Donating Time or Money:
Are they Substitutes or Complements?

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Abstract

Decisions to donate time or money for charitable purposes are typically seen as make-or-buy decisions, implying that there should be a clear distinction between individuals engaging in one of these two forms of giving and that this distinction should be somehow linked to opportunity costs. But this is not at all what we observe in micro-level data. We therefore suggest an alternative explanation by which time and cash donations are complements rather than substitutes. Assuming that there is asymmetric information about charities' activities and their effectiveness, doing volunteer work may serve as a screening mechanism enabling donors to better assess the use that is made of the money they could contribute. We formalize this idea and, building on the European Social Survey (ESS), we also provide empirical evidence regarding the co-variation of volunteering and donating money which is suited to support our view.

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May 2012

1.   Introduction

Over the years, charitable giving has received considerable attention in theoretical and empirical research. Theorists were often attracted by the challenge involved in analysing seemingly unselfish behaviour as the outcome of rational decision-making. Empirical work has shed much light on who is likely to become a donor, controlling for his or her personal characteristics as well as the institutional context. Still, while the two major types of charitable giving – volunteering and donating money – have been analysed quite intensely, little is known concerning the relationship between the two, where volunteering can basically be understood as donating time.

The present paper focuses on the co-variation of cash donations and time spent in volunteer work for charitable organizations, addressing the role that informational constraints may play in a potential donor's decision. Specifically, we suggest a model in which volunteer work serves as a screening mechanism reducing the cash donor's uncertainty and rendering cash donations more likely. In addition, we use data taken from the European Social Survey (ESS) to produce empirical evidence supporting our idea.

The paper is organized as follows. Section 2 summarizes the literature analysing donations of either cash or time and the limited number of contributions that try to address the two phenomena simultaneously. In Section 3, we motivate our approach with a few observations that actually made us think about the relationship between cash and time donations. Then, we set out our basic idea which links the two phenomena. In Section 4, we re-state this idea in terms of a simple formal model. In Section 5, we test the complementarity of the two forms of giving using a bivariate probit model which is applied to a large multi-country set of micro-data providing rather detailed information regarding charitable behaviour. Section 6 concludes.

2.   Related literature

For quite a while, research on charitable giving mostly concentrated on cash donations, investigating how making transfers of resources to other people on a voluntary basis could be reconciled with the fundamental assumption that individuals are maximizing their own utility. In an early contribution, Hochman and Rodgers (1969) suggest an extreme type of individual preferences to solve this problem – 'pure altruism' by which cash donations directly increase the utility of both the donor and the recipient. Subsequent work has come up with numerous other explanations which are less noble, but probably more elegant and certainly more realistic. The starting point for many of these publications is that the provision of a public good, *e.g.*, the well-being of recipients of transfers, can be financed either from public funds or private support. Roberts (1984) was one of the first to argue that, since public spending is based on taxes paid by the individuals, public and private transfers can be substitutes from an individual's perspective. As a limiting case, private giving is crowded out on a one-for-one basis

by the introduction or expansion of public transfers even if individuals are motivated altruistically.

More recent contributions often refer to Roberts' argumentation but do not confirm his conclusion. In empirical or experimental studies, Andreoni (1993), Payne (1998), Brooks (2000) or Dokko (2009) find evidence for some amount of crowding out, but even in the presence of massive public spending, private giving does not tend to zero. Theoretical studies argue that incomplete crowding out is a consequence of some kind of 'impure altruism' (Andreoni 1988; 1989; 1990). While a pure altruist is solely interested in the provision of a specific public good, but not necessarily interested in financing it, impure altruists are driven by egoistic motives as well. This could be Arrow's (1972) 'warm glow', also described as an 'internal satisfaction that comes from the act of giving' (Harbaugh 1998, p. 272), but also plainly selfish motives such as signalling one's generosity (Harbaugh 1998) or signalling one's wealth (Konrad and Glazer 1996). More recently, Vesterlund (2003) has highlighted the idea that making cash donations could have a genuine informational content, sending a signal of the "quality" of a charitable fund to other individuals if the names of donors and the sum of their donations are made public (see also Karlan and List 2012 for an empirical confirmation).

