On the causal effect of religiosity on life satisfaction using a propensity score matching technique

Abstract

Using the British Household Panel Survey (BHPS) data set, we investigate the effect of religious involvement on subjective well-being (SWB), specifically taking into account the implication of selection effects explaining religious influence. In order to measure the level of religious involvement, we construct different indices on the base of individual religious belonging, participation and beliefs applying a Propensity Score Matching (PSM) estimator. Our results show a positive and causal association between religiosity and life satisfaction which is confirmed among different aspects of religiosity such as belonging to any religion, attending religious services once a week or more and believing that religion makes a great difference in life. Our findings are robust to different aspects of life satisfaction. We offer an econometric account of the causal impact of different aspects of religiosity finding evidence that the causal effect on SWB is better captured than through typical regression methodologies focusing on the mean effects of the explanatory variables.

Keywords: Subjective well-being; Religion; Propensity score technique

JEL-Codes: C21; C40; I31; Z12

I. INTRODUCTION

The economic analysis of individual subjective well-being has become increasingly popular and indicators such as happiness, life satisfaction, and quality of life are considered important economic outcomes and proxies for individual utility (Lelkes, 2006a; Frey and Stutzer, 2002). Several are the factors associated with subjective well-being (SWB) which can be divided, according to Frey and Stutzer (2002), into economic (i.e. income, unemployment, inflation and inequality) and non-economic (i.e. personality, socio-demographic and institutional factors). Among the economic determinants, the empirical evidence suggests that individually self-reported happiness increases with individual income[1] (Clark et al. 2008) and that unemployment and inflation reduce people happiness, consistently with welfare theory (Clark and Oswald, 1994; Oswald, 1997)[2]. Moreover, there is some evidence that inequality is negatively related with happiness (Alesina et al. 2004)[3]. On the other hand, among the non-economic determinants, it has been found that happiness depends on personal relationships (i.e. quantity and quality of social relations). For an evidence on a social aspect such as volunteering see Fiorillo (2012) and Binder and Freytag (2013). The greater is the level of social capital, the higher is the well-being (Helliwell and Putham, 2004; Powdtharee, 2008). Poor health is also negatively associated with subjective well-being (for instance, according to Shields and Wheatley, 2005, specific conditions, such as heart attacks and strokes reduce well-being)[4]. Socio-demographic variables are important, too. There is evidence that family influences life satisfaction such as married people have a higher subjective well-being than singles, divorced, separated or widowed (Frey and Stutzer, 2002). Regarding age, evidence that happiness is U-shaped through the life cycle, has been found[5] (Blanchflower and Oswald, 2008; Helliwell, 2006). Level of education (Orepoulos and Salvanes, 2011) and political institutions of democracy (Frey and Stutzer, 2000) have a positive impact on subjective well-being, too. See Becchetti et al. (2008) for an evidence on the impact on life satisfaction of a set of social activities.

Among the many aspects of life which have been considered in the literature, also religious involvement, as a determinant of happiness, has been explored. Indeed, it has typically been found that religious activities (Clark and Lelkes, 2005; Hayo, 2004; Gruber, 2005; Myers, 2000; Swinnyard et al.2001) and beliefs (Helliwell, 2003, 2006; Dehejia et al.2007) are positively correlated with subjective well-being. In other words, religious involvement contributes positively to individuals' self-reported satisfaction (Lelkes, 2006b). Specifically, church attendance and its frequency have been found among the main correlate of subjective well-being (Ferriss, 2002; Helliwell, 2003; Lim and Putnam, 2010)[6]. Smith et al. (2003) report evidence that, apart from church attendance, also intrinsic religiousness has a positive impact on subjective well-being. One explanation which might justify these findings is related to the strong social networks and support that religious

[1] Even though Easterlin (1974) found that aggregate national happiness over time was essentially flat, seemingly irresponsive to sustained increases in GDP per capita. This finding is often known as the Easterlin Paradox, in that growth in per capita income is not reflected in increasing happiness (for a review and a debate, see Clark et al. 2008).

[2] Being unemployed is related to lower subjective well-being than being employed (Easterlin, 2003)

[3] Specifically, they found that there is a large, negative and significant effect of inequality on happiness in Europe but not in the U.S. They also find that the distaste for inequality is concentrated in some groups in Europe, mainly the left and poor. In the United States inequality generated unhappiness is only for a sub-group of rich, left-wing people.

[4] Interestingly, it has been found that disabled are found to experience lower life satisfaction, but there is adaptability (partial). Results show that within 3 years 50% of the effect for moderate and 30% of the effect for severe disabilities disappear (Oswald and Powdtharee, 2008).

[5] High amongst the young, reaching a minimum at around 30 or mid 40s (depending on the study) and then lifts back up again.

[6] According to Bettendorf and Dijkgraaf (2010), church membership is also found to have a positive effect on income for high income countries and a negative effect for low income countries.

organizations offer (Clark and Lelkes, 2005; Ellison, 1991)[7]; according to Krause and Wulff (2005), friendships build through church attendance encourage a sense of belonging and consequently help the building of better physical and mental health (see also Krause, 2008 for more empirical evidence on building friendship with church friends). Thus, religious participation plays an important role, leading to higher levels of education and income, lower levels of welfare receipt and disability, higher levels of marriage, and lower levels of divorce (Gruber, 2005) and perhaps to a better reported well-being. See also Feess et al. (2014) for an evidence on the impact of different religions and of the degree of religiosity of individuals on their work ethic.

