

## ANALYSIS OF DETERMINANTS OF LIFE SATISFACTION<sup>1</sup>

### Introduction

International recommendations for the study of well-being defined in the Stiglitz Report (Stiglitz et al., 2009) have stimulated research into the determinants of subjective well-being in the scientific literature (Stone et al., 2018); this is also due to the increased availability of subjective well-being measures, which are now included in the surveys of several national statistical institutes (Tinto et al., 2018).

Also at the international level there are several studies that aim at analysing social and economic progress from a “beyond GDP” perspective, including the United Nations World Happiness Report, published annually from 2012 (Helliwell et al., 2019), the report of the US National Academy of Science (Stone and Mackie, 2015), the OECD’s How’s Life? series (OECD, 2017). Different approaches are adopted for the analyses, however many studies which include territorial factors adopt a multi-level approach (see Aslam and Corrado, 2012; Pierewan A.C., Tampubolon G., 2014; Pittau et al. 2010, Ballas and Tranmer 2012), in order to capture the extent to which individual, family and territorial factors contribute to high levels of life satisfaction. The results of the implementation of multilevel models by geographic distribution were presented in the ISTAT Annual Report 2019, refining the contents of the in-depth analysis on “Determinants of subjective well-being in Italy” published in the 2018 issue of the Bes Report with the aim of including in the analysis aspects related to the territorial and economic characteristics of the context in which people live.

Several works aim at assessing the impact of “non-income related” factors on subjective well-being, considering household income as an indicator of individuals economic well-being (Ng and Diener, 2018; Fleche et al., 2012; Sacks, et al., 2010).

This type of approach was useful to deepen the association between subjective well-being, measured as a positive judgement of life satisfaction, and the relevant aspects that contribute to determine it, studied through the lens of the Bes domains.

Aim of this work, based on data from the ad hoc module on well-being of the European Union Statistics on Income and Living Conditions (Eu-silc), is to integrate the analyses carried out so far by specifically including economic factors together with those already considered previously for the analysis of the determinants of life satisfaction.

This contribution has the double objective of deepening the analysis of the association between life satisfaction and some individual and context variables, including the equivalent disposable income, and of observing regional variations of these associations. At the individual level, the economic and non-economic determinants will thus be put on an equal footing.

### Data and methods

Data used in this study are taken from Eu-silc 2018 survey and the ad-hoc module on well-being. Individuals aged 16 and over, who directly provided the requested information, were asked to express the degree of satisfaction with the quality of several dimensions of their life (such as job, financial situation, leisure time, personal relationships, or overall life satisfaction), measured in a scale ranging from 0 (not at all satisfied) to 10 (completely satisfied). In this study we have modelled the probability P of being very satisfied, that is a response score equal to or greater than 8.

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The overall life satisfaction is estimated through a multilevel logistic model with random intercept and random slope, in order to take into account the hierarchical structure of our data. Data are structured in first level units (individuals), nested in second level units (household they belong to), nested in third level units (region of residence)<sup>2</sup>. The multilevel models allow, under certain assumptions, to decompose the overall variability of the phenomenon under study into the three levels considered and to measure the correlation between the responses of individuals belonging to the same household or living in the same region (but in different households)<sup>3</sup>. The assumption underlying this work is that units within groups are never completely independent: for example, individuals belonging to the same household, sharing many aspects related to the context that shape life satisfaction, tend to be more similar to each other in attributing meaning to the different individual components of well-being; in the same way, households living in the same area are likely to be affected in a similar way by the environmental and political characteristics they share within that specific context, as confirmed by other studies on this topic (Rampichini and D'Andrea, 1998)<sup>4</sup>.

