Estimating the effect on happiness through question randomization: An application to blood donation

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Abstract

We rely on the randomized activation of the heuristic of attribute substitution to analyze the effect of blood donation on donors' happiness. We randomly delivered two versions of a questionnaire where the happiness question is alternatively placed immediately before or after a categorical question asking about the blood donor condition of the respondent (non-donor, previously donor, donor). By comparing the answers given to the happiness question in the two versions, we find a positive effect of donating blood on donors' happiness. We discuss the pros and cons of this method to investigate the determinants of subjective well-being.

Keywords: Attribute substitution, Blood donation, Happiness, Pro-social behavior, Subjective well-being

JEL: C21, C93, D61, D64, I31

1. Introduction

The use of happiness questions based on the Cantril ladder and its variations to measure subjective well-being has gone along with the debate on their reliability. It is well known that responses to these questions can be biased by several factors. Besides the biases commonly affecting responses in surveys (socially desirable responding, acquiescence, moderacy response bias and extreme response bias), possibly associated with cultural factors (e.g., Brulé and Veenhoven, 2017), it has been shown that subjects' evaluation of overall happiness can be affected by recent events (e.g., Kahneman et al., 1993) and weather conditions (e.g., Feddersen et al., 2016). The evidence also shows that self-reported life satisfaction tends to fluctuate over short periods of time (Kahneman and Krueger, 2006) and its variability has cast doubts on the comparability across countries (e.g., Ferrer-i Carbonell and Frijters, 2004).

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In addition, when the happiness question is preceded by a question that reminds the subject of some emotion within the happiness domain, the latter may be used to formulate an overall assessment on the former (Strack et al., 1988; Kahneman and Frederick, 2002). In this case, the satisfaction elicited by an emotional question concerning, for example, interpersonal relations or the personal financial situation, affects the general evaluation on happiness (e.g., Brulé and Veenhoven, 2017). According to Tversky and Kahneman (1973, 1974), this process has its roots in the heuristics of representativeness and availability. Kahneman and Frederick (2002) refer to it as the heuristic of attribute substitution.

All these issues have induced several researchers to question the reliability of the data retrieved from happiness questions (Kahneman and Krueger, 2006; Deaton and Stone, 2013). Nowadays, the use of happiness questions is usually accepted for studying the dynamics and determinants of happiness in populations homogeneous in terms of socio-economic and cultural characteristics, as in representative samples the idiosyncratic impacts of irrelevant determinants are likely to be averaged out, while their limits are regarded as more compelling when the focus is on individual level data (Kahneman and Krueger, 2006).

Looking at the heuristic of attribute substitution as a source of potential biases has prevented researchers from exploiting it as a method to investigate the determinants of happiness. We suggest that relying on the randomized activation of this heuristic might be sometimes a fruitful strategy to detect particularly suitable factors affecting individual happiness. We discuss the pros and cons of this method and the limits of its applicability.

In this paper, we apply the method to study the effect of blood donation on donors' happiness. Our analysis aims at increasing our understanding of the determinants of life satisfaction and at shedding light on the motivations behind blood donation.

Blood donation plays a key role in national health systems (see, for instance, WHO, 2007) and has received a lot of attention in the socio-economic and psychological literature. It was precisely Titmuss' (1970) work on blood donations that suggested to economists that policies based on explicit economic incentives could have counterproductive effects (Bowles and Polania-Reyes, 2012). By comparing two different systems of blood collection and allocation (Great Britain and United States), Titmuss (1970) argues that a non-market system where blood is supplied by voluntary unpaid donors and used for free works better than a system mostly based on monetary incentives. The debate that started after the publication of this work (see, for instance, Steiner, 2003) is connected with the subsequent analyses on the role of social preferences in economics and the crowding out effect of economic incentives on intrinsic motivations (e.g., Frey and Jegen, 2001).

Despite the key role played by blood donation in this literature, the studies on this topic have been virtually confined within the analysis of motivations to donate and on the incentives that may favor donations (e.g., Mellström and Johannesson, 2008; Chell et al., 2018; Goette and Stutzer, 2020). To the best of our knowledge, the analysis of the effect of blood donation on donors' happiness has received no attention. In fact, the only exception is Borgonovi (2008), who uses observational survey data to investigate the effect of volunteering on health and happiness, and she does not find any significant impact of blood donation on self-reported happiness.

By providing empirical evidence based on a randomization technique of a positive effect of blood donation on individual happiness, our paper makes a step forward in improving our understanding on the effect of blood donation on subjective well-being, adding to the existing literature on the effect of donating on happiness, which has mainly

focused on time and money donations.

The rest of the paper is organized as follows. In Section 2, we review the literature on blood donation and discuss the possible relation between blood donation and happiness. In Section 3, we describe the heuristic of attribute substitution and discuss how it can be randomly elicited in questionnaires to study some particularly suitable determinants of happiness, discussing also the relative pros and cons of this method. In Section 4, we describe the data and the empirical application. Section 5 summarizes the main results. Section 6 concludes.

2. Blood donation and happiness

Blood donation could positively impact on individual happiness for both intrinsic and extrinsic reasons. Following Deci (1971, p. 105), an individual is "intrinsically motivated to perform an activity when (she) receives no apparent reward except the activity itself". People may feel a 'warm glow' from donating blood, which could be self-rewarding: they obtain some private benefit from giving *per se*, independently from the consequences of the act (Andreoni, 1990; Meier and Stutzer, 2008). Donations may be motivated by extrinsic reasons as well, such as prestige motives and the pursue of social recognition (Harbaugh, 1998; Meier and Stutzer, 2008; Bekkers and Wiepking, 2011). Both prestige and social approval may be valuable in itself or for they are positively associated with future rewards from interaction with other people. Moreover, people may care about the receivers' situation and the consequences of donations for them because of altruistic preferences (Andreoni, 2006). In this case, the utility of altruistic individuals positively depends on the other agents' utility (Fehr and Schmidt, 2006).

Since Titmuss (1970), blood donation has in fact played a pivotal role in the analysis of the interaction between intrinsic and extrinsic motivations and the crowding out effect of economic incentives on intrinsic motivations. In fact, although there is empirical evidence of motivation crowding out in specific contexts (Frey and Jegen, 2001), a recent survey by Chell et al. (2018) shows that it is not conclusive for blood donation. This holds true also when one considers the recent experimental results, which show that external incentives may have positive as well as negative effects on donations (Mellström and Johannesson, 2008; Goette and Stutzer, 2020).

As a matter of fact, blood donation strictly relates to other donation activities, such as, for instance, time donation through volunteering and membership in voluntary associations, and money donation.

As far as volunteering and associational membership are concerned, they reveal mixed effects on happiness. In particular, Bjørnskov (2006) reports a negative partial correlation between life satisfaction and associational activity in Latin American countries; whereas Bjørnskov (2008) finds no relation in the USA between life satisfaction and a composite index of social activities. Using micro-level data, Borgonovi (2008) shows that people who volunteer report greater happiness than people who do not, and Meier and Stutzer (2008) provide empirical evidence of a positive effect of volunteering on life satisfaction. Rodríguez-Pose and von Berlepsch (2014) show that formal engagement in Putnam-type associational activities (social meets, volunteering, church attendance) increases individual well-being, while participation in Olson-type group shows either positive (trade unions and professional organizations), or negative effects (political associations) on happiness.

As for money donation, Dunn et al. (2008) and Aknin et al. (2013) provide evidence that spending money for others and donating money to charity organizations increases happiness, although others (e.g., Wang and Graddy, 2008; Boenigk and Mayr, 2016) have stressed the issue of reverse causality, where the causal relation runs from happiness to money donation.

