect individual happiness in the same way in all regions. Differences in the levels of happiness between respondents and in different regions are thus attributed to the individual, regional and national factors, not to differences in parameters of the happiness function.

3 Results

As a first step, Table 1 presents the results of regressions featuring only individual variables: the nine objective variables in the first column and combining objective and subjective variables in the second column. Individual factors such as gender, age and marital status are important determinants of happiness: females are happier than males, happiness falls with age initially until it reaches a low point when people are aged in their forties and fifties and then it starts growing again, and those living with partner experience a sizeable happiness premium. These results are very similar to the findings in the earlier literature (Winkelmann and Winkelmann, 1995; Di Tella et al., 2001, 2003; Alesina et al., 2004; Haller and Hadler, 2006; Frey et al., 2009; Pittau et al., 2010; Rodríguez-Pose and Maslauskaite, 2011; Cuñado and de Gracia, 2013; de Vroome and Hooghe, 2015). Employment status matters too: those who are employed are happier than those who are either unemployed, ill or retired while being a student is associated with an increase in happiness. Education and earnings (relative to the national average) boost happiness – both effect follow an inverted U-shaped pattern, peaking at 33 years or education and a four-fold multiple of national income, respectively. [1] Being a member of an ethnic minority depresses happiness. Finally, religious individuals are happier than those who do not pray regularly, in line with previous findings (Ellison, 1991; Chang, 2015).

Subjective individual factors play important roles too in rather predictable manner: good health and greater feeling of security are associated with greater happiness, trusting individuals are happier and those who feel being discriminated against are less happy. Adding subjective factors alters the coefficients of objective determinants, in a predictable manner: the effects of one's main activity, education and income fall (educated, employed and well-off individuals are more likely to be in good health).

In table 2, we keep the nine objective individual variables and add to them five regional variables and WGI as the only national variable (Model 3). Again, we find a quadratic relationship between happiness and household income to country income ratio: maximum happiness is attained at household income 3.6 times higher than average income in the country. In contrast, the regional to national income ratio is negative when we control for household income: a given household income 'buys' more happiness in a relatively poor region than in a rich region. This conclusion corresponds to theory that we compare ourselves with people around us (Frey and Stutzer, 2002; Stutzer, 2004). [2]

The effects of other regional variables are rather intuitive. Unemployment has negative influence on happiness. Life expectancy, availability of internet connections and income redistribution increase happiness (the last effect is inverted-U-shaped, peaking when taxes redistribute 55% of disposable

[1] The quadratic effect of income deviates from the literature, as most studies assume a linear relationship between income and happiness. Rodríguez-Pose and Maslauskaite (2011) find that the quadratic term for income is not significant. However, Caporale et al. (2009) find the coefficient for ninth income category to be greater than for the two next income categories, which approximately corresponds to our results.

[2] Clark and Oswald (1996) reports that job satisfaction is inversely related to income level of reference group.

Table 1: Models with objective individual variables (on left) and with objective and also subjective individual variables (on right)