Existing research on volunteer work mostly addresses this issue from a sociological perspective. The main interest is in analysing the socio-demographic structure of volunteers and in identifying certain factors that influence the individuals' willingness to work voluntarily (see Musick and Wilson 2008 for a detailed survey). The determinants of volunteer work can be distinguished into different categories. First, as volunteer work is seen as unpaid labour, it is determined both by resources such as income, education and health (Schlozman *et al.* 1994, p. 979; Day and Devlin 1996, p. 47) as well as by subjective dispositions, e. g. religion (Curtis *et al.* 2001) or attitudes (Wilson and Musick 1997, p. 695). Second, when the issue is addressed from a dynamic perspective, it turns out that willingness to do volunteer work varies substantially over different stages of the life cycle (Oesterle *et al.* 2004; Tang 2006; Erlinghagen 2010). Third, research on volunteer work also focuses on specific social contexts in which time donations take place, explaining a considerable amount of cross-country variation (Anheier and Salamon 1999). For economists, the motivation to do volunteer work is also closely linked to labour market conditions. For instance, Day and Devlin (1998) analyse vocational opportunities that arise from volunteer work, arguing that working voluntarily can be seen as an investment in human capital which improves an individual's employment prospects.

The small number of contributions that try to address cash donations and volunteer work at the same time do not provide clear-cut findings, even though there is a common focus on relative prices of cash and time donations in most of the relevant studies. For instance, Brown and Lankford (1992) look at the effects of changes in relative prices caused by changes in the tax system and conclude that cash donations and volunteer work are complements as they show parallel responses to tax rates or tax deductibility of financial gifts in empirical

data. Andreoni *et al*. (1996) argue that this could be due to substitution and income effects for volunteering that work in opposite directions, while the two activities are basically substitutes, and they also provide empirical evidence supporting this view. Duncan (1999) extends the studies on crowding out of charitable giving through public spending to volunteer work and finds that private cash donations and volunteering appear to be perfect substitutes. These conclusions are basically confirmed by Feldman (2010), although she concedes that there are some effects pointing to complementarity that are not explained by changes in relative prices. In contrast, Apinunmahakul *et al*. (2009) link the issue to the donor's vocational position and tax credits offered for donations producing evidence that giving and volunteering are genuine complements.

3.   Donating time or money, and asymmetric information

Devoting time or money to charitable activities reduces the opportunities of individuals to cater for their own needs and wants, though probably in a slightly different way. By basic economic wisdom, one should thus classify the choice between these two forms of charitable giving as a typical "make-or-buy" decision (see, *e.g*., List and Price 2012: 7, who do not hesitate to draw this conclusion from a descriptive view on macro-level data). Provided that individuals are willing to make donations at all, they should choose that channel for doing so which is relatively cheaper for them in terms of their own, private consumption. In other words, some individuals should prefer to work as volunteers because they value their income forgone less than the contribution in kind they are making to the charity's activities, while others should make cash donations because the opportunity costs of directly spending their time for parallel purposes appear to be relatively high.

However, this divide between those who donate time and those who donate money is not what can be observed in reality. In addition, at the micro-level, there is neither an obvious link between individuals' wages or qualifications on the one hand and their (predominant) form of charitable giving on the other, nor is there any other clear pattern by which one form of giving could be thought to substitute for the other. Rather, among those who engage in charitable giving there appears to be a strong tendency to do so in both forms, even if we disaggregate data as much as possible by the type of organization which is supported.

To illustrate these points we use data taken from the European Social Survey (ESS) conducted in 2002/03, a representative survey covering 22 European countries which provides detailed information concerning civic engagement and charitable behaviour (based on a list of twelve different types of organizations that respondents may have supported through cash or time donations within the last 12 months; for more information about the dataset and our data handling, see Section 5).