It appears to be clear the positive relationship between religiosity and subjective well-being, even though most of the evidence comes from correlational studies and there are implications of selection effects to be taken into account. Indeed, as Regnerus and Smith (2005) very well underlined, the observed association may be the result of alternative possible processes involving different relationships and directions of causal influences. Self-selection is likely to happen and religious individuals who report to be happy may be more likely to stay religious; moreover, poorly measured differences between those involved in religion activities and the non-religious may play an important role. In other words, the casual relationship between religious involvement and subjective well-being is still not very clear and more evidence is needed to analyse how religiosity really shapes life satisfaction.

In this paper, three components of religious involvement are taken into account and their relationship with different life satisfaction indices is assessed. Specifically, we consider three distinct measures of religiosity such as religious belonging (whether an individual belongs to any religion), church or religious service attendance (attendance categories are: never, only at weddings, funerals, at least once a year, at least once a month, once a week or more) and finally the self-reported importance of religion in the respondent's life (religious salience categories are: no difference, a little difference, some difference, and a great difference). Using the British Household Panel Survey (BHPS), we thus focus on the relationship between religiosity and overall life satisfaction; firstly and differently from the main literature, we initially use these three variables separately in order to check whether different measures of religiosity affect the estimates. Moreover, we construct three other indices of religiosity; according to how involved into religion is the individual, we identify different degrees of religiousness such as belonging to any religion and also think that religious beliefs make a great difference in life (low level of religiosity), belonging to any religion and attend religious services once a week or more (medium level of religiosity), and finally belonging to any religion, attending religious services once a week or more and thinking that religious beliefs make a great difference in life (high level of religiosity). Secondly, we offer an econometric account of the causal impact of different aspects of religiosity on subjective well-being by making use of propensity score matching estimators (Imbens, 2004; Caliendo and Kopeinig, 2008). Propensity score matching is a methodology which rests upon the claim that all the most important factors relevant to the outcome variable (i.e. SWB) are observed for participants (i.e. religious individuals) and non-participants (i.e. non-religious individuals). Once these factors are controlled for in the analysis, the selection bias term must be zero by definition and thus the mean causal effect can be retrieved. Thirdly, as robustness checks, we also take into account how satisfied are individuals with their social life.

We find that the causal effect of belonging to any religion, attending religious services once a week or more and think that religious beliefs make a great difference in life do not seem to be well captured by typical regression methodologies focusing on the mean effects of the explanatory variables. Indeed, once the potential selection effects influencing the

[7] See Durkheim (1951)for the social dimension of religion.

association between religious involvement and subjective well-being have been taken into account, the results show that religious active participation plays a very important role on SWB.

The rest of the paper is organized as follows. Section 2 describes the data, the identification strategy and illustrates the research design, Section 3 describes the empirical results, Section 4 provides some robustness checks and finally Section 5 concludes.

II. DATA AND IDENTIFICATION STRATEGY

2.1. Data

We base our investigation on data from the British Household Panel Survey (BHPS)[8]. It is a longitudinal survey of private households in Great Britain and it aims to track social and economic changes in a representative sample of the British population. The sample used in the paper consists of about 12,000 individuals. The data contains information on various domains of the respondents lives, ranging from income to jobs, household consumption, education, health, but also social and political values. We have specifically used the 18th wave (2008). The descriptive statistics for our data set can be found in Table 1 in Appendix.

2.2. How we model religious involvement and subject well-being

In our empirical investigation, we use three key religious variables. The first one picks up whether an individual belongs to any religion (*Religious*). Respondents are asked: Do you regard yourself as belonging to any particular religion? [9], with the following possible replies: No religion; Church of England/Anglican; Roman Catholic; Church of Scotland; Free Church or Free Presbyterian Church of Scotland; Episcopalian; Methodist; Baptist; Congregational/United; Reform/URC; Other Christian; Christian; Muslim/Islam; Hindu; Jewish; Sikh. A binary variable has been created, being 1 whether an individual belongs to any religion and 0 otherwise. The second one measures church attendance (*Attendance*). Respondents are asked: How often, if at all, do you attend religious services or meetings? [10], with the possible replies: Once a week or more; Less often but at least once a month; Less often but at least once a year; Never or practically never; Only at weddings, funerals etc. (scaled from 1 to 4). A binary variable has been created, being 1 whether an individual goes once a week or more to services or meetings and 0 otherwise. Finally, the third one, aims to measure individual religious beliefs (*Beliefs*). Respondents, indeed, are asked: How much difference would you say religious beliefs make to your life?[11], with the

[8] University of Essex. Institute for Social and Economic Research and National Centre for Social Research, British Household Panel Survey: Waves 1-18, 1991-2009. Colchester, Essex: UK Data Archive [distributor], Wave 18 - 1 September 2008 to 9 April 2009. SN: 5151, http://dx.doi.org/10.5255/UKDA-SN-5151-1

[9] See among others, Clark and Lelkes (2005) and Hayo (2004) using a similar survey question and measure in order to investigate whether an individual belongs to any religion.

[10] See among others Clark and Lelkes (2005), Hayo (2004), Gruber (2005), Dehejia et al. (2007), Regnerus and Smith (2005), Ferriss (2002), Helliwell (2003), Lim and Putnam (2010), Brown and Tierney (2009) using a similar survey question to measure the frequency of attendance at religious services.