Objective ind factors (1)			**Objective + subjective ind factors (2)**		
	Estimate	Std. Error		Estimate	Std. Error
(Intercept)	6.772***	(0.063)	(Intercept)	8.009***	(0.061)
gender female	0.070***	(0.011)	gender female	0.201***	(0.011)
age 20-29	−0.301***	(0.038)	age 20-29	−0.126***	(0.035)
age 30-39	−0.650***	(0.041)	age 30-39	−0.393***	(0.039)
age 40-49	−0.855***	(0.041)	age 40-49	−0.530***	(0.039)
age 50-59	−0.940***	(0.042)	age 50-59	−0.485***	(0.039)
age 60-69	−0.662***	(0.044)	age 60-69	−0.318***	(0.042)
age 70-79	−0.577***	(0.047)	age 70-79	−0.169***	(0.045)
age 80 +	−0.349***	(0.052)	age 80 +	−0.005	(0.050)
student	0.460***	(0.031)	student	0.205***	(0.028)
unempl looking	−0.573***	(0.027)	unempl looking	−0.462***	(0.026)
unempl not looking	−0.524***	(0.043)	unempl not looking	−0.363***	(0.042)
sick, disabled	−0.620***	(0.035)	sick, disabled	0.104***	(0.035)
retired	−0.202***	(0.022)	retired	0.031	(0.021)
mil/com service	−0.201	(0.208)	mil/com service	−0.360*	(0.201)
housework	−0.037	(0.023)	housework	−0.004	(0.022)
other	0.081	(0.056)	other	0.159***	(0.053)
household 2	−0.200***	(0.021)	household 2	−0.020	(0.020)
household 3	−0.392***	(0.023)	household 3	−0.100***	(0.022)
household 4	−0.314***	(0.025)	household 4	−0.037	(0.023)
household 5+	−0.284***	(0.028)	household 5+	−0.014	(0.026)
minority	−0.460***	(0.024)	minority	−0.275***	(0.025)
pray no	−0.239***	(0.015)	pray no	−0.227***	(0.014)
partner no	−0.683***	(0.017)	partner no	−0.573***	(0.016)
edu years	0.067***	(0.005)	edu years	0.015***	(0.005)
edu yearsˆ2	−0.001***	(0.000)	edu yearsˆ2	0.000**	(0.000)
housh to cntry inc	1.021***	(0.020)	housh to cntry inc	0.502***	(0.019)
housh to cntry incˆ2	−0.127***	(0.004)	housh to cntry incˆ2	−0.068***	(0.004)
			health good	−0.382***	(0.014)
			health fair	−0.837***	(0.016)
			health bad	−1.535***	(0.025)
			health very bad	−2.347***	(0.05)
			safety safe	−0.250***	(0.013)
			safety unsafe	−0.462***	(0.017)
			safety very unsafe	−0.545***	(0.028)
			discrimination	−0.203***	(0.021)
			trust and satisf	0.234***	(0.003)
Observations		117,744	Observations		105,128
R^2		0.138	R^2		0.271
Adjusted R^2		0.137	Adjusted R^2		0.271
Residual Std. Error		1.864	Residual Std. Error		1.656
F Statistic		695.846	F Statistic		1,087.457

*Note: *p<0.1; **p<0.05; ***p<0.01. Reference: male, age < 20, employed, household with one member, no minority group member, pray everyday, living with partner, health very good, feel very safety, no discriminated group member.*

Table 2: Models with objective individual variables, regional variables and WGI for both genders, females, and males

	Both genders (3)		**Females (4)**		**Males (5)**	
	Estimate	Std. err	Estimate	Std. err	Estimate	Std. err
(Intercept)	2.172***	(0.208)	2.906***	(0.289)	1.554***	(0.300)
gender female	0.097***	(0.011)				
age 20-29	−0.329***	(0.038)	−0.290***	(0.055)	−0.356***	(0.052)
age 30-39	−0.657***	(0.041)	−0.559***	(0.059)	−0.749***	(0.058)
age 40-49	−0.886***	(0.041)	−0.781***	(0.059)	−0.985***	(0.058)
age 50-59	−0.921***	(0.042)	−0.812***	(0.060)	−1.033***	(0.059)
age 60-69	−0.680***	(0.045)	−0.586***	(0.063)	−0.778***	(0.063)
age 70-79	−0.612***	(0.048)	−0.538***	(0.067)	−0.694***	(0.068)
age 80 +	−0.459***	(0.052)	−0.340***	(0.073)	−0.604***	(0.076)
student	0.289***	(0.031)	0.362***	(0.043)	0.221***	(0.044)
unempl looking	−0.623***	(0.027)	−0.503***	(0.041)	−0.733***	(0.037)
unempl not looking	−0.579***	(0.043)	−0.485***	(0.062)	−0.660***	(0.060)
sick, disabled	−0.768***	(0.035)	−0.796***	(0.049)	−0.742***	(0.049)
retired	−0.163***	(0.023)	−0.168***	(0.031)	−0.169***	(0.033)
mil/com service	−0.224	(0.225)	−0.220	(0.491)	−0.247	(0.249)
housework	−0.078***	(0.023)	0.001	(0.026)	−0.273***	(0.064)
other	−0.013	(0.056)	0.017	(0.077)	−0.030	(0.083)
household 2	−0.024	(0.021)	−0.081***	(0.028)	0.027	(0.032)
household 3	−0.065***	(0.023)	−0.157***	(0.032)	0.014	(0.034)
household 4	0.016	(0.025)	−0.065*	(0.035)	0.076**	(0.037)
household 5+	0.027	(0.028)	−0.092**	(0.040)	0.126***	(0.041)
minority	−0.303***	(0.024)	−0.334***	(0.034)	−0.280***	(0.034)
pray no	−0.225***	(0.015)	−0.197***	(0.019)	−0.284***	(0.024)
partner no	−0.614***	(0.017)	−0.583***	(0.023)	−0.646***	(0.027)
edu years	0.059***	(0.005)	0.079***	(0.007)	0.028***	(0.008)
edu yearsˆ2	−0.001***	(0.000)	−0.002***	(0.000)	−0.001**	(0.000)
housh to cntry inc	0.703***	(0.021)	0.765***	(0.030)	0.651***	(0.029)
housh to cntry incˆ2	−0.098***	(0.004)	−0.110***	(0.006)	−0.086***	(0.006)
WGI	0.057***	(0.002)	0.066***	(0.003)	0.048***	(0.003)
redist of income	2.848***	(0.194)	2.811***	(0.274)	2.826***	(0.274)
redist of incomeeˆ2	−2.607***	(0.267)	−2.654***	(0.380)	−2.478***	(0.374)
reg to cntry inc	−0.961***	(0.051)	−0.906***	(0.071)	−1.033***	(0.074)
NEET rate	−0.025***	(0.001)	−0.030***	(0.002)	−0.019***	(0.002)
life expectancy	0.060***	(0.003)	0.047***	(0.004)	0.075***	(0.004)
internet	0.008***	(0.001)	0.008***	(0.001)	0.007***	(0.001)
Observations	108,719		57,705		51,014	
R^2	0.205		0.205		0.209	
Adjusted R^2	0.205		0.204		0.209	
Residual Std. Error	1.799		1.836		1.752	
F Statistic	824.980		449.505		409.046	