More generally, several personal, demographic, socio-economic and institutional factors have been shown to be associated with individual happiness and to interact with the happiness effect of pro-social behavior: personality traits (e.g., Furnham and Cheng, 1997; Ruiz, 2005; Demır and Weitekamp, 2007); age (e.g., Blanchflower and Oswald, 2008; Frijters and Beatton, 2012; Wunder et al., 2013; Laaksonen, 2018); health (e.g., Gerdtham and Johannesson, 2001; Graham, 2008; Sabatini, 2014); education (e.g., Gerdtham and Johannesson, 2001; Cuñado and de Gracia, 2012; Nikolaev and Rusakov, 2016); religiosity (e.g., Stark and Maier, 2008; Sahraian et al., 2013; Francis et al., 2017; Frey, 2018); income (e.g., Clark and Oswald, 1996; Frey and Stutzer, 2002; Blanchflower and Oswald, 2004; Boes and Winkelmann, 2010; Powdthavee, 2010); marital status (e.g., Gerdtham and Johannesson, 2001; Stutzer and Frey, 2006); having children (e.g., Cetre et al., 2016); social capital (e.g., Leung et al., 2011; Rodríguez-Pose and von Berlepsch, 2014); unemployment (e.g., Clark and Oswald, 1994; Di Tella et al., 2001; Frey and Stutzer, 2002); inflation (e.g., Di Tella et al., 2001; Frey and Stutzer, 2002); economic and political freedom (e.g., Veenhoven, 2000; Frey and Stutzer, 2002); democratic participation (e.g., Frey and Stutzer, 2000, 2002).

To study the effect on subjective well-being of these factors, what is usually done in the empirical literature based on survey data is to estimate a (possibly non-parametric or semi-parametric) conditional expectation function of happiness, that depends on the (presence and/or the level of the) factor to be analyzed and several other variables correlated with it and individual happiness, and then to compare the difference in the expected happiness between individuals conditional on the factor, averaging out the confounding variables.

In fact, a common issue in these studies is endogeneity for self-selection and reverse causality. Marriage, unemployment, donating time and money are just a few examples of variables that are correlated with happiness and might both affect happiness or be affected by it. In this respect, blood donation is a case in point. Although analyses based on instrumental variables, structural equation models or panel data models can somehow deal with the issue, these models require longitudinal data and/or additional assumptions.

In the following section, we discuss how the heuristic of attribute substitution may be exploited to overcome the issue in a cross-sectional setting.

3. Exploiting the heuristic of attribute substitution to investigate possible determinants of happiness

"Attribute substitution occurs when the target attribute is assessed by mapping the value of another attribute on the target scale" (Kahneman and Frederick, 2002, p. 54). This heuristic affects judgment when the following three conditions are satisfied: i) the attribute to be evaluated is relatively inaccessible; ii) another semantically and associatively attribute is highly accessible; iii) the substitution in the judgment provided by the heuristic is not rejected by the reflective system (Kahneman and Frederick, 2002).

Strack et al. (1988) provide an example of this heuristic in the domain of happiness. The authors consider a survey question asking respondents to rate how happy they are with life in general and a question about how often they normally go out on a date. The authors show that the correlation between the level of happiness and the frequency of dates is not significantly different from zero when the happiness question precedes the other one, while it becomes highly significant when the order of the two questions is reversed.

In Strack et al. (1988), some specific characteristics of the two questions and of their randomization had allowed the heuristic to be effective. The happiness question asks about the overall life satisfaction ("How happy are you with life in general?"). This evaluation is a difficult task to accomplish and this satisfies the first condition for the heuristic of attribute substitution. The question concerning the substitute attribute ("How often do you go out on a date?") is asked immediately before the happiness question. The proximity of the two questions favors the availability of the substitute attribute. The evocation of an effect in the happiness domain is a necessary condition to make the attribute semantically and associatively related to the target: only the phenomena that elicit emotions concerning happiness are good candidates as substitute attributes for the evaluation of overall happiness. Thus, the respondent's evaluation of happiness in the specific domain of dating life becomes a candidate as the heuristic attribute when the subsequent happiness question is asked.

The effect of the heuristic of attribute substitution can be reduced or prevented by the activation of the reflective system. In this regard, Strack et al. (1988, p. 434) show that the correlation between reported general happiness and date frequency is strongly reduced when the two questions are formulated within a conversation context introduced by: "Now, we would like to learn about two areas of life that may be important for people's overall well-being". Similarly, Schwarz and Clore (1983) show that happiness evaluations are affected by respondent's mood elicited by asking for descriptions of a recent happy or sad event in their lives or by interviewing them on rainy or sunny days. However, the authors show that, in case of bad mood, the negative impact on the judgments of their lives disappears when respondents are induced to connect their present feelings to transient external and irrelevant sources.

Despite its possible role in identifying some suitable factors affecting overall happiness, the heuristic of attribute substitution has not been exploited to this aim, although, when the conditions for the heuristic are satisfied, its activation through question randomization could help analyze the effect of these factors. In fact, the main advantage of the randomized activation of the heuristic of attribute substitution through question randomization is that it allows to overcome the issues of reverse causality and selection bias discussed at the end of Section 2, whereas its main shortcoming seems to be the impossibility to provide a precise estimate of the effect on happiness. The reason is that, for the very same activation of the heuristic, the answers to the happiness question placed before and after the question concerning the substitute attribute are not perfectly comparable. This is also the reason why the approach should be used with caution and a general application of this method to study any determinant is not warranted.

Keeping this in mind, in what follows we show an empirical application of the randomized activation of the heuristic of attribute substitution to investigate the impact of blood donation on subjective well-being.

Table 1: Descriptive statistics

Variable	Description	Obs	Mean	SD	Q1	Median	Q3	Mode	Min	Max
Happiness (h)	"As a whole, would you say that you are a happy person? Please reply considering the following range between: 1 – not at all – and 10 – totally."	2,635	7.30	1.76	7	8	8	8	1	10
Blood donor (D)	"Are you or have you ever been a blood donor?" 0=No (Non-donor); 1=Yes, I was (Previously donor); 2=Yes, I am (Donor).	2,635	1.17	0.95	0	2	2	2	0	2
After (A)	Dummy=1 if in the questionnaire the happiness question is located immediately after the question on blood donation.	2,635	0.50	0.50	0	0	1	0	0	1
Avis mailing list	Dummy=1 if the respondent was subscribed to the mailing list of Avis.	2,635	0.49	0.50	0	0	1	0	0	1
Female	Dummy=1 if female.	2,635	0.57	0.49	0	1	1	1	0	1
Age	Age	2,633	32.7	13.3	21	27	43	20	18	70
Openness	Variable ranging from 1 (conservative/traditional) to 4 (creative/ curious).	2,604	2.91	0.40	2.69	2.86	3.14	3	1	4
Conscientiousness	Variable ranging from 1 (disorganized/careless) to 4 (organized/ mindful of details).	2,605	3.25	0.48	3	3.25	3.6	3	1.2	4
Extraversion	Variable ranging from 1 (solitary/introverted) to 4 (sociable/outgoing).	2,609	2.97	0.51	2.6	3	3.4	3	1	4
Agreeableness	Variable ranging from 1 (manipulative /competitive) to 4 (empathetic/cooperative).	2,607	3.26	0.44	3	3.25	3.6	3	1	4
Neuroticism	Variable ranging from 1 (emotionally stable/resilient) to 4 (moody/anxious).	2,607	2.64	0.59	2.25	2.67	3	3	1	4
Subjective health	1=Poor; 2=Fair; 3=Good; 4=Very good.	2,622	3.12	0.70	3	3	4	3	1	4
Place of birth	0=Abroad; 1=North; 2=Center; 3=South.	2,606	1.26	0.73	1	1	1	1	0	3
Close friends	Number of close friends (no relatives)	2,603	5.46	8.64	3	4	5	3	0	100
Children	Dummy=1 if the respondent has children.	2,599	0.28	0.45	0	0	1	0	0	1
Graduate	Dummy=1 if the respondent is graduated.	2,595	0.35	0.48	0	0	1	0	0	1
Believer	Dummy=1 if the respondent believes in a religion; =0 if agnostic or an atheist.	2,306	0.58	0.49	0	1	1	1	0	1
Marital status	1=Single; 2=Couple; 3=Married; 4=Separated; 5=Divorced; 6=Widowed.	2,294	-	-	1	1	3	1	1	6
Financial condition	1=Really bad; 2=Bad; 3=Acceptable; 4=Comfortable.	2,258	3.08	0.60	3	3	3	3	1	4
Unemployed	Dummy=1 if the respondent is unemployed.	1,342	0.06	0.23	0	0	0	0	0	1