In order to verify the existence of a hierarchical structure, first we have estimated the “null” multilevel model, i.e. with no predictors, obtaining an estimate of how much of the overall variance is explained by between-groups variability by means of the intra-class correlation coefficient (ICC)<sup>5</sup>, which provides a measure of the degree of homogeneity between observations belonging to the same group. The higher the ICC value, the more appropriate it becomes to use an estimation procedure that takes into account the positive correlation between the first level units belonging to the same higher level unit. In the specific case, the ICC is equal to 0.427, mainly due to the similarity within the same household (0.386) and to a lesser extent to the similarity of individuals of different households within the same region (0.041). Therefore, the ICC value confirms the preference for grouping individuals into second level units, such as households, and into third level units, such as regions.

In order to identify the determinants of life satisfaction, measured as a dichotomous variable equal to 1 if the individual declares a high level of satisfaction and 0 otherwise, the probability of being very satisfied is modelled considering, as covariates, individual characteristics (gender, age, citizenship, role within the household, level of education, occupational status, presence of physical limitations), household socio-economic status (logarithm of the equivalised disposable income, material and housing deprivation, accommodation tenure status),

2 The three-level logistic multilevel model, with random intercepts and random slopes, can be formalized in this way:  $\text{logit}(\mathbf{P}) = \log \frac{\mathbf{P}}{1-\mathbf{P}} = \mathbf{X}\boldsymbol{\beta} + \mathbf{Z}\mathbf{u} + \mathbf{K}\mathbf{w} + \boldsymbol{\varepsilon}$ , where  $\mathbf{P}$  is the  $(n \times 1)$  vector of the responses on the degree of satisfaction (1 very satisfied, 0 not at all),  $\mathbf{X}$  is the  $(n \times q_1)$  matrix of the covariates (including possible interactions) for which the fixed effects have to be estimated and  $\boldsymbol{\beta}$  the  $(q_1 \times 1)$  vector of the relative coefficients,  $\mathbf{Z}$  is the  $(n \times q_2)$  matrix of the covariates for which the random effects at the second level have to be estimated and  $\mathbf{u}$  the  $(q_2 \times 1)$  vector of the relative coefficients,  $\mathbf{K}$  is the  $(n \times q_3)$  matrix of the covariates for which the random effects at the third level have to be estimated and  $\mathbf{w}$  the  $(q_3 \times 1)$  vector of the relative coefficients,  $\boldsymbol{\varepsilon}$  is the  $(n \times 1)$  vector of the level-one residuals,  $n$  is the number of the level-one units (individuals). In this study the matrix  $\mathbf{X}$  contains data on individual characteristics, household socio-economic status and territorial characteristics, the matrix  $\mathbf{Z}$  contains only the intercept, and the matrix  $\mathbf{K}$  contains the intercept and the logarithm of the disposable equivalised income.

3 The violation of the independence of observations assumption makes it difficult to adopt conventional models: using them in such circumstances, generally brings to underestimate standard errors and therefore to consider results statistically significant even if they are not.

4 The authors have noted that individuals from the same region share common socio-economic, political and culture environments, which, as well as individual characteristics, could determine their perceived satisfaction.

5 In three-level hierarchical models, the variability of the response variable can be decomposed into two components, between-groups variability ( $\sigma_u^2$  e  $\sigma_w^2$  are the variances at the second and third level respectively) and within-groups (residual) variability ( $\sigma_\varepsilon^2$  is the variance of level-one residual errors, approximated by the quantity  $\pi^2/3$  in those cases where the response variable (having a logistic distribution) is obtained by the dichotomization of a quantitative dependent variable (Hox, 2002)). The ICC is therefore defined as  $\frac{(\sigma_u^2 + \sigma_w^2)}{(\sigma_u^2 + \sigma_w^2 + \sigma_\varepsilon^2)}$

territorial characteristics (type of municipality, logarithm of per capita municipal value added, per capita municipal social expenditure, soil sealing, unemployment rate and number of violent crimes reported at provincial level) (Table 1)<sup>6</sup>.