*Note: *p<0.1; **p<0.05; ***p<0.01. Reference: male, age < 20, employed, household with one member, no minority group member, pray everyday, living with partner.*

Table 3: Additional models with different combinations of regional variables, individual factors and fixed effects

	Model 6	**Model 7**	**Model 8**	**Model 9**	**Model 10**	**Model 11**
individual factors	objective	objective	objective	obj + subj	objective	obj + subj
fixed effects	no	no	no	no	yes	yes
WGI	0.057***	0.067***	0.060***	0.048***	0.102***	0.058***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.017)	(0.017)
redist of income	2.848***		2.641***	1.102***	0.366	2.314***
	(0.194)		(0.198)	(0.225)	(0.470)	(0.486)
redist of income^2	−2.607***		−2.151***	−1.032***	−1.060*	−2.480***
	(0.267)		(0.270)	(0.291)	(0.643)	(0.631)
reg to cntry inc	−0.961***	−0.980***	−0.707***	−0.413***	−0.415***	−0.684***
	(0.051)	(0.053)	(0.051)	(0.058)	(0.076)	(0.094)
NEET rate	−0.025***	−0.026***		−0.013***	−0.019***	−0.022***
	(0.001)	(0.001)		(0.001)	(0.002)	(0.003)
life expectancy	0.060***	0.066***	0.059***	0.072***	−0.021**	−0.033***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.009)	(0.008)
internet access	0.008***	0.010***	0.011***	0.005***	0.007***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
GDP pc		0.004***		−0.011***	0.000	−0.001
		(0.001)		(0.001)	(0.001)	(0.001)
unemployment			−0.001			
			(0.001)			
R^2	0.2051	0.2001	0.2023	0.2882	0.2170	0.3004
Adjusted R^2	0.2049	0.1998	0.2021	0.2878	0.2165	0.2999
Observations	108,719	110,279	108,918	91,149	108,719	91,149

*Note: *p<0.1; **p<0.05; ***p<0.01*

income). Finally, sound institutions at the country level are associated with greater happiness.[3] We have also built 6 models with separated indicators from WGI on RHS: all indicators have significantly positive impact on happiness. It can be concluded that good governance makes people happier.

Table 2 also contains separate estimates by gender, which reveal some important differences. Years of full-time education have a maximum effect on happiness at around 23 years when considering both genders together (Model 3). Female attain the maximum effect at around 20 years, while for men happiness peaks at 14 years of education. For females, living in bigger household has a negative impact on happiness. Housework has a negative effect for males, but for females it is not significantly different from reference group of being employed. Similarly, being unemployed imposes a greater happiness toll on males, while being single is more costly for females.