[11] See among other Dehejia et al. (2007), Regnerus and Smith (2005) and Helliwell (2003; 2006) using a similar question in order to get information on whether individuals think that religious beliefs make a great difference in life.

possible replies: A little difference, Some difference, A great difference, or No difference. A binary variable has been created, being 1 whether an individual thinks that religious beliefs make a great difference in his/her life and 0 otherwise[12]. We initially use these three variables separately in order to check how different measures of being religious affect the estimates. In other words, we want to verify whether subjective well-being is associated with belonging to any religion and with the frequency of attendance at religious services; moreover, we also examine how religiosity actually shapes life satisfaction taking into account what individuals think about religion and its importance in their life (i.e. religious beliefs). For robustness, we construct three other indices of religiosity. An individual has been considered religious at low level when he/she belongs to any religion and also think that religious beliefs make a great difference in life (*Religious*Beliefs*), religious at medium level when he/she does belongs to any religion and attend religious services once a week or more (*Religious*Attendence*)[13], and finally religious at high level when he/she belongs to any religion, attend religious services once a week or more and think that religious beliefs make a great difference in life (*CompleteReligious*). We use overall life satisfaction as a measure of the individual subjective well-being. This is measured as follows: All things considered, how satisfied are you with your life overall?. Answers are on a 1 to 7 scale, where 1means not satisfied at all and 7 means completely satisfied. For robustness, we also use another measure of life satisfaction which is specifically related to the social life satisfaction. It is measured as follows: All things considered, how satisfied are you with your social life?. Again, answers are on a 1 to 7 scale, where 1 means not satisfied at all and 7 means completely satisfied[14]. A potential concern regards using the same measures of religiosity to all religions; in other words, as the analyses include observations from respondents of different religions or beliefs, there could be worries that the concept of religiosity can differ significantly from one religion to another and thus using the same measures across all respondents could be somewhat questionable. According to our opinion, it is reasonable to assume that, independently from the type of religion to which individuals belong, attending to religious services and believing that religion makes a great difference in life capture two different aspects of religious involvement which should not be such different among religions. In other words, potentially, the concept of religiosity could differ from one religion to another, even though we do not expect both the importance of church/religious service attendance and self-reported importance of religion in the respondent's life being different among religions. In support of this assumption, Dolan et al. (2008) stated that it seems to make relatively little difference which religion one belongs to (Christian, Judaism, Hinduism, Buddhism, etc.). Moreover, Rehdanz and Maddison (2005) found that the average happiness of different countries was not affected by the proportion of the population with different religious

[12] Given the support of the previous literature, we believe that the variables used in this paper for measuring religiosity are appropriate with regards to their validity and reliability.

[13] We consider the level of religiosity of those who belong to any religion and also attend religious services once a week or more (medium level) higher than the level of those who belong to any religion and think that religion makes a great difference in life (low level) on the base of the fact that religious active participation is considered one of the main detector of religious involvement. The idea is that attending religious services and activities is more time and energy demanding for individuals. For instance going to the church or to religious meetings frequently implies a strong motivation which translates in more familiarity with church ritual and doctrine, and friendships in the religious community; in other words, in our opinion, attending religious services once a week or more is a better proxy of the religious certainty and strength than just claiming that religion is important in life. However, we recognize the potential limitation of the above stated argument and that claiming to separate out different degrees of religiosity is to some extent subjective.

[14] The overall life satisfaction and the social life satisfaction have been used both as continuous variables and as dummy variables. In the latter case, we created a dummy variable equal to 1 if the individual is satisfied, corresponding to the values 5 (Somewhat satisfied), 6 (Mostly satisfied) and 7 (Completely satisfied) and 0 otherwise, corresponding to the values 1 (Completely dissatisfied), 2 (Mostly dissatisfied), 3 (Somewhat dissatisfied) and 4 (Neither satisfied nor dissatisfied).

beliefs and Ferris (2002) found no differences in happiness in the United States as a function of whether respondents were Jewish, Catholic or Protestant[15]. On this topic, see also Cohen (2002)[16].

2.3. Identification strategy

As already stated in the introduction, most of the empirical evidence which has been found in the literature on the relationship between religiosity and subjective well-being is debated on the account that it is based on correlational studies. In other words, the casual interpretation of this association and the direction of cause and effect between religious involvement and life satisfaction is not easy to be measured. As Regnerus and Smith (2005) very well underlined, the possible endogeneity problem related to the religious concept may raise through several channels. Indeed, there is a selection effect to take into account due to the fact that individuals choose how important is religion in their life; thus, they might tend to consider themselves as less or more religious for different reasons, including several that have nothing to do with the content of the religion itself. Such reasons might include personality type, age, race or ethnicity, and cultural surroundings (Regnerus and Smith, 2005). If those reasons also affect the reported well-being, then we end up with attributing to religion what, instead, might have nothing to do with it. Moreover, self-selection might arise if happy people may take up religion to pursue spiritual well-being and, people who find happiness in religious involvement may be more likely to stay religious than those who do not (Lim and Putnam, 2010). This is related to what Regnerus and Smith (2005) call the religious strategy explanation. In other words, individuals might use religion as a strategy for achieving a desired outcome such as being married or staying healthy (i.e. if an individual has already an aptitude for being married, then he/she could choose of being involved in religion activities as a strategy for achieving that result). Finally, there is also the possibility that a person self-selects out of religion such that the apparent association between religion and being involved in religious activities and well-being is largely the product of reverse causation; this creates "observed (but not real) associations between religion or religiosity and particular outcomes among the population of individuals that did not decrease their religious involvement or did not alter their religious beliefs or attitudes" (see again Regnerus and Smith, 2005).

We estimate the following model of latent subjective well-being (SWB*):

$$SWB_i = \beta REL_i + \delta X_i + \varepsilon_i \quad (1)$$

where SWB_i measures the individual subjective well-being; REL_i captures whether an individual belongs to any religion, attend religious services or meetings and his/her religious beliefs; X_i is a vector of other explanatory variables including gender, marital status, age, health and economic variables; ε_i is an error term.

Considering the reported level of life satisfaction as an ordinal measure, we firstly estimate Eq. (1) using an ordered logit estimator. Vector X_i contains the following control variables. We firstly include *Gender*(a dummy variable equal to one if

[15] For some literature claiming that religiosity could be viewed differently across different religion, see Schwartz and Huismans (1995) and Cohen et al. (2003).