4. Data and method

The empirical analysis is based on an original dataset collected through an anonymous online survey in 2019. Questionnaires were delivered via email to the following mailing lists: i) students (undergraduate, master and Ph.D.) at the University of Parma (36,002 emails); ii) Avis (Associazione Volontari Italiani Sangue), the Italian association for the collection of blood donation, in the Province of Parma (11,168 emails). The link to the questionnaire was sent with a brief accompanying text reporting that it was elaborated by professors at the University of Parma for a research project with no details on the project. The questionnaire has a total of 57 questions, but respondents were asked only part of them, for the presence of filter questions, in particular concerning the condition of blood donor. On average, it took about 10 minutes to be completed.

Two versions of the questionnaire were randomly delivered. They differed only for the relative position of the happiness question ("As a whole, would you say that you are a happy person? Please reply considering the following range between 1 – not at all – and 10 – totally") with respect to the categorical question about blood donation to identify non donors, donors and previously donors ("Are you currently a blood donor or have you been a blood donor in the past? a. No; b. Yes, I am; c. Yes, I was"). In a version of

the questionnaire, the happiness question was placed immediately before the question on blood donation, where, in the other version, the former question was placed immediately after the latter.

A total of 3,707 questionnaires were returned, out of which 2,635 were usable as they had responses for both the happiness question and the question on blood donation. About half of the usable questionnaires came from subjects listed in the mailing list of Avis (49%). Table 1 reports the descriptive statistics for all the variables we use in the analysis, along with their description and the number of valid observations in the sample of usable questionnaires: gender; region of birth (outside Italy, North, Center and South Italy); age; the 'Big Five' personality traits computed following Smith et al. (2013) (openness, conscientiousness, extraversion, agreeableness and neuroticism); self-assessed subjective state of health (poor, fair, good and very good); self-assessed financial condition (really bad, bad, acceptable, comfortable); employment condition (employed or inactive vs. unemployed); marital status (single, couple, married, separated, divorced, widowed); the number of the respondent's close friends, with the exclusion of relatives; if the respondent has one or more children; if the respondent believes in a religion or instead she declares herself agnostic or an atheist.

About half of the usable questionnaires have the happiness question placed immediately after the question on blood donation (After = 1). As the version of the questionnaire was randomly assigned, the associated dummy is not correlated neither with the question on blood donation nor with the other variables possibly correlated with happiness. This is shown in Table 2 that reports, for each covariate, subsample means, standard errors and sample sizes by blood donor condition and relative placement of the happiness question, along with t tests testing for balance between 'before' and 'after' groups in each blood donor condition. The results show that the randomization in the administration of the questionnaires was effective in generating subsamples balanced along the different relevant observed characteristics in each category (non-donors, previously donors and donors).

To analyze the impact of blood donation on happiness, we estimate the following equation by OLS:

$$h_i = \alpha + \mathbf{x}_i\boldsymbol{\beta} + \sum_{k=1}^{2} \gamma_k D_{ki} + \sum_{k=0}^{2} \delta_k I_{ki} + \epsilon_i \tag{1}$$

where: h_i is the self-reported happiness of individual i; D_{ki} ($k \in \{0, 1, 2\}$) are dummies taking value 1 if the respondent is, respectively, not a blood donor (D_{0i}), she was a blood donor in the past (D_{1i}), or she is a blood donor (D_{2i}); I_{ki} is the indicator variable of the event $D_{ki} = 1$ and $A_i = 1$, where A_i is the dummy that takes value 1 if in the version of the questionnaire delivered to i the happiness question is placed immediately after the question on blood donation and 0 if it is instead placed immediately before the question on blood donation; $\mathbf{x}_i$ is a vector of controls, a subset of the variables listed in Table 1; ϵ_i is the independently distributed random term.

Eq. (1) is a full factorial model as far as the condition of blood donor and the relative placement of the question on blood donation are concerned. To detect the effect of blood donation on subjective well-being, we analyze the differences in self-reported happiness within each category of blood donor (non-donors, previously donors and donors) between the subjects who saw the happiness question after the question on blood donation and

Table 2: Means and balance tests for covariates by blood donor condition on relative placement of the happiness question with respect to the question on blood donation (before-after)

		Non-donors (0)			Previously donors (1)			Donors (2)		
		Before (b)	After (a)	$\mu_{0a} - \mu_{0b}$	Before (b)	After (a)	$\mu_{1a} - \mu_{1b}$	Before (b)	After (a)	$\mu_{2a} - \mu_{2b}$
Avis mailing list	Mean (μ)	0.016	0.022	0.007	0.323	0.438	0.115	0.846	0.822	-0.024
	Std. err.	0.124	0.148	0.009	0.470	0.499	0.071	0.361	0.383	0.020
	Obs	511	494	1005	99	89	188	713	729	1442
Female	Mean (μ)	0.726	0.733	0.007	0.586	0.640	0.055	0.473	0.436	-0.036
	Std. err.	0.446	0.443	0.028	0.495	0.483	0.071	0.500	0.496	0.026
	Obs	511	494	1005	99	89	188	713	729	1442
Age	Mean (μ)	24.00	24.09	0.093	33.96	33.63	-0.330	38.72	38.57	-0.150
	Std. err.	7.20	7.42	0.461	13.91	12.07	1.909	13.11	13.43	0.699
	Obs	511	493	1004	99	89	188	712	729	1441
Openness	Mean (μ)	2.967	2.980	0.013	2.909	2.846	-0.063	2.853	2.880	0.026
	Std. err.	0.395	0.384	0.025	0.393	0.459	0.062	0.422	0.387	0.021
	Obs	509	490	999	99	88	187	701	717	1418
Conscientiousness	Mean (μ)	3.181	3.220	0.039	3.201	3.217	0.016	3.294	3.293	-0.001
	Std. err.	0.491	0.520	0.032	0.387	0.522	0.067	0.468	0.457	0.025
	Obs	507	490	997	99	88	187	702	719	1421
Extraversion	Mean (μ)	2.918	2.919	0.001	2.991	2.973	-0.018	3.009	3.011	0.002
	Std. err.	0.530	0.543	0.034	0.535	0.511	0.077	0.467	0.488	0.025
	Obs	509	491	1000	99	89	188	703	718	1421
Agreeableness	Mean (μ)	3.238	3.286	0.047	3.270	3.282	0.012	3.247	3.273	0.026
	Std. err.	0.420	0.453	0.028	0.450	0.449	0.066	0.460	0.414	0.023
	Obs	508	493	1001	99	89	188	701	717	1418
Neuroticism	Mean (μ)	2.738	2.714	-0.023	2.698	2.741	0.043	2.550	2.586	0.036
	Std. err.	0.589	0.570	0.037	0.571	0.589	0.085	0.585	0.608	0.032
	Obs	510	491	1001	99	88	187	700	719	1419
Subjective health	Mean (μ)	2.092	2.078	-0.014	1.948	2.146	0.198	2.149	2.175	0.026
	Std. err.	0.761	0.712	0.047	0.808	0.649	0.108	0.671	0.647	0.035
	Obs	510	489	999	97	89	186	712	725	1437
Place of birth:	Mean (μ)	0.747	0.707	-0.041	0.673	0.773	0.099	0.864	0.858	-0.005
North of Italy	Std. err.	0.435	0.456	0.028	0.471	0.421	0.066	0.343	0.349	0.018
	Obs	499	484	983	98	88	186	711	726	1437
Close friends	Mean (μ)	5.045	4.949	-0.096	6.444	4.386	-2.058	5.643	5.902	0.259
	Std. err.	6.986	7.198	0.449	14.243	3.917	1.569	7.596	10.703	0.493
	Obs	508	489	997	99	88	187	703	716	1419
Children	Mean (μ)	0.034	0.039	0.005	0.263	0.330	0.067	0.452	0.449	-0.002
	Std. err.	0.181	0.194	0.012	0.442	0.473	0.067	0.498	0.498	0.026
	Obs	503	486	989	99	88	187	704	719	1423
Graduate	Mean (μ)	0.268	0.286	0.018	0.469	0.442	-0.028	0.366	0.395	0.029
	Std. err.	0.443	0.453	0.029	0.502	0.500	0.074	0.482	0.489	0.026
	Obs	496	482	978	98	86	184	711	722	1433
Believer	Mean (μ)	0.530	0.462	-0.068*	0.583	0.513	-0.071	0.627	0.653	0.026
	Std. err.	0.500	0.499	0.034	0.496	0.503	0.079	0.484	0.476	0.027
	Obs	434	418	852	84	78	162	646	646	1292
Marital status:	Mean (μ)	0.866	0.829	-0.038	0.637	0.450	-0.187*	0.392	0.361	-0.032
Single	Std. err.	0.341	0.377	0.026	0.483	0.501	0.075	0.489	0.481	0.026
	Obs	389	368	757	91	80	171	673	693	1366
Financial	Mean (μ)	2.090	2.069	-0.021	1.938	2.070	0.132	2.092	2.082	-0.010
condition	Std. err.	0.605	0.630	0.043	0.713	0.640	0.111	0.575	0.588	0.033
	Obs	423	404	827	81	71	152	633	646	1279
Unemployed	Mean (μ)	0.052	0.056	0.004	0.089	0.000	-0.089*	0.070	0.049	-0.022
	Std. err.	0.222	0.230	0.021	0.288	0.000	0.044	0.256	0.215	0.017
	Obs	232	215	447	56	42	98	385	412	797