Table 3 considers different combinations of regional factors with the objective and subjective in-

[3] Positive impact of life expectancy on happiness can be found in Heukamp and Arino (2011). In the study by Ovaska and Takashima (2006) life expectancy has significant positive impact on satisfaction with life, but is insignificant for happiness. Positive impact of WGI indicators on happiness can be found in Helliwell and Huang (2006) and Helliwell (2006). Positive of redistribution on impact on happiness was found for size of the state (Flavin et al., 2011), and for government expenditures and government transfers (Ott, 2010). Relation between government spending and happiness is not significant in paper by Ram (2009).

dividual determinants, and with or without regional fixed effects.[4] The NEET rate has a negative sign in all the models, and seems a stronger determinant of happiness than unemployment rate. When it is replaced with unemployment (Model 8), the coefficient becomes insignificant. GDP per capita is insignificant in models with fixed effects. It has a positive impact on happiness in Model 7 (without individual factors) and negative in Model 9 (with individual variables included). Internet access and income redistribution are significant in all models.

Table 4 reproduces Model 3 and reports similar estimates for satisfaction with life and satisfaction with the economy. Most coefficients are qualitatively similar across all three models, suggesting that our happiness model captures a rather broad notion of happiness.

[4] The fixed effects for models 10 and 11 are reported in Table 5.

Table 4: Model 3 with objective individual variables, regional variables and WGI

	Happiness (3)		**Sat w life (12)**		**Sat w economy (13)**	
	Estimate	Std. err	Estimate	Std. err	Estimate	Std. err
(Intercept)	2.172***	(0.208)	1.938***	(0.233)	10.659***	(0.248)
gender female	0.097***	(0.011)	0.064***	(0.013)	−0.154***	(0.014)
age 20-29	−0.329***	(0.038)	−0.470***	(0.042)	−0.248***	(0.045)
age 30-39	−0.657***	(0.041)	−0.854***	(0.046)	−0.415***	(0.050)
age 40-49	−0.886***	(0.041)	−1.073***	(0.046)	−0.435***	(0.049)
age 50-59	−0.921***	(0.042)	−1.118***	(0.047)	−0.495***	(0.050)
age 60-69	−0.680***	(0.045)	−0.747***	(0.050)	−0.277***	(0.053)
age 70-79	−0.612***	(0.048)	−0.594***	(0.053)	−0.048	(0.057)
age 80 +	−0.459***	(0.052)	−0.421***	(0.058)	0.129**	(0.063)
student	0.289***	(0.031)	0.311***	(0.034)	0.371***	(0.037)
unempl looking	−0.623***	(0.027)	−0.971***	(0.031)	−0.616***	(0.033)
unempl not looking	−0.579***	(0.043)	−0.781***	(0.048)	−0.447***	(0.052)
sick, disabled	−0.768***	(0.035)	−0.987***	(0.039)	−0.543***	(0.041)
retired	−0.163***	(0.023)	−0.136***	(0.025)	−0.144***	(0.027)
mil/com service	−0.224	(0.225)	0.094	(0.252)	−0.089	(0.270)
housework	−0.078***	(0.023)	−0.081***	(0.026)	−0.142***	(0.028)
other	−0.013	(0.056)	−0.070	(0.063)	−0.205***	(0.067)
household 2	−0.024	(0.021)	−0.184***	(0.023)	−0.205***	(0.025)
household 3	−0.065***	(0.023)	−0.246***	(0.026)	−0.286***	(0.028)
household 4	0.016	(0.025)	−0.197***	(0.028)	−0.250***	(0.030)
household 5+	0.027	(0.028)	−0.239***	(0.032)	−0.243***	(0.034)
minority	−0.303***	(0.024)	−0.414***	(0.027)	0.146***	(0.029)
pray no	−0.225***	(0.015)	−0.255***	(0.017)	0.006	(0.018)
partner no	−0.614***	(0.017)	−0.498***	(0.019)	−0.198***	(0.021)
edu years	0.059***	(0.005)	0.070***	(0.006)	0.026***	(0.006)
edu yearsˆ2	−0.001***	(0.000)	−0.002***	(0.000)	−0.001**	(0.000)
housh to cntry inc	0.703***	(0.021)	0.974***	(0.023)	0.602***	(0.025)
housh to cntry incˆ2	−0.098***	(0.004)	−0.131***	(0.005)	−0.071***	(0.005)
WGI	0.057***	(0.002)	0.083***	(0.003)	0.094***	(0.003)
redist of income	2.848***	(0.194)	2.853***	(0.217)	5.114***	(0.232)
redist of incomeeˆ2	−2.607***	(0.267)	−2.047***	(0.299)	−6.266***	(0.319)
reg to cntry inc	−0.961***	(0.051)	−1.164***	(0.057)	−2.712***	(0.061)
NEET rate	−0.025***	(0.001)	−0.038***	(0.001)	−0.122***	(0.002)
life expectancy	0.060***	(0.003)	0.071***	(0.003)	−0.068***	(0.003)
internet	0.008***	(0.001)	0.009***	(0.001)	0.033***	(0.001)
Observations	108,719		108,903		107,745	
R^2	0.205		0.237		0.273	
Adjusted R^2	0.205		0.236		0.272	
Residual Std. Error	1.799		2.015		2.139	
F Statistic	824.980		992.898		1,186.962	