[16] Even if the same measures of religiosity do differ across respondents, this could be more relevant when comparing different countries (especially if those countries are far from each other from the geographical and cultural point of view). In our study, instead, we take in consideration only a representative sample of the British population (British Household Panel Survey), meaning that differences in traditions, culture and geographic position should be less relevant than comparing individuals across countries. Indeed, the most representative type of religion in the population analysed are Church of England, Church of Scotland, Roman Catholic and Free Presbyterian Church of Scotland; we do not expect the measures of religiosity used in the paper different consistently among these religions.

the individual is a man), *Age*, *Age*^{2}, *Married*(a dummy variable equal to one if the individual is married)[17]. We then control for some human capital variables. Indeed, we include *Employed* (a dummy variable equal to 1 if the individual is currently employed), *Education* (we measure education according to the International Standard Classification of Education levels such as primary; lower secondary; upper secondary; higher vocational; first stage of tertiary; second stage of tertiary), *Financial Situation* (a five point scale variable indicating whether the individual finds living very difficult, quite difficult, whether he/she is just able to getting by, does alright or lives comfortably). We control for the individual health status, through *Health Situation* (measuring, on a five point scale whether the individual health situation is very poor, poor, fair, good and excellent), and *Disability*, a dummy which takes the value of 1 if the individual has health limits in daily activities (it is a proxy for controlling that the individual might suffer from any disability). In addition, we control for *Stress*, a dummy which measures a stressful event taking a value of one in the case that a negative event, such as a divorce occurred to the individual. This should greatly reduce any bias that may derive from contingent circumstances, which are considered particularly important in defining the reliability of happiness scores (see Carrieri and De Paola, 2012). Moreover, according to Regnerus and Smith (2005), one of the most plausible claims of unmeasured selection effects (i.e. not demographic differences) appear to involve concepts like being conformist, risk aversive, and strategic personality types. That is, religiosity may be in part the result of hard-wired personality differences. Safe or risk-aversive people are more likely to both display greater religiosity and to exhibit positive health practices, lifestyles, and generally pro-social behaviour. In order to control for this issue, we include *Risks* in the analysis which is a variable taking the value of 1 to 10 scale where 1 means not taking risk and 10 means taking risks. Furthermore, in order to control for the fact the religious organizations may influence individuals' beliefs, attitudes and values, we also include two dummies (*Voluntary* and *Homosexual*) which, respectively, take value of 1 if the individual is involved in any volunteering and if he/she thinks that homosexual relationships are wrong. Finally, we also take into account regional fixed effects including a dummy taking the value of one if the individual lives in England (*England*).

2.4. Propensity score matching

To recover from the selection effects underlined in Section 2.3, we employ a Propensity Score Matching (PSM) technique in order to estimate the Average Treatment effect of the Treated (ATT) using different methods (for a similar approach applied to explore the relationship between volunteering and SWB, see Binder and Freytag, 2013). The PSM procedure aims to identify the average treatment effect by comparing outcomes of those individuals who claim to belong to any religion, attend religious services or meetings, and have strong religious beliefs and those who do not, having these two groups, a priori, similar probabilities of being involved into religion. The idea beyond this methodology rests upon the claim that all the most important factors relevant to the outcome variable are observed for participants (i.e. religious individuals) and non-participants (non-religious individuals). Once these factors are controlled for in the analysis, the selection bias term must be zero by definition and thus the mean causal effect can be retrieved. In other words, we want to compare mean outcomes for religious individuals to mean outcomes for non-religious individuals net of compositional differences that can be attributed to the confounding factor X. It is the case we want to mimic, ex-post, an experiment by constructing a suitable comparison group by matching treated (i.e. religious individuals) and non-treated (non-religious individuals) in term of their

[17] According to Frey and Stutzer (2002), although socio-demographic variables might not be as relevant from an economic standpoint (they cannot be easily controlled, such as age, gender, and marriage) they have an effect on happiness and thus should be included as controls in regression analysis to avoid generating biases in the estimations.

observable characteristics. That is, we compare average outcomes for individual involved in religion and non-religious within strata defined by the variable X . This will allows us to study how the causal effect of belonging to any religion, attending religious services or meetings, and having strong religious beliefs vary across values of the deprivation index X . When the dimension of X is large, we can make this operational through the so called propensity score which was defined by Rosenbaum and Rubin (1983), as the probability of treatment assignment conditional on observed baseline covariates. In order to make the propensity score matching procedure work, two important properties have to be satisfied. According to the first one, the balancing property, for a given propensity score the distribution of the covariates X is, on average, the same among the two groups (i.e. religious and non-religious individuals); with regard to the second one, the two groups are equivalent with respect to Y (i.e. subjective well-being) once we conditions on covariates X . In other words, all differences between treated (i.e. religious individuals) and non-treated (i.e. non-religious individuals) are captured in their observable attributes. To diagnose the quality of the resulting matched samples we test the assessment of the covariate balance in the groups, where balance is defined as the similarity of the empirical distributions of the full set of covariates in the matched treated and control groups. For each covariate, we test the equality of means and the standardized percentage bias in the two samples before and after matching and then we test the joint insignificance of all the regressors before and after matching.

We use 1 to 1 nearest neighbour matching, that selects for each treated individual i the control individual with the smallest distance from individual i[18].