**Table 1. Selected indicators**

Domains	Indicators	Categories	Source
<b>Individual characteristics</b>			
Socio-demographic characteristics	Gender	Males, females	Istat, Eu-silc survey, 2018
	Age	In years	Istat, Eu-silc survey, 2018
	Family context	In couple without children, parent in couple with children, single parent, child, living alone, other	Istat, Eu-silc survey, 2018
	Citizenship	Italian, foreign	Istat, Eu-silc survey, 2018
Education and training	Level of education	Low (Isced 0-2), Medium (Isced 3-4), High (Isced 5-8)	Istat, Eu-silc survey, 2018
Work and life balance	Labour status	Employed, unemployed, inactive	Istat, Eu-silc survey, 2018
Health	Activity limitations	No limitations, severe limitations, non severe limitations, did not reply	Istat, Eu-silc survey, 2018
<b>Household characteristics</b>			
Economic well-being	Per capita disposable income	Net equivalised disposable income (log)	Istat, Eu-silc survey, 2018
	Arrangements under which the dwelling is occupied	Ownership, other	Istat, Eu-silc survey, 2018
	Material deprivation	Severe material deprivation, no material deprivation	Istat, Eu-silc survey, 2018
	Housing deprivation	Severe housing deprivation, no housing deprivation	Istat, Eu-silc survey, 2018
<b>Territorial characteristics</b>			
Structural characteristics	Municipality classification	Urban and suburban area Up to 10,000 inhabitants (small dimension) 10,001 inhabitants or more (medium dimension)	Istat, Eu-silc survey, 2018
Quality of services	Social expenditure of municipalities	Per capita social expenditure of municipalities (indicator at municipal level)	Istat, Census survey on interventions and social services of single and associated municipalities, 2016
Environment	Soil sealing from artificial land cover	Percentage of soil sealed following a change from non-artificial to artificial coverage	Ispra, Soil consumption, territorial dynamics and ecosystem services, 2017
Work and life balance	Unemployment rate	Percentage of unemployed persons in relation to the corresponding labour force (indicator at province level)	Istat, Labour Force Survey, 2018
Production system	Value added	Per capita value added (logarithm) (indicator at municipal level)	Istat, Extended register of economic variables at territorial level (Territorial Frame SBS), 2016
Safety	Violent crimes	Violent crimes reported (per 10,000 inhabitants) in the province of residence (provincial indicator)	Istat, Processing on data on crimes reported to Police Forces, 2017

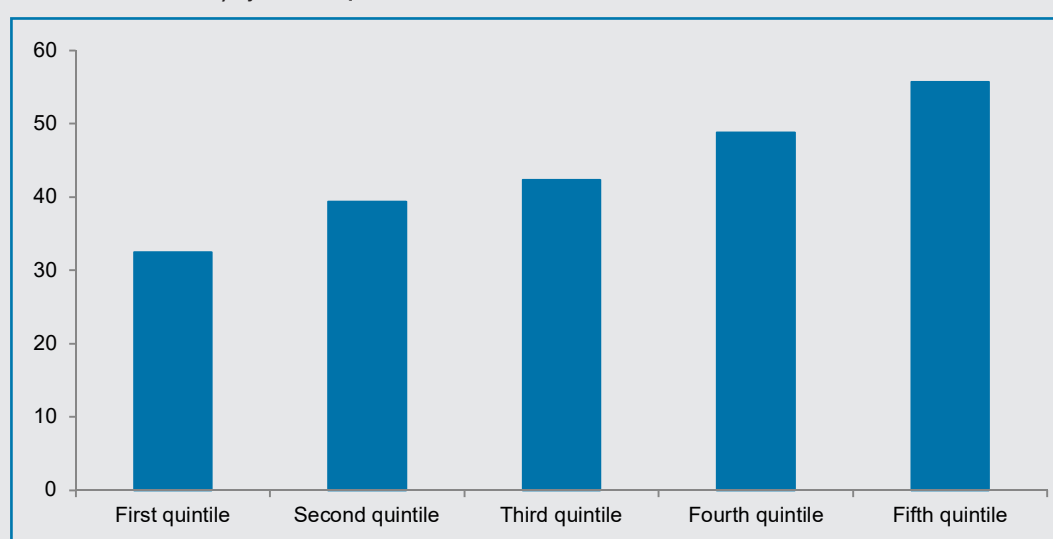
In addition to the fixed effects of explanatory variables and to the random intercepts at household and regional levels, the model estimates also the random effect of the equivalised