*Note: *p<0.1; **p<0.05; ***p<0.01. Reference: male, age < 20, employed, household with one member, no minority group member, pray everyday, living with partner.*

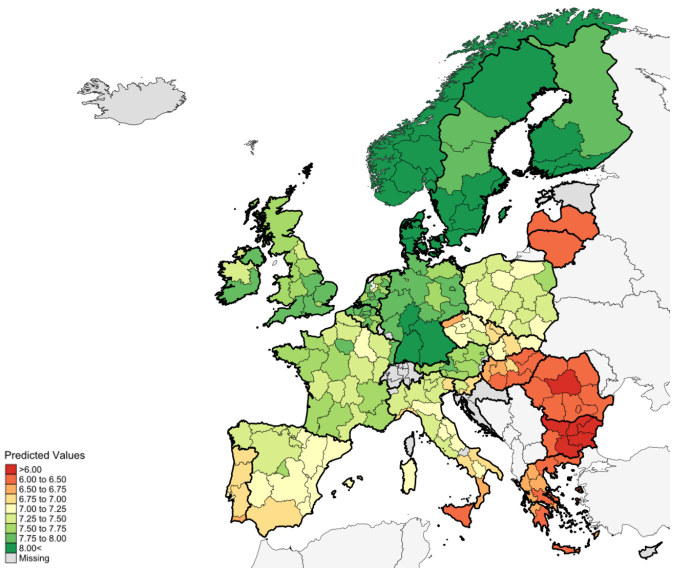

Figure 1: Predicted values of average happiness for European regions (latest available data)

Table 5: Fixed effects

	FE Model 5		**FE Model 6**	
	Estimate	Std. err	Estimate	Std. err
BE	0.481***	(0.051)	0.339***	(0.049)
BG	−0.649***	(0.155)	−0.299**	(0.150)
CZ	−0.251***	(0.088)	−0.053	(0.085)
DE	−0.014	(0.040)	0.225***	(0.039)
DK	0.588***	(0.157)	0.040	(0.148)
EE	−0.153*	(0.080)	0.006	(0.078)
ES	0.922***	(0.093)	1.183***	(0.090)
FI	0.335***	(0.053)	0.133***	(0.051)
FR	0.068	(0.058)	0.305***	(0.056)
GB	0.273***	(0.041)	0.319***	(0.040)
GR	−0.025	(0.129)	0.140	(0.125)
HU	−0.558***	(0.106)	−0.356***	(0.103)
IE	−0.075*	(0.045)	−0.037	(0.044)
IT	0.816***	(0.146)	0.937***	(0.140)
LT	−0.359***	(0.108)	−0.088	(0.105)
LV	−0.315***	(0.113)	0.139	(0.110)
NL	0.681***	(0.100)	0.459***	(0.097)
NO	0.191***	(0.055)	−0.078	(0.052)
PL	−0.304***	(0.067)	0.152**	(0.065)
PT	0.189**	(0.096)	0.423***	(0.093)
RO	−0.598***	(0.101)	−0.306***	(0.100)
SE	0.619***	(0.086)	0.161*	(0.083)
SI	0.450***	(0.156)	0.741***	(0.152)
SK	−0.570***	(0.084)	−0.126	(0.081)

*Note: *p<0.1; **p<0.05; ***p<0.01*

We use the model with objective individual variables and regional/national variables, as depicted