III. EMPIRICAL RESULTS

Results from the ordered logistic regression[19] (see Table 2 in Appendix[20]), confirming what has already been found in the literature, show that religious individuals are happier than non-religious; indeed, respondents who either belong to any religion, or believe that religion makes a great difference in life, or participate in religious activities and attend religious services have positive odds of life satisfaction (see Table 2 in Appendix, Columns 1, 2 and 3, respectively, OR = 0.132, 0.221 and 0.271), significant at the 1% level. We then check whether the results change when different degrees of being involved into religion are taken into account. Three different stages are considered such as a low (belonging to any religion and believing that religion makes a great difference in life), medium (belonging to any religion and attending religious services once a week or more), and high (belonging to any religion, believing that religion makes a great difference in life and attending religious services once a week or more) level of religiosity, and they are all positive and statistically significant related to life satisfaction (see Table 2 in Appendix, Columns 4, 5 and 6, respectively, OR = 0.208, 0.331 and 0.380).[21]

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[18] We estimate Kernel matching, Local linear regression matching, Mahalanobis matching and k-Nearest neighbors matching with different k, too. Results change only slightly and are available upon request.

[19] We have also computed OLS and Fixed effects estimations using the individual subjective well-being variable both as continuous and as a dummy and, finally, a Logit estimation; results are reported in Table 8 in Appendix.

[20] See Table 3 in Appendix for the ordered logistic regressions' marginal effects for each outcome (i.e., from 1 to 7). Due to space constraints, we report marginal effects only for the main variables related to the religion participation. Marginal effects for all the other variables are available on request.

[21] As briefly discussed in Section 2.2. above, there could be worries that the concept of religiosity can differ significantly from one religion to another; in order to analyse whether using the same measures across all respondents could be somewhat questionable, we can conduct a separate analysis for each religion, or controlling for religion in the estimations. Regarding the first solution, due to data constraints (i.e. number of observation for each type of religion), we cannot obtain reliable estimates for each religion separately. We try

In addition, also the results related to the other determinants of happiness are consistent with those emerging from the literature (see again Table 2 in Appendix); indeed, life satisfaction is U-shaped in age, showing a negative and statistically significant relationship between subjective well-being and age while, instead, a positive and statistically significant relationship between subjective well-being and age^2 has been found. In other words, the progression of age does not lead to a linear increase in happiness. Individuals who are married report significantly higher levels of life satisfaction, while a stressful event in life such as being divorced has a negative effect on happiness. Both the financial and health status seem to play an important role, too, being economic and physical conditions positively associated with individuals self-assessed well-being. The Education variable has a negative and statistically significant coefficient. This could be due to the fact that the effects tend to drop out, especially in equations in which health status is included, for higher levels of education in more fully specified models. Education improves health and thus indirectly improves subjective well-being, but net of that effect (and of the other factors in the analysis), education appears to have a different impact on subjective well-being (on this point, see Helliwell and Putnam, 2004). See also Hungerman (2014) who finds that high levels of education lead to lower levels of religious participation later in life[22]. There is no evidence of differences in reported well-being between females and males as well as being employed and being involved into volunteering activities do not seem to be crucial in explaining happiness. Finally, there is evidence that disability has a negative impact on life satisfaction and being a less risk aversive type seem to be, instead, related to a higher level of satisfaction.

As already stated in section 2, the estimates obtained so far may be biased due to the selection effects shaping religions impact on life satisfaction. In order to take into account this issue and to attribute a casual interpretation to the association between religious involvement and subjective well-being, we rely on matching estimators. To simplify the interpretation of the results, a dummy variable taking the value of 1 if the individual is satisfied and 0 otherwise has been used as outcome variable[23]. The results show that the causal impact of belonging to any religion, of believing that religion makes a great difference in life and of attending religious services once or more a week are, 0.0183, 0.0380 and 0.0616, respectively, almost all significant at the 1% level (see Table 4 in Appendix). Furthermore, we also check whether the results change when different degrees of being involved into religion are taken into account. The causal impact of having a low, medium and high level of religiosity on subjective well-being is 0.0227, 0.0319 and 0.0524, respectively (again, see Table 4 in Appendix). The PS test confirms these results, do not rejecting the null hypothesis of balancing in the covariates between treated group and control group, except for belonging to any religion estimation.

IV. ROBUSTNESS CHECKS

In this section, we propose a sensitivity analysis to verify the robustness of our results using social life satisfaction as a proxy of subjective well-being measured as follows: All things considered, how satisfied are you with your social life overall? Answers are on a 1 to 7 scale, where 1 means not satisfied at all and 7 means completely satisfied. The results from

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to replicate the analysis controlling for religion in the estimation (i.e. including a dummy for each religion). More specifically, when we performed the ordered logistic regression the results are similar (results are not showed in the paper but area available on request) supporting the idea that the measures of religiosity used in the paper can be applied to all religions even though the analyses include observations from respondents of different religions or beliefs and that the concept of religiosity does not different significantly from one religion to another at least for the type of religions represented in the population analysed.

[22]Specifically, he finds that an additional year of education leads to a 4 percentage points in decline in the likelihood that an individual identifies with any religious tradition.

[23]We also estimate the PS Matching using the individual subjective well-being measured on a 1 to 7 scale as outcome. Results change only slightly and are available upon request.

the ordered logistic regression[24](see Table 5 in Appendix[25]) confirm that religious individuals are happier than non-religious also considering subjective social life satisfaction. Results are confirmed also considering the other determinants of happiness. Interestingly, differently from the analysis when the overall life satisfaction has been used, being employed and being involved into volunteering activities appear to be important in explaining social life satisfaction. In other words, there is evidence that individuals participation in the labour market and in an activity which benefits another person, group or organization, specifically affects social life satisfaction more than overall well-being.

The main evidence is also confirmed when matching estimators are considered (see Table 7 in Appendix). Indeed, we still find the presence of a causal impact of belonging to a religion, of believing that religion makes a great difference in life and of attending religious services once or more a week on social life satisfaction.