Significance levels for differences: $^*p < .05$; $^{**}p < .01$; $^{***}p < .001$.

those who did not:

$$\mathbb{E}(h \mid A = 1, D_k = 1) - \mathbb{E}(h \mid A = 0, D_k = 1) = \delta_k \tag{2}$$

In particular, if the act of donating blood has got a positive effect on subjective well-being, we expect this difference to be positive and statistically significant for donors ($\delta_2 > 0$), while negative or not significantly different from zero for non-donors ($\delta_0 \leq 0$).

In fact, under the assumption that the expected effect of blood donation on subjective well-being is the same for all the people, if δ_2 is positive we can conclude that blood donation would have got a positive effect for all, whereas if we relax this assumption we can conclude that it has a positive effect on well-being at least for the donors.

By estimating Eq. (1) via OLS, we treat the dependent variable as though it were continuous, although the happiness question gives rise to a discrete variable with ten categories, and we implicitly interpret happiness scores as cardinal and comparable across respondents (Ferrer-i Carbonell and Frijters, 2004).

To cope with these issues, an alternative approach, usually followed in the economic literature on happiness and job satisfaction, is to adopt a random utility model for the non observed (latent) level of subjective well-being and assume the existence of a monotonically non-decreasing step function to be estimated that relates actual to reported subjective well-being (e.g., Blanchflower and Oswald, 2004), or treat self-reported happiness as an ordinal variable (e.g., Winkelmann and Winkelmann, 1998; Frey and Stutzer, 2000), thus assuming only interpersonal ordinal comparability (Ferrer-i Carbonell and Frijters, 2004).

Applying the ordered latent-response model, the dependent variable in Eq. (1) can be thought of as the unobserved level of individual general satisfaction, which in turn can be considered "a positive monotonic transformation of an underlying metaphysical concept called welfare" (Ferrer-i Carbonell and Frijters, 2004, p. 643):

$$h_i^* = \alpha + \mathbf{x}_i\boldsymbol{\beta} + \sum_{k=1}^{2} \gamma_k D_{ki} + \sum_{k=0}^{2} \delta_k I_{ki} + \epsilon_i \tag{3}$$

This latent variable has got a deterministic as well as a random component (ϵ_i). The probability of a value j ($j \in \{1, 2 \ldots, 10\}$) for the happiness reported by individual i is then given by:

$$p_j(A, D_k, \mathbf{x}) = \Pr(h = j \mid A, D_k, \mathbf{x}) = \Pr(\kappa_{j-1} < h^* < \kappa_j \mid A, D_k, \mathbf{x}) \tag{4}$$

where κ_0 is defined as $-\infty$, κ_{10} as $+\infty$ and the other κs are cut points (or threshold parameters) to be estimated.

If we assume that the random component ϵ has a standard logistic (normal) distribution, Eq. (3) and (4) identify an ordered logit (probit) model (Wooldridge, 2010, Ch.16). These models rest on the parallel regression assumption. It is possible to partly relax this assumption by estimating generalized ordered logit models (Boes and Winkelmann, 2010; Williams, 2016), or multinomial logit models. The latter models completely ignore the ordinality of the dependent variable and treat it as nominal, thus implying a loss of efficiency but delivering consistent estimates also when the parallel regression assumption does not hold (Wooldridge, 2010).

Ordered latent-response models allow to acknowledge the discrete, ordered nature of the response variable, but coefficients have no straightforward interpretation in terms of

partial effects and are directly comparable neither across ordered probit/logit nor with OLS estimates. To study the effect of blood donation on happiness in these models, we compute and compare the Average Partial Effects (APEs) of placing the happiness question after the question on blood donation in each category (non-donors, previously donors and donors) on the predicted probabilities of happiness scores, i.e.:

$$\frac{1}{N}\sum_{i=1}^{N}\Big(\hat{p}_j(A=1,D_k=1,\mathbf{x}_i)-\hat{p}_j(A=0,D_k=1,\mathbf{x}_i)\Big) \tag{5}$$

for $j=1,2,\ldots,10$ and $k\in\{0,1,2\}$ and where N is the sample size.

To compare the results in these models with those in the OLS regressions (Eq. 2), we give a quantitative meaning to self-reported happiness, assume again interpersonal cardinal comparability, and compute the estimated partial effects on the conditional expectation of self-reported happiness (see Wooldridge, 2010, p. 655–658):

$$\begin{aligned}&\hat{\mathbb{E}}(h\,|\,A=1,D_k=1)-\hat{\mathbb{E}}(h\,|\,A=0,D_k=1)=\\&\quad\sum_{j=1}^{10}\sum_{i=1}^{N}\frac{j}{N}\Big(\hat{p}_j(A=1,D_k=1,\mathbf{x}_i)-\hat{p}_j(A=0,D_k=1,\mathbf{x}_i)\Big)\end{aligned} \tag{6}$$

5. Results

To start with, Table 3 summarizes the descriptive statistics for the responses to the happiness question in our sample by blood donor condition (non-donors, previously donors and donors) and relative placement of the happiness question with respect to the question on blood donation (immediately after vs. immediately before), along with standard errors and associated 95% confidence intervals (CIs) for the means. The same means and CIs are reported also in Figure 1, which shows the distribution of the variable in the six categories.

Mean self-reported happiness is higher for donors than previously donors and non-donors, and such difference is rather large (0.39 points) and statistically significant at the 0.1% level in the comparison between donors and non-donors (Table 3). Nonetheless, this evidence is not enough to support the claim that blood donation positively affects subjective well-being, because we are dealing with observational data and there is likely an issue of endogeneity for self-selection and reverse causality.