Figure 1 gives a first impression in showing aggregate shares of respondents in our sample who indicate that they have made either cash donations or time donations or both to all kinds of relevant organizations. In total, 32.8% of the entire sample have engaged in some

form of giving. Of those who donate money, 40.6% also donate time; of those who donate time, no less than 60.7% also donate money; the overlap is 10.6 percentage points of the entire sample, roughly one third of all donors. Another way of putting things is to compare the shares of those who donate money among those who donate time (60.7%, as just mentioned) and among those who don't (18.7%). Not surprisingly, this difference is significant at the 1-percent level by a simple chi-squared test.

Figure 1: Donating cash or time or both
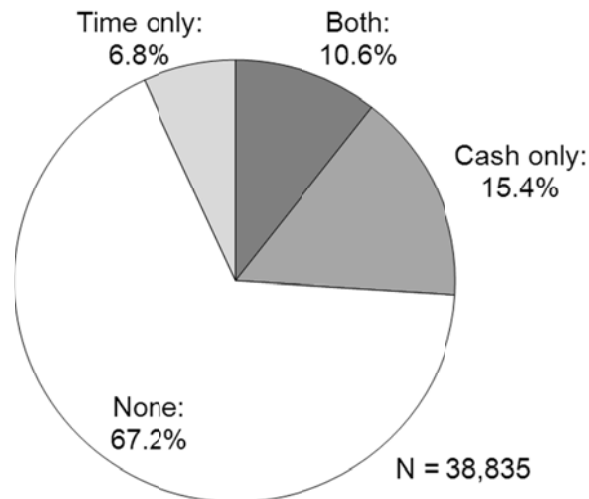
Source: European Social Survey (2002/03 round); weighted shares.

The strong correlation of cash and time donations can in fact be traced much further in our dataset. This is shown in Table 1 where, for individuals reporting they have made both, we disaggregate cash and time donations by the different types of organizations, hence by fields of charitable activities (and other forms of civic engagement), receiving these gifts.

When indicating the types of organizations they have supported, respondents were allowed to pick more than one item. Therefore, marginal counts in the table may need explanation. In each row (column), the number of all responses is denoted by m_{i+} (m_{+j}), while $m_{i.}$ ($m_{.j}$) denotes the number of respondents accounting for these answers (this notation has been proposed by Thomas and Decady 2000). For instance, 1.429 individuals donated some amount of their time to a sports organization *and* donated money to at least one organization of arbitrary type, thus making a total of 3.122 cash contributions covered in the relevant row. A fraction of 27% of these cash donations (made by individuals volunteering with sports organizations) were directed towards sports organizations, whereas the fractions of donations to other organizations are smaller (e.g., 10% to organizations dealing with individuals' hobbies, 4% to trade unions, etc.; shares do not sum up to 100% due to multiple responses). Among those supporting trade unions as volunteers, 18% also directed their cash donations to a union, etc.

Table 1: Coincidence of cash and time donations by types of organizations

Time donations	Cash donations %												$m_{i.}$	m_{i+}
	Sports	Hobby	Union	Profession	Consumers	Humanit.	Environm.	Religion	Pol. party	Science	Social clubs	Other		
Sports	27	10	4	3	2	18	10	10	3	4	5	3	1,429	3,122
Hobby	13	23	3	3	2	17	10	11	3	4	7	4	1,116	2,718
Union	11	10	18	4	3	17	7	8	7	5	6	4	276	738
Profession	13	10	5	19	4	13	8	10	4	6	5	3	265	732
Consumers	10	10	6	6	14	13	11	8	4	6	6	6	61	174
Humanit.	8	10	3	2	2	32	10	14	3	5	6	3	474	1,203
Environm.	9	12	5	4	3	18	23	9	4	5	5	5	233	666
Religion	6	8	2	2	1	18	9	36	4	4	6	4	921	2,214
Polit. party	10	9	5	4	3	12	8	10	22	5	7	5	329	946
Science	10	8	5	3	3	18	11	12	5	15	5	4	568	1,577
Soc. clubs	11	10	4	2	2	16	10	12	4	5	21	4	838	2,081
Other	8	7	3	3	2	18	10	14	4	4	6	20	495	1,144
$m_{.j}$	1,181	875	364	278	194	1,684	936	1,325	332	400	569	417	4,098	
m_{+j}	2,277	1,974	768	615	417	3,122	1,741	2,482	807	933	1,311	859		

Source: European Social Survey (2002/03 round), weighted shares.