<sup>6</sup> In order to select the covariates to be included in the regression model, the presence of multicollinearity between predictors has been detected through the Variance Inflation Factor (VIF), defined as:  $VIF = \frac{1}{1 - R^2}$  where  $R^2$  is the coefficient of determination. The quantitative variables has been previously mean centered and rescaled by the standard deviation. Analyses were conducted with R programming software using the package lme4 (Bates et al., 2015).

disposable income at regional level<sup>7</sup>, in order to assess how much the effect of income varies on the degree of satisfaction in a specific region with respect to the expected average value for all individuals (fixed effect of income). This allows to evaluate specifically how life satisfaction reacts to the income values in the various regional contexts.

According to descriptive analysis, Eu-silc data show that individuals with a higher income have higher percentages of being very satisfied (55.7% of individuals who have an equivalised disposable income in the fifth quintile of income distribution) (Figure 1)<sup>8</sup>.

**Figure 1. Percentage of persons aged 16 and over referring to be very satisfied with their life (8-10 score on a 0 to 10 scale) by income quintile. Year 2018**



Source: Istat, Eu-Silc survey

## Results

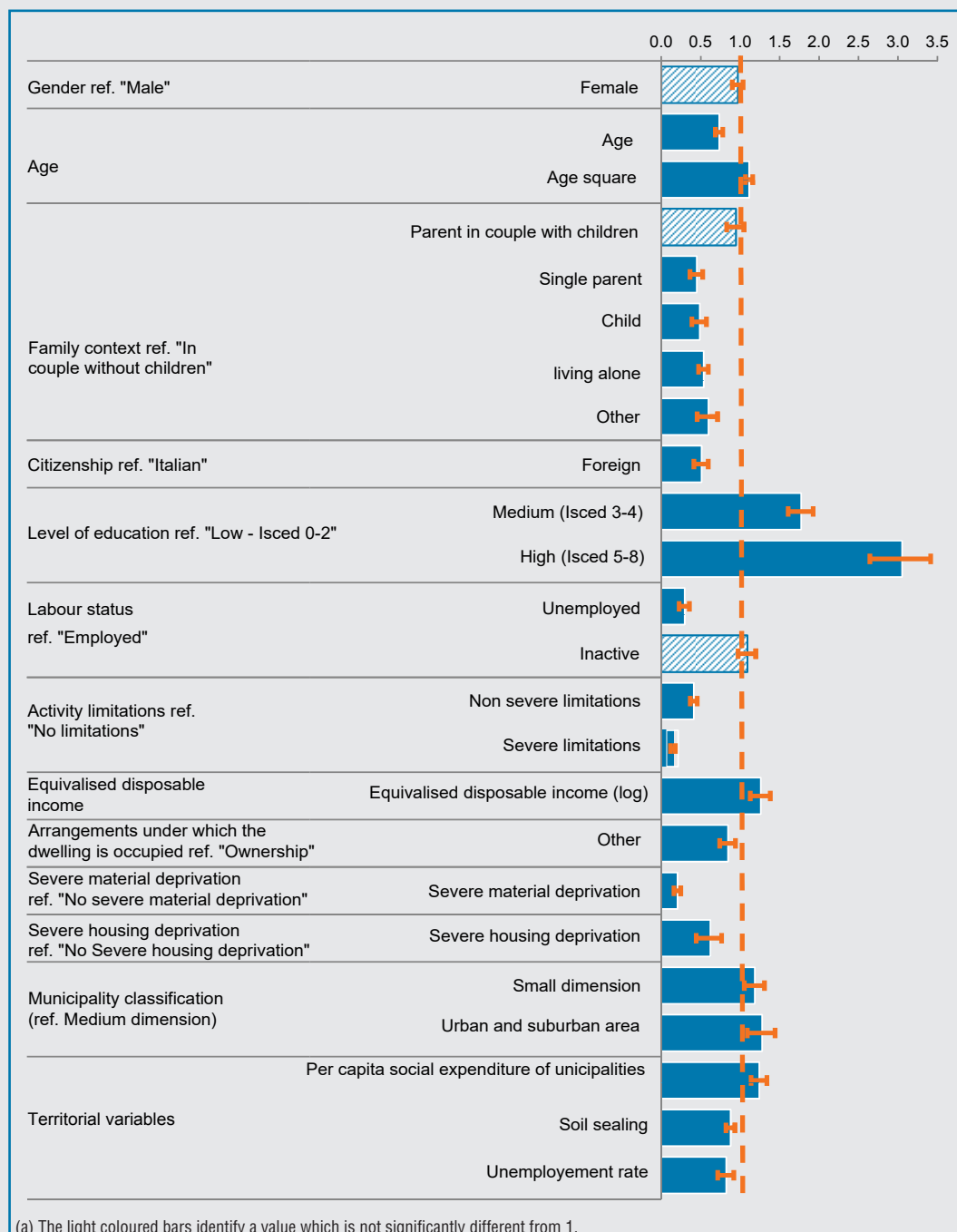
The estimated fixed effects in the model are shown in Figure 2 in terms of odds ratio (OR). These represent the ratio between the odds of those who are exposed to a given risk factor and of those belonging to the target category. The odds are given by the probability of being very satisfied in relation to its complementary probability. In other words, the OR measures the association between the response variable and the covariate under examination: it's 1 in the absence of this association, it's more than 1 when the probability of being very satisfied increases in presence of risk factor; it's less than 1 when it decreases.