To overcome this issue, by exploiting the heuristic of attribute substitution, we compare the differences in mean happiness scores within each category (non-donors, previously donors and donors) across the two versions of the questionnaire (before vs. after), that were randomly delivered. In so doing, the mean self-reported happiness for the blood donors who received the questionnaire where the happiness question was placed immediately after the question on blood donation turns out to be 0.22 points higher than the same mean computed for the donors who received the other version of the questionnaire, where the happiness question was placed immediately before the question on blood donation, and the difference is statistically significant at the 5% level. On the contrary, when computed for non-donors and previously donors, the same difference is negative and not significantly different from zero.

Table 3: Statistics by blood donor condition and relative placement of the happiness question with respect to the question on blood donation with two-sample pooled t tests for equal means

		Obs	Mean (μ)	Std. err.	SD	95% CI
Non-donors (0)	Total	1,005	7.07	0.084	1.88	(6.95, 7.18)
	Before (b)	511	7.10	0.084	1.90	(6.93, 7.26)
	After (a)	494	7.04	0.059	1.86	(6.87, 7.20)
	$\mu_{0a} - \mu_{0b}$		-0.06	0.119		(-0.30, 0.17)
Previously donors (1)	Total	188	7.25	0.129	1.76	(7.00, 7.50)
	Before (b)	99	7.29	0.152	1.51	(6.99, 7.59)
	After (a)	89	7.20	0.213	2.01	(6.78, 7.63)
	$\mu_{1a} - \mu_{1b}$		-0.09	0.258		(-0.60, 0.42)
$\mu_1 - \mu_0$			0.18	0.148		(-0.11, 0.47)
Donors (2)	Total	1,442	7.46	0.044	1.65	(7.38, 7.55)
	Before (b)	713	7.35	0.062	1.65	(7.23, 7.48)
	After (a)	729	7.57	0.061	1.65	(7.45, 7.69)
	$\mu_{2a} - \mu_{2b}$		0.22*	0.087		(0.05, 0.39)
$\mu_2 - \mu_0$			0.39***	0.072		(0.25, 0.54)
$\mu_2 - \mu_1$			0.21	0.129		(-0.04, 0.47)

Significance levels for differences: $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$. In pairwise comparisons between non-donors, previously donors and donors, significance levels adjusted using the Bonferroni correction.

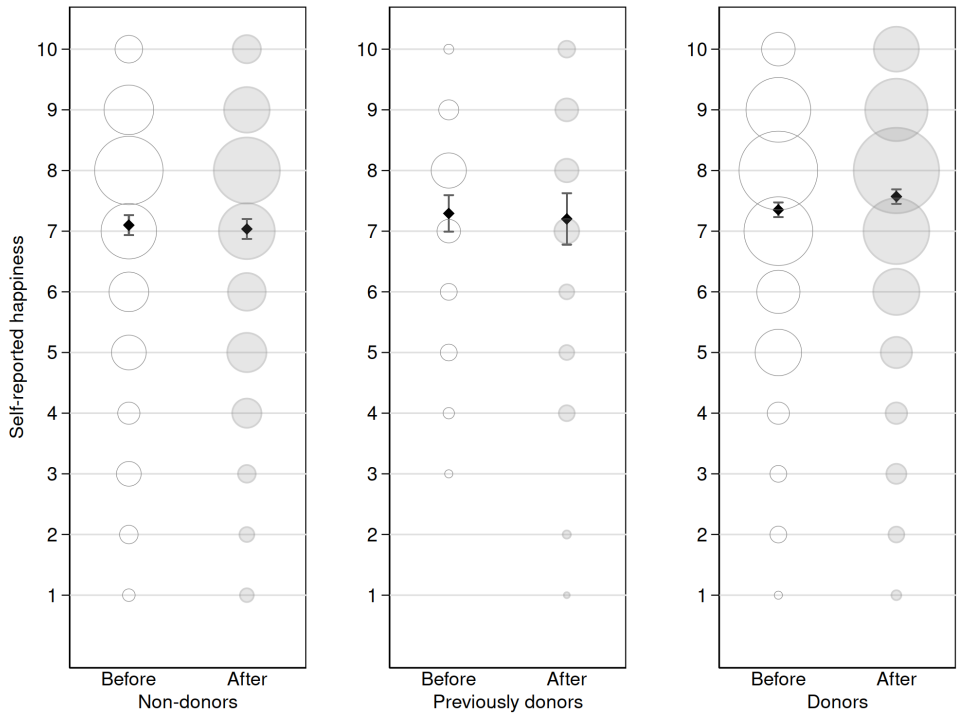


Figure 1: Distribution of responses to happiness question by blood donor condition and relative placement of the happiness question with respect to the question on blood donation. Circle sizes proportional to absolute frequencies and means in each group identified by black diamonds with error bars (95% CIs).

As for previously donors, aside from the smaller sample size (188 observations), the negative, although not statistically significant, difference in self-reported happiness in the two versions of questionnaires could be explained also by the fact that more than half of previously donors in our sample reported they stopped donating for health reasons. This fact might be reasonably expected to create an association in their mind between their worsened health condition and blood donation. By recalling their past experience as blood donors immediately before answering the happiness question, these individuals might thus be primed for the sad feelings associated with their worsened health condition.

Identical results of Table 3 can be obtained by running an OLS regression to estimate Eq. (1) with no controls (column (1) of Table 4).

By adding other covariates we can increase efficiency (as far as this does not decrease sample size) and check that the other determinants of happiness have the expected signs and significance. In particular, if we include the Avis dummy, a dummy equal to 1 if the respondent was subscribed to the mailing list of Avis, and the gender dummy (model 2), the point estimate of the partial effect on subjective well-being of blood donation for blood donors slightly increases (0.23) and the effect turns out statistically significant at the 1% level ('Donor $\wedge$ After' row of column (2) in Table 4).

In models 3-9, we include other covariates, reducing the sample size. In particular, in model (3), we control for age; in model (4), we add controls for personality traits and self-assessed subjective states of health; in model (5), we further add controls for place of birth, number of close friends, the presence of one or more children and education; in models (6) and (7), we include controls for the fact that the respondent believes in a religion and for marital status; finally, in models (8) and (9), we also control for self-assessed financial condition and employment condition. As far as age and the number of close friends are concerned, we include also the quadratic forms of the regressors (and the cubic form for age) to overcome functional misspecification issues revealed by test statistics. Such terms can actually account for the nonlinearities in the effect of these factors, of age in particular, usually pointed out in the empirical literature on the determinants of happiness (e.g., Demır and Weitekamp, 2007; Frijters and Beatton, 2012; Laaksonen, 2018).

In the models, the signs and significance of the estimated impacts are mostly in line with the literature on the determinants of happiness. In details, as far as personality traits are concerned, all personality variables but openness are significantly correlated with happiness. In particular, in line with previous studies, expected self-reported happiness negatively depends on neuroticism, while it positively depends on extraversion, agreeableness and conscientiousness, with the largest positive impact being exerted by extraversion (e.g., Furnham and Cheng, 1997; Ruiz, 2005; Demır and Weitekamp, 2007).

Expected self-reported happiness also positively depends on health, as expected (e.g., Gerdtham and Johannesson, 2001; Graham, 2008; Rodríguez-Pose and von Berlepsch, 2014; Sabatini, 2014), and on the fact that the subject has got children, a result consistent with the evidence discussed in Cetre et al. (2016) for our sample is made up of people living in a developed country with a relatively high household net income on average.