V. CONCLUDING REMARKS

This study focuses the attention on the relationship between religiosity and individual subjective well-being. Specifically, it addresses the point that the empirical evidence already provided in the literature is mostly based on correlational studies meaning that the positive association between religious involvement and activities and life satisfaction may suffer from the lack of a causal interpretation; unobserved or poorly measures of differences between religious and non-religious individuals may, indeed, explain this association as well as self-selection may lead to erroneously attribute this influence to religiosity (i.e. the observed association may be the result of alternative possible processes).

Firstly, by using an ordered logit estimator, we demonstrate that religious involvement is positively correlated to a better life satisfaction. Secondly and more importantly, we provide a causal interpretation to this association. Indeed, by making use of a propensity score matching technique, we estimate the casual effects of belonging to a religion, of attending religious services once or more a week and of believing that religion makes a great difference in life on both individual overall and social life satisfaction, confirming that these effects do not seem to be well captured by typical regression methodologies focusing on the mean effects of the explanatory variables.

Our analysis could suffer from some limitations and some potential concerns. One of this concerns hinges our measurement of religiosity which focuses more on the aspect of religious social involvement, rather than other multi-faced parts of religiosity. Keeping this concern in mind, we think a useful lesson can be learned from this study such that religious involvement may enhance life satisfaction because it gives people a sense of belonging to a social group or a community. Religion is typically a social activity and previous research (see for instance Regnerus and Smith, 2005) indicates that social ties are one of the most important contributors to happiness. This suggests that social networks and strong religious identities (i.e. religious activities and church attendance, religious beliefs) are key variables mediating the positive connection between religion and life satisfaction. Probably, well-being is easier to be achieved being part of a community in which people share similar attitudes and beliefs, and identify with the same moral values. In other words, people with religious affiliations are more satisfied with their lives because they attend religious services frequently and build intimate social networks in their congregations. Thus, further research is needed in order to deeper analyse whether social support and religious support may be substitutes for individuals who are faced with adverse life events, whether religious

[24]Again we have also computed OLS and Fixed effects estimations using the individual subjective well-being variable both as continuous and as a dummy and, finally, a Logit estimation; results are reported in Table 9 in Appendix.

[25] See Table 6 in Appendix for the ordered logistic regressions' marginal effects for each outcome (i.e., from 1 to 7). Due to space constraints, we report marginal effects only for the main variables related to the religion participation. Marginal effects for all the other variables are available on request.

organizations contribute to the integration of a community and as a consequence, whether such community integration may contribute to life satisfaction and happiness.

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APPENDIX

Table 1: Descriptive Statistics

Variables	Mean	Std. Dev.	Min	Max
Life satisfaction (1-7)	5.244	1.227	1	7
Life satisfaction (0-1)	0.781	0.413	0	1
Social Life satisfaction (1-7)	4.952	1.423	1	7
Social Life satisfaction (0-1)	0.667	0.471	0	1
Religious	0.507	0.500	0	1
Attendance	0.133	0.339	0	1
Beliefs	0.151	0.358	0	1
Religious*Attendance	0.082	0.274	0	1
Religious*Beliefs	0.105	0.307	0	1
Complete Religious	0.059	0.235	0	1
Gender	0.456	0.498	0	1
Health Situation	3.809	0.923	1	5
Financial Situation	3.839	0.978	1	5
ISCED levels	3.510	1.730	1	7
Married	0.518	0.500	0	1
Age	46753	18.943	15	101
Age Squared	2544.677	1895.224	225	10201
Employed	0.567	0.495	0	1
England	0.495	0.500	0	1
Voluntary	1.616	1.227	1	5
Homosexual	3.376	1.169	1	5
Stress	0.056	0.384	0	1
Disability	0.180	0.384	0	1
Risks	5.524	2.188	1	10
Observations	12190			

Table 2: Ordered Logit – Life Satisfaction

	(1)	(2)	(3)	(4)	(5)	(6)
Religious	0.132***					
	(0.038)					
Beliefs		0.221***				
		(0.053)				
Attendance			0.271***			
			(0.057)			
Religious*Beliefs				0.208***		
				(0.067)		
Religious*Attendance					0.331***	
					(0.070)	
Complete Religious						0.380***
						(0.081)
Gender	-0.032	-0.046	-0.048	-0.043	-0.044	-0.045
	(0.036)	(0.034)	(0.034)	(0.036)	(0.036)	(0.036)
Health Situation	0.686***	0.682***	0.680***	0.687***	0.687***	0.687***
	(0.024)	(0.023)	(0.023)	(0.024)	(0.024)	(0.024)
Financial Situation	0.490***	0.496***	0.494***	0.490***	0.488***	0.489***
	(0.021)	(0.019)	(0.019)	(0.021)	(0.021)	(0.021)
ISCED levels	-0.089***	-0.085***	-0.085***	-0.091***	-0.092***	-0.092***
	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)
Married	0.405***	0.370***	0.369***	0.412***	0.411***	0.409***
	(0.045)	(0.042)	(0.042))	(0.045)	(0.044)	(0.045)
Age	-0.061***	-0.060***	-0.060***	-0.059***	-0.058***	-0.058***
	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)
Age Squared	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Employed	-0.008	-0.002	0.001	-0.009	-0.006	-0.008
	(0.049)	(0.045)	(0.045)	(0.049)	(0.049)	(0.049)
England	-0.047	-0.078**	-0.070**	-0.037	-0.035	-0.036
	(0.037)	(0.034)	(0.034)	(0.037)	(0.037)	(0.037)
Voluntary	0.030**	0.020	0.015	0.024	0.017	0.018
	(0.015)	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)
Homosexual	0.025	0.015	0.018	0.027	0.033*	0.033*
	(0.017)	(0.016)	(0.016)	(0.018)	(0.018)	(0.018)
Stress	-0.231***	-0.224***	-0.222***	-0.230***	-0.234***	-0.233***
	(0.089)	(0.083)	(0.083)	(0.089)	(0.088)	(0.088)
Disability	-0.288***	-0.283***	-0.277***	-0.292***	-0.286***	-0.286***
	(0.059)	(0.054)	(0.054)	(0.059)	(0.059)	(0.059)
Risks	0.062***	0.054***	0.055***	0.062***	0.063***	0.062***
	(0.010)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)
Log Likelihood	-15083.132	-17276.157	-17276.354	-15083.522	-15077.701	-15077.844
Pseudo R-squared	0.0803	0.0802	0.0803	0.0802	0.0806	0.0806
Observations	10625	12154	12155	10625	10625	10625