When analysing the model's results, referring to individual, family and context effects, it can be observed firstly that the fixed effects estimate indicates how positive variations in individual well-being perceptions are due to having a high educational qualification: among graduates the propensity to be very satisfied with life is about three times higher than among those with a lower educational qualification (OR 3.1), almost twice as high among graduates (OR 1.8) (Figure 2). Moreover, as age increases, the proportion of very satisfied decreases, with a slight recovery among the elderly, attested by a positive odds ratio for the squared age. A decisive factor that negatively affects life satisfaction at the individual level is the level of autonomy, which is included in the model as indicative of his or her general health status:

<sup>7</sup> The equivalised income is calculated by dividing the total net household income by an appropriate correction factor (modified OECD equivalence scale), in order to take into account the effect of economies of scale and to make directly comparable income levels of households with different size and composition.

having limitations in carrying out daily activities, both serious (OR 0.1) and medium (OR 0.4), drastically decreases the probability of attributing high scores to life satisfaction. The position within the household can also be a relative disadvantage, especially that of a single parent or single person (OR 0.5 in both cases, comparing to those living in couple without children).

Figure 2. Estimates from the fixed effects logistic regression multilevel model on the probability of giving a 8-10 score to own life satisfaction. Year 2018 Odds ratio (a)

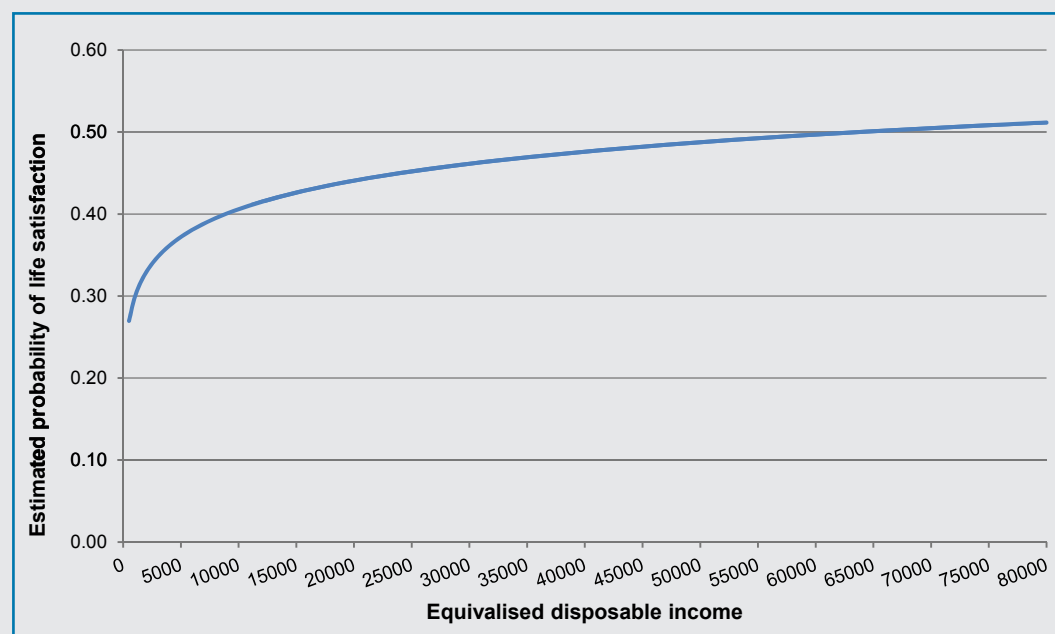


At household level, the economic resources provided by the equivalised household income lead to an increase in the propensity to be very satisfied, albeit with a lower OR compared to those just mentioned (OR 1.3). Relative disadvantages are severe deprivation (OR = 0.2 for material, OR = 0.6 for housing deprivation). Living in a non-owned dwelling reduces the chances of family members to be very satisfied with their lives (OR 0.8).

Regarding the territorial context in which people live, living in metropolitan areas but also in small municipalities increases the probability of being very satisfied (OR 1.3 and 1.2 respectively compared to those living in medium-sized municipalities). There is also a positive impact of local economic interventions, aimed at integrating and supporting weaker groups, with higher levels of satisfaction combined with higher levels of social spending in the municipality (OR 1.2). Living in a region with a high unemployment rate is a risk factor for satisfaction, as it reduces the probability of being very satisfied with one's life (OR 0.8).

These evidences show that economic resources have an impact on well-being, even if at a minor extent compared to the other factors taken into account. As said above, in fact, the odds ratio of the equivalised disposable income is 1.3. To give an idea of what this means in terms of relation between income level and life satisfaction, let us consider a baseline individual<sup>8</sup> defined as the one having the characteristics of the reference category of categorical covariates and average values of quantitative covariates. *Ceteris paribus*, the overall probability of being very satisfied plotted versus the equivalised income is shown in Figure 3. As an example, other conditions being equal, with an equivalised income of 10,000 euros per year (about equal to the at-risk-of poverty threshold) such a probability is 0.41, with an equivalised income of 20,000 euros per year the probability rises to 0.44, and at 30,000 euros it becomes 0.46; for a very well-off individual, having for instance 500,000 euros,

Figure 3. Estimated probability of being very satisfied by level of equivalised disposable income