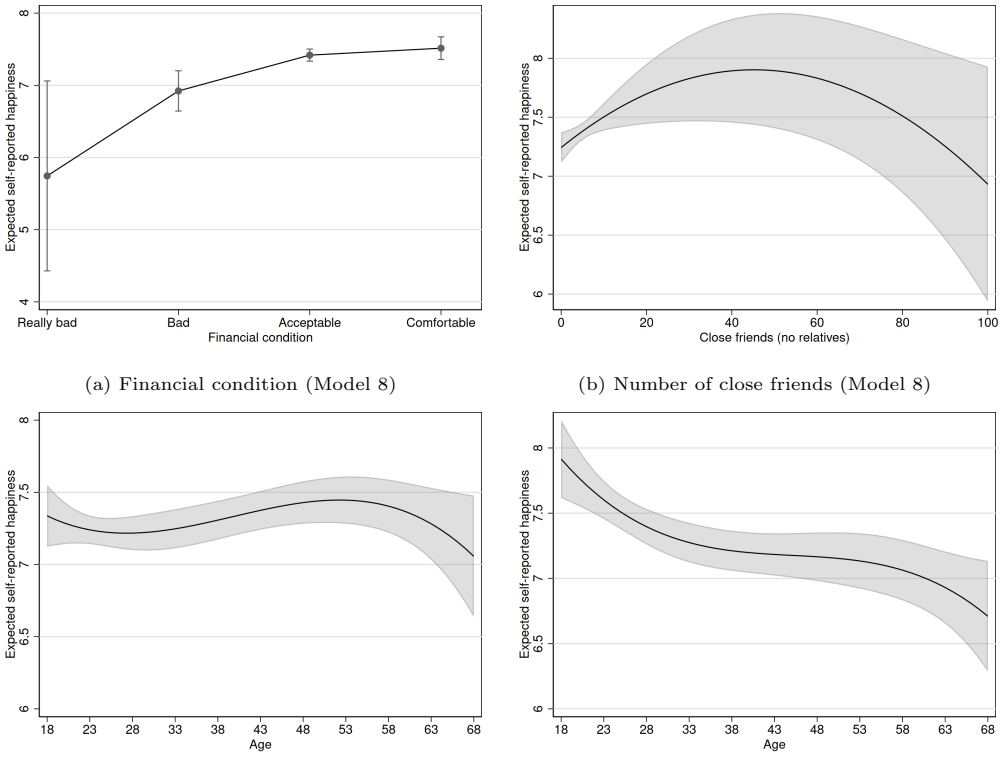
Furthermore, married individuals and those in couples tend to be significantly happier than singles (Frey and Stutzer, 2000, 2002; Rodríguez-Pose and von Berlepsch, 2014), whereas separated and widowed individuals report on average lower happiness scores, although the difference with respect to singles is not statistically significant.

As far as education is concerned, in contrast with, on the one side, Cuñado and

Table 4: OLS estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Avis mailing list (dummy)		0.447***	0.375**	0.211	0.195	0.161	0.187	0.122	-0.038
		(0.115)	(0.132)	(0.123)	(0.125)	(0.137)	(0.144)	(0.158)	(0.201)
Female (dummy)		0.141	0.150*	0.091	0.126	0.078	0.074	0.038	-0.009
		(0.074)	(0.075)	(0.070)	(0.071)	(0.076)	(0.078)	(0.085)	(0.120)
Age			0.0097*	0.0141**	-0.0024	-0.0045	-0.0179**	-0.0177*	-0.0230*
			(0.0049)	(0.0047)	(0.0056)	(0.0059)	(0.0065)	(0.0069)	(0.0093)
$(\text{Age} - \overline{\text{Age}})^2$			0.00060	0.00087*	0.00088	0.00070	0.00130*	0.00118*	0.00193**
			(0.00047)	(0.00042)	(0.00046)	(0.00049)	(0.00052)	(0.00055)	(0.00073)
$(\text{Age} - \overline{\text{Age}})^3$			-2.96e-5*	-4.65e-5***	-3.8e-5*	-2.92e-5	-3.5e-5*	-3.25e-5	-4.94e-5*
			(1.52e-5)	(1.38e-5)	(1.5e-5)	(1.58e-5)	(1.61e-5)	(1.71e-5)	(2.23e-5)
Openness				-0.088	-0.075	-0.091	-0.086	-0.107	-0.081
				(0.089)	(0.092)	(0.098)	(0.104)	(0.111)	(0.143)
Conscientiousness				0.162*	0.156*	0.196**	0.154	0.117	0.077
				(0.068)	(0.070)	(0.074)	(0.079)	(0.085)	(0.112)
Extraversion				0.931***	0.886***	0.853***	0.859***	0.918***	0.792***
				(0.072)	(0.075)	(0.080)	(0.085)	(0.091)	(0.119)
Agreeableness				0.205*	0.172*	0.154	0.128	0.125	0.227
				(0.083)	(0.085)	(0.091)	(0.093)	(0.098)	(0.127)
Neuroticism				-0.411***	-0.412***	-0.416***	-0.425***	-0.402***	-0.491***
				(0.058)	(0.059)	(0.063)	(0.065)	(0.070)	(0.098)
Subjective health: Poor				-	-	-	-	-	-
Fair				0.781*	0.839*	0.925*	0.876*	0.924*	0.369
				(0.356)	(0.365)	(0.391)	(0.402)	(0.402)	(0.480)
Good				1.494***	1.515***	1.567***	1.464***	1.418***	1.042*
				(0.345)	(0.354)	(0.378)	(0.390)	(0.389)	(0.458)
Very good				1.982***	1.978***	2.037***	1.916***	1.832***	1.384**
				(0.349)	(0.358)	(0.383)	(0.394)	(0.394)	(0.469)
Place of birth: North					-	-	-	-	-
Abroad					-0.033	0.140	0.114	0.127	-0.031
					(0.153)	(0.163)	(0.178)	(0.192)	(0.276)
Center					0.078	-0.037	-0.068	0.061	0.377
					(0.194)	(0.218)	(0.229)	(0.240)	(0.335)
South					-0.150	-0.147	-0.126	-0.123	-0.192
					(0.090)	(0.097)	(0.103)	(0.111)	(0.167)
Number of close friends					0.0258*	0.0340**	0.0334**	0.0292**	0.0229
					(0.0110)	(0.0111)	(0.0111)	(0.0112)	(0.0145)
Number of close friends^2					-0.00031*	-0.00041**	-0.00039**	-0.00032**	-0.00026
					(0.00013)	(0.00013)	(0.00013)	(0.00013)	(0.00016)
Children (dummy)					0.552***	0.534***	0.382**	0.382**	0.500**
					(0.102)	(0.109)	(0.122)	(0.129)	(0.172)
Graduate (dummy)					0.104	0.068	0.088	0.065	0.220
					(0.071)	(0.077)	(0.077)	(0.083)	(0.113)
Believer (dummy)						0.221**	0.164*	0.169*	0.164
						(0.071)	(0.075)	(0.081)	(0.112)
Marital status: Single							-	-	-
Couple							0.396**	0.413**	0.303
							(0.134)	(0.140)	(0.194)
Married							0.530***	0.545***	0.585**
							(0.142)	(0.146)	(0.199)
Separated							-0.365	-0.319	-0.223
							(0.318)	(0.302)	(0.380)
Divorced							0.461	0.638**	0.787**
							(0.247)	(0.228)	(0.287)
Widowed							-0.857	-0.696	-0.694
							(0.529)	(0.610)	(0.582)
Financial condition: Really bad								-	-
Bad								1.178	2.087**
								(0.685)	(0.672)
Acceptable								1.674*	2.597***
								(0.672)	(0.648)
Comfortable								1.770**	2.486***
								(0.676)	(0.657)
Unemployed (dummy)									-0.156
									(0.253)
Previously donor	0.193	0.075	0.081	0.135	0.133	0.109	0.081	0.086	0.191
	(0.173)	(0.178)	(0.180)	(0.166)	(0.166)	(0.183)	(0.193)	(0.211)	(0.257)
Donor	0.254*	-0.081	-0.082	-0.201	-0.242	-0.252	-0.299	-0.260	-0.254
	(0.104)	(0.143)	(0.143)	(0.130)	(0.133)	(0.144)	(0.157)	(0.173)	(0.226)
Non-donor $\wedge$ After	-0.063	-0.067	-0.067	-0.110	-0.065	-0.043	-0.070	-0.101	-0.148
	(0.119)	(0.118)	(0.118)	(0.102)	(0.104)	(0.112)	(0.123)	(0.136)	(0.196)
Previously donor $\wedge$ After	-0.091	-0.150	-0.157	-0.277	-0.337	-0.347	-0.395	-0.337	-0.498
	(0.261)	(0.261)	(0.261)	(0.245)	(0.245)	(0.269)	(0.277)	(0.313)	(0.402)
Donor $\wedge$ After	0.217*	0.233**	0.239**	0.218**	0.232**	0.216*	0.208*	0.179*	0.293*
	(.087)	(0.086)	(0.087)	(0.081)	(0.082)	(0.087)	(0.088)	(0.092)	(0.121)
Observations	2,635	2,635	2,633	2,576	2,459	2,164	1,947	1,710	932
R-squared	0.014	0.020	0.022	0.213	0.221	0.221	0.225	0.244	0.277

Dependent variable: Self-reported happiness (1-10). Constant not reported. Robust standard errors in parentheses. $^*p < .05$; $^{**}p < .01$; $^{***}p < .001$.