Notes: Standard errors, in parenthesis, are robust to heteroskedasticity and autocorrelation. ***, ** and * indicate coefficients significant at the 1%, 5% and 10% levels, respectively.

Table 3: Marginal effects of religious variables in ordered logit estimation.

Life Satisfaction:	1	2	3	4	5	6	7
Religion	-0.001**	-0.002***	-0.005***	-0.013***	-0.012***	0.022***	0.011***
	0.000	0.000	0.002	0.004	0.004	0.006	0.003
Beliefs	-0.001***	-0.003***	-0.008***	-0.020***	-0.023***	0.035***	0.020***
	0.000	0.001	0.002	0.005	0.006	0.008	0.005
Attendance	-0.001***	-0.003***	-0.010***	-0.025***	-0.028***	0.043***	0.024***
	0.000	0.001	0.002	0.005	0.007	0.009	0.006
Religion*Beliefs	-0.001**	-0.002***	-0.008***	-0.019**	-0.021**	0.034**	0.018**
	0.000	0.001	0.002	0.006	0.007	0.011	0.006
Religion*Attendance	-0.002***	-0.004***	-0.012***	-0.030***	-0.035***	0.052***	0.030***
	0.000	0.001	0.002	0.006	0.008	0.011	0.007
Complete Religious	-0.002***	-0.004***	-0.013***	-0.034***	-0.042***	0.060***	0.035***
	0.000	0.001	0.003	0.007	0.01	0.012	0.008

Notes: Standard errors, in parenthesis, are robust to heteroskedasticity and autocorrelation. ***, ** and * indicate coefficients significant at the 1%, 5% and 10% levels, respectively.

Table 4: Life Satisfaction – 1-to-1 PS Matching

	Religious	Beliefs	Attendance
ATT	0.0183** (0.0082)	0.0380*** (0.0137)	0.0616*** (0.0143)
PS test	0.000***	0. 941	0.770

	Religious*Beliefs	Religious*Attendance	Complete Religious
ATT	0.0227 (0.0171)	0.0319* (0.0176)	0.0524** (0.0210)
PS test	0.995	0.985	0.987

Standard Errors in parentheses. ***, ** and * indicate coefficient significant at the 1%, 5% and 10% levels, respectively. PS test is a test on the balancing of the variablesbetween treated group and control group, distributed as chi-square under the null of balancing.

Table 5: Ordered Logit – Social Life Satisfaction

	(1)	(2)	(3)	(4)	(5)	(6)
Religious	0.125***					
	(0.037)					
Beliefs		0.111***				
		(0.051)				
Attendance			0.210***			
			(0.054)			
Religious*Beliefs				0.090		
				(0.067)		
Religious*Attendance					0.254***	
					(0.067)	
Complete Religious						0.224***
						(0.079)
Gender	0.029	0.006	0.007	0.015	0.018	0.015
	(0.035)	(0.033)	(0.033)	(0.035)	(0.035)	(0.035)
Health Situation	0.501***	0.500***	0.499***	0.501***	0.501***	0.500***
	(0.024)	(0.022)	(0.022)	(0.024)	(0.024)	(0.024)
Financial Situation	0.399***	0.409***	0.407***	0.399***	0.397***	0.398***
	(0.021)	(0.019)	(0.019)	(0.021)	(0.021)	(0.021)
ISCED levels	-0.098***	-0.092***	-0.093***	-0.097***	-0.100***	-0.098***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Married	0.073***	0.049	0.048	0.081*	0.078*	0.078*
	(0.044)	(0.041)	(0.041)	(0.044)	(0.044)	(0.044)
Age	-0.064***	-0.064***	-0.063***	-0.062***	-0.062***	-0.062***
	(0.007)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Age Squared	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Employed	0.108**	0.124***	0.127***	0.106**	0.109**	0.107**
	(0.047)	(0.044)	(0.044)	(0.047)	(0.047)	(0.047)
England	-0.053	-0.049	-0.039	-0.043	-0.041	-0.042
	(0.036)	(0.033)	(0.033)	(0.036)	(0.036)	(0.036)
Voluntary	0.068***	0.068***	0.061***	0.068***	0.060***	0.063***
	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)
Homosexual	-0.009	-0.016	-0.010	-0.012	-0.006	-0.008
	(0.017)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)
Stress	-0.282***	-0.318***	-0.316***	-0.281***	-0.284***	-0.283***
	(0.084)	(0.080)	(0.080)	(0.084)	(0.084)	(0.084)
Disability	-0.230***	-0.267***	-0.264***	-0.230***	-0.228***	-0.229***
	(0.056)	(0.051)	(0.051)	(0.056)	(0.056)	(0.056)
Risks	0.076***	0.071***	0.072***	0.075***	0.076***	0.076***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Log Likelihood	-17193.442	-19715.828	-19713.917	-17197.877	-17191.926	-17194.911
Pseudo R-squared	0.0501	0.0520	0.0522	0.0498	0.0502	0.0500
Observations	10654	12189	12190	10654	10654	10654

Notes: Standard errors, in parenthesis, are robust to heteroskedasticity and autocorrelation. ***, ** and * indicate coefficients significant at the 1%, 5% and 10% levels, respectively.