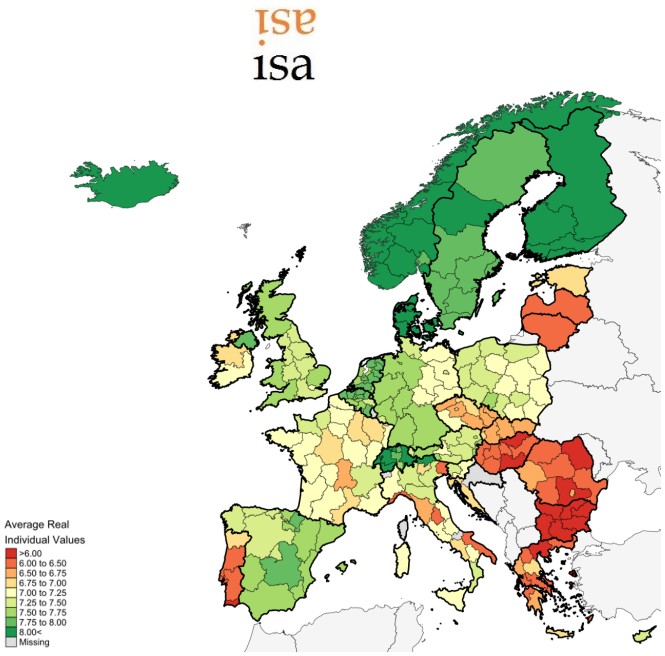

Figure 2: Average reported happiness for European regions (survey averages)

in Model 3, to compute predicted average happiness in different European regions. The results are displayed in Figure 1, which shows the estimated average happiness based on values of individual factors from 2014 (the last available round of ESS) and regional data from the latest year for which data are available (2014 in most cases). Figure 2, in turn, depicts the average regional values of happiness from the ESS surveys (all waves combined).

The new indicator of predicted happiness has a number of distinct advantages over GDP per capita, and also relative to using actual (survey-based) happiness. It reflects actual wellbeing, and incorporates the contributions of objective and measurable factors. Because of this, it is possible to construct this indicator for any level of aggregation – countries, regions, individual postcodes or socio-economic groups – for which the required data are available. For the same reason, this indicator can be used in a straightforward manner for the purposes of impact assessment (e.g. what will be the effect of rising unemployment or increased educational attainments). Unlike GDP per capita, it is measured at the place of residence, not where production takes place: output statistics tend to overestimate the wellbeing of major urban areas because they include the economic contributions of commuters. Unlike actual average happiness, the predicted value removes country-specific deviations, which can result, for example, from cultural biases (interpretation of the meaning ascribed to being extremely happy/unhappy). The comparison of actual and predicted happiness, for example, suggests that the Portuguese and French tend to be overly pessimistic while the Spanish and Germans seem rather optimistic.

Finally, predicted (and actual) happiness varies much less across regions than GDP per capita. In particular, the coefficient of variation is 0.53 in the case of GDP per capita and only 0.09 for predicted happiness (and 0.1 for actual happiness). Moreover, the richest European regions are not necessarily also the happiest: the region with the highest output per person is Inner London, which the region with greatest predicted happiness is Southern Denmark; the poorest and least happy region is in both instances Yuzhen tsentralen in Bulgaria.

4 Conclusion

This paper is devoted to happiness of Europeans. The concept of happiness is closely related to wellbeing and utility and it has been more and more popular not only in academic field, but also among policy makers. We use answers of more than 100,000 respondents to the question:

"Taking all things together, how happy would you say you are?" We identify 9 objective individual variables with significant impact on happiness. By using only objective variables we try to eliminate the endogeneity problem. In our basic model, there are nine objective individual variables, five regional variables, and national variable. We estimate a 'production function of happiness' and use it to construct a new indicator of 'predicted happiness' at the level of EU NUTS2 regions. This constitutes a novel broad indicator of welbeing that is not based only on a relatively narrow criterion of measuring the market value of goods and services. Our indicator, furthermore, not only estimates wellbeing, it also and explains how it is attained. Our approach allows us to predict happiness for different categories of people and estimate the impacts of changes in individual factors and regional indicators.

We observe considerably less variation within and across countries in actual or predicted happiness than with respect to GDP per capita. Hence, GDP overestimates wellbeing in rich (and mainly urban) regions and underestimates it in poorer regions. This is, in part, because GDP pc is measured at the point of production, which is concentrated in cities. Happiness (actual or predicted) is measured at the place of residence.

Based on our model, we are able to estimate happiness at the individual level and also at the regional level. With appropriate data it is possible to make these estimates not just on NUTS 1 and NUTS 2 levels, but also on lower levels of regional classification (NUTS 3, LAU 1, LAU 2).

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