(a) Financial condition (Model 8)

(b) Number of close friends (Model 8)

(c) Age (Model 3)

(d) Age (Model 8)

Figure 2: Average predicted self-reported happiness with 95% CIs

de Gracia (2012) and Rodríguez-Pose and von Berlepsch (2014), who find a significant positive direct effect of education on self-reported happiness, and, on the other side, Clark and Oswald (1996) and Green (2011), who instead find that, holding income constant, life satisfaction is declining in the level of education, we find only a weak and never statistically significant, although positive, direct effect of education on happiness (the results do not change if we include covariates for primary and secondary education).

In line with the empirical literature on happiness, where cross-sectional micro data estimations usually find a positive relation between life satisfaction and income (Powdthavee, 2010), in our sample a better financial condition is associated ceteris paribus with higher levels of subjective well-being with a decreasing marginal effect of 'money'. Figure 2a shows average predicted self-reported happiness in model (8) in the different financial conditions.

Also in line with the literature (e.g., Clark and Oswald, 1994; Frey and Stutzer, 2002), the point estimate of the effect of unemployment on expected self-reported happiness controlling for, among the others, personality traits, health and financial conditions, is negative, although in our case it is not statistically significant.

As for the self-declared number of close friends, we find evidence of an inverted U-shaped pattern of its effect on average subjective well-being (Figure 2b). This is also

probably the result of the fact that, although we control for personality traits, we are not able to control for the quality of friendship, as done by Demır and Weitekamp (2007).

We also find a statistically significant association between religiosity and happiness: ceteris paribus, people who declare themselves agnostics or atheists report on average lower happiness scores. This result is consistent with the empirical studies on religiosity and happiness (e.g., Francis et al., 2000; Stark and Maier, 2008; Sahraian et al., 2013; Francis et al., 2017; Frey, 2018).

Finally, as for the effect of age on subjective well-being, we do find evidence of nonlinearities although the pattern is more complex than the (inverted) U-shape often found in the economic literature on happiness (e.g., Clark and Oswald, 1994; Gerdtham and Johannesson, 2001; Blanchflower and Oswald, 2004, 2008). In our estimates, the age-happiness profile in model (3), where we control only for gender and blood donor condition, is the one shown in Figure 2c. This profile somehow resembles the one found by Frijters and Beatton (2012) and Wunder et al. (2013). The age-happiness profile resulting from model (8), where we include all the controls but unemployment, is instead shown in Figure 2d. By controlling for the other factors possibly affecting happiness and correlated with age (i.e., marital status, health, financial condition, etc.), the U-shape profile observed before the 60s disappears and what remains is a negative, although nonlinear, association between age and happiness. A somehow similar although less pronounced effect of the inclusion of more controls is found by Frijters and Beatton (2012).

The effect of blood donation on happiness, estimated by looking at the partial effect on average predicted happiness scores of placing the happiness question after the question on blood donation, remains positive and statistically significant for blood donors across all the specifications and in spite of the significant reduction of the sample size, with point estimates ranging from 0.29 to 0.18. The same partial effect for non-donors (and previously donors) is instead always not statistically significant and negative.

To deal with the discrete character of the dependent variable and relax the assumption of cardinal comparability of happiness scores across respondents, we estimate also ordered latent-response models. Table 5 summarizes the results of the ordered logit estimates for a subset of the specifications estimated by OLS. The sign and significance of the coefficients in these models turn out to be essentially the same of the OLS models.

To summarize the main results with respect to the effect of blood donation, Figure 3 shows the APEs in model (2) of placing the happiness question after the question on blood donation on the predicted probabilities of happiness scores for non-donors and donors. In case of donors, placing the happiness question after the question on blood donation significantly decreases the probability of observing an outcome smaller than 8 and increases the probability of observing an outcome of 8, 9 or 10, whilst in case of non-donors the reverse happens, although in this case the effect is never statistically significant at the 5% level.

To allow a comparison between ordered logit and OLS, Table 6 reports APEs on expected self-reported happiness computed from ordered logit estimates in the different specifications (see Eq. 6). These results are very close to those obtained by OLS, with the estimated effect of blood donation for donors always statistically significant at the 5% level and ranging from 0.22 to 0.29.

Finally, we also run ordered probit regressions for all the specifications. The results are almost the same in terms of sign and significance of coefficients, average predicted