Table 6: Marginal effects of religious variables in ordered logit estimation.

Social Life Satisfaction:	1	2	3	4	5	6	7
Religion	-0.002**	-0.004***	-0.008***	-0.014***	-0.001*	0.016***	0.012***
	0.001	0.001	0.002	0.004	0	0.005	0.004
Beliefs	-0.001*	-0.003*	-0.007*	-0.012*	-0.002	0.014*	0.011*
	0.001	0.001	0.003	0.006	0.001	0.007	0.005
Attendance	-0.003***	-0.006***	-0.013***	-0.023***	-0.004*	0.027***	0.022***
	0.001	0.001	0.003	0.006	0.002	0.007	0.006
Religion*Beliefs	-0.001	-0.003	-0.006	-0.01	-0.001	0.012	0.009
	0.001	0.002	0.004	0.007	0.001	0.008	0.006
Religion*Attendance	-0.003***	-0.007***	-0.015***	-0.028***	-0.006*	0.033***	0.026***
	0.001	0.002	0.004	0.007	0.003	0.009	0.008
Complete Religious	-0.003**	-0.006**	-0.014**	-0.025**	-0.005	0.029**	0.023**
	0.001	0.002	0.004	0.009	0.003	0.01	0.009

Notes: Standard errors, in parenthesis, are robust to heteroskedasticity and autocorrelation. ***, ** and * indicate coefficients significant at the 1%, 5% and 10% levels, respectively

Table 7: Social Life Satisfaction – 1-to-1 PS Matching

	Religion	Beliefs	Attendance
ATT	0.0359*** (0.0092)	0.0195*** (0.0157)	0.0496*** (0.0165)
PS test	0.000***	0.704	0.940

	Religious*Beliefs	Religious*Attendance	Complete Religious
ATT	0.0182 (0.0197)	0.0516** (0.0209)	0.0546** (0.0248)
PS test	0.987	0.740	0.974

Standard Errors in parentheses. ***, ** and * indicate coefficient significant at the 1%, 5% and 10% levels, respectively. PS test is a test on the balancing of the variablesbetween treated group and control group, distributed as chi-square under the null of balancing.

Table 8: Robustness –Life Satisfaction

	Satisfaction (1-7)		Satisfaction (0-1)		
	OLS	Fixed Effects	OLS	Fixed Effects	Logit
	(1)	(2)	(3)	(4)	(5)
Religious	0.071***	0.065*	0.007	0.008	0.043
	(0.023)	(0.037)	(0.008)	(0.014)	(0.056)
Beliefs	0.100***	0.045	0.022**	0.028	0.178**
	(0.031)	(0.053)	(0.010)	(0.020)	(0.078)
Attendance	0.141***	-0.079	0.041***	-0.023	0.337***
	(0.032)	(0.068)	(0.011)	(0.023)	(0.087)
Religious*Beliefs	0.087**	0.020	0.016	0.015	0.145
	(0.038)	(0.071)	(0.013)	(0.025)	(0.096)
Religious*Attendance	0.182***	0.056	0.042***	0.003	0.380***
	(0.039)	(0.083)	(0.013)	(0.029)	(0.114)
Complete Religious	0.197***	0.093	0.043***	0.026	0.416***
	(0.045)	(0.094)	(0.015)	(0.032)	(0.134)

Notes: Standard errors, in parenthesis, are robust to heteroskedasticity and autocorrelation. Clustered standard errors in Fixed Effects estimation are considered. ***, ** and * indicate coefficients significant at the 1%, 5% and 10% levels, respectively. Coefficients of the explanatory variables have been omitted here but are available on request. Columns 1 and 2 consider Life Satisfaction as a 1 to 7 scale value variable, columns 3, 4 and 5 consider Life Satisfaction as dummy variable.

Table 9: Robustness – Social Life Satisfaction

	Satisfaction (1-7)		Satisfaction (0-1)		
	OLS	Fixed Effects	OLS	Fixed Effects	Logit
	(1)	(2)	(3)	(4)	(5)
Religious	0.085***	0.094**	0.027***	0.031**	0.132***
	(0.027)	(0.044)	(0.009)	(0.016)	(0.047)
Beliefs	0.063***	0.056	0.015	0.044**	0.089
	(0.037)	(0.063)	(0.012)	(0.022)	(0.064)
Attendance	0.138***	-0.052	0.043***	0.027	0.244***
	(0.038)	(0.088)	(0.013)	(0.029)	(0.071)
Religious*Beliefs	0.052	0.054	0.007	0.051*	0.051
	(0.045)	(0.080)	(0.015)	(0.028)	(0.078)
Religious*Attendance	0.187***	0.045	0.057***	0.046	0.345***
	(0.046)	(0.109)	(0.015)	(0.038)	(0.092)
Complete Religious	0.165***	-0.053	0.048**	0.025	0.305***
	(0.054)	(0.119)	(0.018)	(0.040)	(0.108)

Notes: Standard errors, in parenthesis, are robust to heteroskedasticity and autocorrelation. Clustered standard errors in Fixed Effects estimation are considered. ***, ** and * indicate coefficients significant at the 1%, 5% and 10% levels, respectively. Coefficients of the explanatory variables have been omitted here but are available on request. Columns 1 and 2 consider Social Life Satisfaction as a 1 to 7 scale value variable, columns 3, 4 and 5 consider Social Life Satisfaction as dummy variable.