Source: Istat, Eu-silc survey

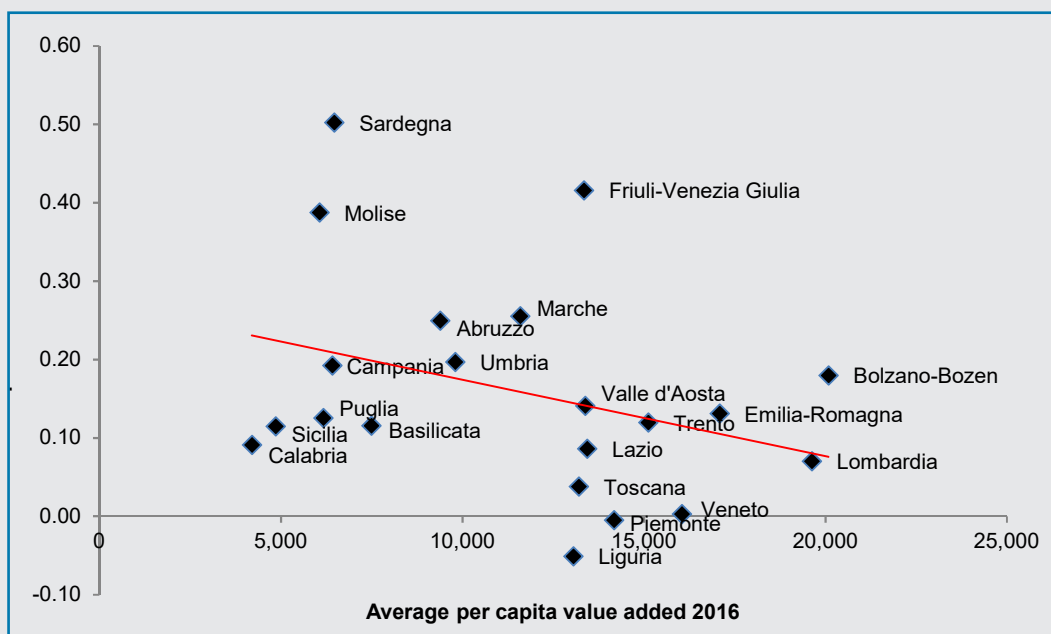
<sup>8</sup> The baseline individual considered here is an Italian man of average age, living in a couple without children, with a low education level, occupied, without physical limitations, without material or housing deprivation, owner of the accommodation he lives in, living in a medium-sized municipality and in a territory where we fictitiously assume that the unemployment rate, the per capita value added, the reported crimes, the soil sealing, the per capita social expenditure are equal to the national average value.

the probability of being very satisfied would reach the value of 0.6. In more general terms, similar income increases imply a well-being growth greater in the lowest income classes and gradually minor in the upper classes.

Furthermore, variations in the association between equivalised disposable income and life satisfaction have been found across regions. Figure 4 displays the estimated random income slopes for each region plotted versus the regional per capita value added, here used as a measure of the richness of the region. The positive effect of income on life satisfaction (represented on the vertical axis) is stronger in Sardegna, Friuli-Venezia Giulia and Molise, denoting that the same income increase has a greater impact on the probability of very high satisfaction in these regions.

On the other side, taking into account the association between the equivalised disposable income effect and the area richness level, a slight inverse relation has been found on average: having more economic resources accounts more in poorer regions than in wealthier regions. The negative association, shown by the decreasing regression line, highlights that, controlling for basic socio-demographic characteristics, an individual living in a poor context is more likely to relate his subjective well-being to his own income, as confirmed by other similar studies (Pittau et al., 2010). In other words, disposable income is a better predictor for life satisfaction in poorer regions than in richer regions: this result does not necessarily mean that a low income person in a rich region (as Lombardia) feels less satisfied than a low income person in a less rich region (as Sardegna), but that other non-economic factors could have a greater impact on subjective satisfaction levels in less deprived areas.

Figure 4. Random effect of equivalised disposable income (a) by regional per capita value added



Source: Istat, Eu-silc survey; Extended register of economic variables at territorial level (Territorial Frame SBS)  
 a) The random effect measures the association between equivalised disposable income and life satisfaction within each region.

### Final remarks

Although income is confirmed as one of the factors associated with high levels of life satisfaction, a number of other characteristics are particularly relevant, including educational attainment, health, employment status and housing conditions. At the territorial level, living in contexts characterised by a higher level of employment, higher levels of social expenditure

by the municipality, and better environmental conditions (measured by an indicator on soil sealed) brings an advantage in terms of life satisfaction.

Deepening the analysis of the impact of household income on life satisfaction, it emerges that it varies by region, with a more marked positive effect in the most economically disadvantaged territories.

These regional variations in the effect of economic resources should be further investigated, also to take into account territorial differentials in terms of purchasing power. A possible development of the analysis could be, for example, the inclusion of estimated sub-national spatial deflators in the model. Alternatively, one could also consider, among the explanatory factors, the relative economic positioning of individuals within the territorial context, in the hypothesis that the degree of satisfaction could also be determined in part by comparison with the economic situation of the other individuals living in the same context.