Table 5: Ordered logit estimates

	(2)	(5)	(7)	(8)	(9)
Avis mailing list (dummy)	0.463*** (0.113)	0.195 (0.139)	0.151 (0.157)	0.011 (0.170)	-0.140 (0.220)
Female (dummy)	0.104 (0.074)	0.141 (0.082)	0.092 (0.091)	0.052 (0.098)	-0.065 (0.138)
Age		-0.0016 (0.0068)	-0.0183* (0.0078)	-0.0170* (0.0083)	-0.0255* (0.0109)
$(\text{Age} - \overline{\text{Age}})^2$		0.00077 (0.00053)	0.00129* (0.00061)	0.00103 (0.00065)	0.00195* (0.00089)
$(\text{Age} - \overline{\text{Age}})^3$		-4.25e-5* (1.82e-5)	-4.08e-5* (2e-5)	-3.58e-5 (2.13e-5)	-5.73e-5* (2.80e-5)
Openness		-0.048 (0.103)	-0.042 (0.116)	-0.062 (0.124)	-0.065 (0.164)
Conscientiousness		0.219** (0.079)	0.230* (0.090)	0.173 (0.096)	0.161 (0.132)
Extraversion		1.032*** (0.084)	1.014*** (0.096)	1.083*** (0.102)	0.969*** (0.140)
Agreeableness		0.231* (0.094)	0.211* (0.105)	0.204 (0.112)	0.324* (0.152)
Neuroticism		-0.519*** (0.067)	-0.545*** (0.075)	-0.521*** (0.080)	-0.659*** (0.111)
Subjective health: Poor		-	-	-	-
Fair		0.810** (0.302)	0.756* (0.335)	0.805* (0.347)	0.417 (0.469)
Good		1.487*** (0.293)	1.393*** (0.323)	1.335*** (0.334)	1.153* (0.452)
Very good		2.136*** (0.299)	2.022*** (0.331)	1.924*** (0.343)	1.643*** (0.465)
Place of birth: North		-	-	-	-
Abroad		-0.106 (0.197)	0.108 (0.232)	0.082 (0.248)	-0.064 (0.361)
Center		0.088 (0.222)	-0.111 (0.261)	0.033 (0.285)	0.599 (0.414)
South		-0.269* (0.108)	-0.230 (0.125)	-0.217 (0.135)	-0.277 (0.198)
Number of close friends		0.0301** (0.0115)	0.0364** (0.0126)	0.0289* (0.0134)	0.0246 (0.0177)
Number of close friends^2		-0.00034** (0.00013)	-0.00042** (0.00014)	-0.00032* (0.00015)	-0.00027 (0.00019)
Children (dummy)		0.710*** (0.120)	0.497*** (0.146)	0.486** (0.155)	0.638** (0.203)
Graduate (dummy)		0.086 (0.085)	0.079 (0.094)	0.015 (0.100)	0.169 (0.137)
Believer (dummy)			0.233** (0.087)	0.240* (0.094)	0.229 (0.129)
Marital status: Single			-	-	-
Couple			0.469** (0.151)	0.513*** (0.159)	0.405 (0.215)
Married			0.606*** (0.164)	0.674*** (0.173)	0.800*** (0.228)
Separated			-0.243 (0.334)	-0.232 (0.346)	-0.028 (0.426)
Divorced			0.562 (0.323)	0.759* (0.332)	1.078* (0.437)
Widowed			-0.854 (0.566)	-0.759 (0.643)	-0.690 (0.693)
Financial condition: Really bad				-	-
Bad				1.596** (0.508)	2.404*** (0.569)
Acceptable				2.031*** (0.493)	2.847*** (0.546)
Comfortable				2.268*** (0.501)	2.830*** (0.559)
Unemployed (dummy)					-0.232 (0.270)
Previously donor	-0.016 (0.193)	0.051 (0.200)	0.020 (0.230)	0.009 (0.256)	-0.065 (0.326)
Donor	-0.172 (0.138)	-0.360* (0.145)	-0.393* (0.168)	-0.309 (0.184)	-0.378 (0.247)
Non-donor $\wedge$ After	-0.101 (0.113)	-0.099 (0.118)	-0.094 (0.143)	-0.120 (0.155)	-0.238 (0.224)
Previously donor $\wedge$ After	-0.047 (0.263)	-0.253 (0.274)	-0.302 (0.307)	-0.251 (0.338)	-0.234 (0.453)
Donor $\wedge$ After	0.253** (0.093)	0.333*** (0.098)	0.320** (0.106)	0.275* (0.112)	0.377* (0.151)
Cut point 1	-4.823 (0.259)	-0.606 (0.596)	-0.382 (0.675)	1.532 (0.844)	1.843 (1.074)
Cut point 2	-3.652 (0.163)	0.638 (0.565)	0.735 (0.643)	2.582 (0.826)	2.695 (1.057)
Cut point 3	-2.937 (0.132)	1.408 (0.558)	1.417 (0.635)	3.272 (0.824)	3.438 (1.056)
Cut point 4	-2.308 (0.116)	2.096 (0.556)	2.074 (0.632)	3.940 (0.823)	4.080 (1.056)
Cut point 5	-1.478 (0.104)	3.012 (0.557)	3.032 (0.632)	4.865 (0.825)	4.936 (1.060)
Cut point 6	-0.877 (0.100)	3.704 (0.558)	3.766 (0.634)	5.613 (0.827)	5.711 (1.065)
Cut point 7	0.065 (0.099)	4.826 (0.561)	4.874 (0.637)	6.727 (0.832)	6.876 (1.072)
Cut point 8	1.438 (0.102)	6.428 (0.566)	6.513 (0.643)	8.370 (0.838)	8.633 (1.081)
Cut point 9	2.958 (0.122)	8.092 (0.573)	8.199 (0.651)	10.05 (0.845)	10.28 (1.090)
Observations	2,635	2,459	1,947	1,710	932
Pseudo R-squared	0.0049	0.0678	0.0701	0.0748	0.0866

Dependent variable: Self-reported happiness (1-10).Standard errors in parentheses. $^*p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Table 6: Average partial effect on expected self-reported happiness of placing the happiness question after the question on blood donation (ordered logit estimates)

	(2)	(5)	(7)	(8)	(9)
Non-donors	-0.094	-0.080	-0.073	-0.094	-0.182
	(0.105)	(0.095)	(0.111)	(0.122)	(0.172)
Previously donors	-0.044	-0.204	-0.239	-0.199	-0.181
	(0.244)	(0.222)	(0.244)	(0.268)	(0.3514)
Donors	0.236**	0.274***	0.257**	0.220*	0.291*
	(0.087)	(0.081)	(0.085)	(0.090)	(0.117)

Standard errors in parentheses. $^*p < .05$; $^{**}p < .01$; $^{***}p < .001$.

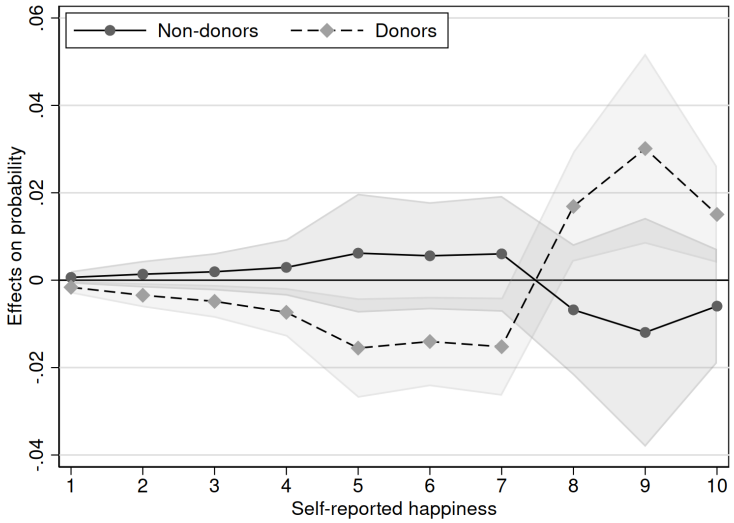


Figure 3: Average partial effects of placing the happiness question after the question on blood donation on the predicted probabilities of happiness scores with 95% CIs (Model 2 – ordered logit estimates)

probabilities and APEs. Moreover, since the tests of the parallel regression assumption rejects the null at the 1% level, we have also estimated generalized ordered logit models and multinomial logit models. In all the specifications, all these regression models deliver approximately the same results as far as the APE of the dummy 'After' in each category of blood donor on predicted probabilities and expected value of happiness scores are concerned.

6. Conclusions

A common issue in the empirical findings on the determinants of happiness is endogeneity for self-selection and reverse causality. Marriage, unemployment, donating money and time are just a few examples of variables which are correlated with happiness and might both affect happiness and be affected by it.

Blood donation is a case in point in this respect. Donating blood strictly relates to other donation activities, like volunteering and money donation. In fact, in spite of the important role that blood donation played in the theoretical debate on the crowding out effect of monetary incentives and its relevance in national health systems, the analysis of the effects of blood donation on donors' happiness has received scant attention.

In this paper, we argue that, when the conditions for the heuristic of attribute substitution are satisfied, its randomized activation in the happiness domain may allow for a clear identification of causality, ruling out the endogeneity concerns related to self-selection and reverse causality. This heuristic occurs when the target attribute is evaluated by mapping the value of a different attribute on the target scale and the following conditions are satisfied: i) the attribute to be evaluated is relatively inaccessible;

ii) another semantically and associatively attribute is highly accessible; iii) the substitution provided by the heuristic is not rejected by the reflective system.

We exploit the randomized activation of the heuristic to investigate the effect of blood donation on subjective well-being by randomly delivering two versions of a questionnaire including, among others, a happiness question and a categorical question about the condition of the respondent as blood donor, non-donor or previously donor. In a version of the questionnaire, the happiness question was placed immediately before the question on donor condition; whereas, in the other, the order of the two questions was reversed.

Our analysis shows that blood donors (non-donors) answering the version of the questionnaire with the happiness question after the question on blood donation report higher (lower) happiness scores than donors (non-donors) who received the other version, with the happiness question placed before the question on blood donation. These differences, produced by the selective activation of the heuristic of attribute substitution, can be actually interpreted as a causal impact of blood donation on donors' well-being.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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