In each row, cells with the highest shares are shaded grey. All except one of these maximum shares are located along the principal diagonal of the table. This indicates very clearly that donors tend to give financial support to the same types of organizations which they support through voluntary work as well. Testing this hypothesis through a chi-squared test of independence is slightly controversial, due to the possibility of multiple responses. Rao and Scott (1984) suggest dividing the usual chi value by a correction factor taking care of this complication. However, both corrected and uncorrected results show that this pattern is not accidental (at a 1-percent level of significance). It is of course highly likely, that donations of time and money are not only directed to organizations operating in the same fields but in fact go to identical organizations in most cases. We cannot verify this using our dataset, but we are in any case far away from a make-or-buy explanation for the co-variation of both forms of giving.

In this paper, we therefore suggest an alternative approach to understanding choices between making cash donations and doing volunteer work by which the two effectively become complements for individuals who are basically inclined to engage in charitable giving. The starting point for our reasoning is that individuals are typically not fully informed about the goals and activities of charitable organizations they could support. Charities may differ

substantially in the approaches, hence the effectiveness, of how they pursue their official goals, and they may also have different sub-tasks which are not publicly known in all detail. Therefore, individuals have difficulties in assessing the impact of cash donations they are considering to make. Assuming that charities or their agents know quite well what they are after, or how they perform in terms of effectiveness of their work, this is actually a situation with asymmetric information.

Participating in the activities of a charity as a volunteer may then involve an element of screening (or even monitoring). In doing so, individuals may learn more about the charity's hidden goals and hidden performance (or through their presence, they could even induce the charity to concentrate on its official goals and to improve on its efficiency in pursuing these). As a result, individuals may value their cash donations higher when also spending some time in volunteer work than they would otherwise do. Note that this screening effect does not even need not to be limited to a particular charity. Working, or having worked, for a charitable organization, individuals might be more informed about this sector in general, and they might be more able to assess the impact of donating money to all organizations of a similar type or similar size, engaged in a similar field, and so forth.

4. Donations and asymmetric information: a formal model

To further develop our idea that, for individual donors, cash donations and volunteer work may be strong complements, since the latter can be a way of acquiring information about how a charitable organization uses the former, let us re-state it in terms of a simple formal model. It may be worthwhile to note, first of all, that this idea is applicable to a wide range of individual motivations for engaging in charitable giving which have been suggested in the literature. It goes through if individuals who are making donations are assumed to be purely altruistic (as in Hochman and Rodgers 1969), to be motivated more selfishly by a "warm glow" or by other forms of "impure altruism" (Arrow 1972; Andreoni 1989). It is probably less convincing if making donations is essentially considered as a signal of being rich (Konrad and Glazer 1996), while it still has some appeal if charitable giving is partly, but not exclusively, considered as a signal of being generous (Harbaugh 1998).

Here, we will first consider a basic model where information about the actual impact of cash donations on the donor's own goals is asymmetric, but where there is no way of transmitting reliable information (Sub-section 4.1). In this set-up, the choice between donating time or money is indeed essentially a decision to make or to buy the intended support for a charitable organization. We will then look at the case where working as a volunteer is not only an alternative way of making donations, but also an instrument for screening the activities of the organization and learning more about the impact of monetary support (Sub-section 4.2).

4.1 The basic model

Consider individuals i who are maximizing their utilities

$$u^i = u(c_i, g_i) \tag{1}$$

by consuming private goods, c_i, and engaging in charitable giving, g_i. The utility function has the usual properties, so that $u_x > 0$, $u_{xx} < 0$ for $x \in \{c_i, g_i\}$. For each individual, the amount of money spent on c_i is limited by the individual's financial budget constraint,

$$\begin{aligned} c_i &= w(h_i)\,l_i - d_i = \\ &= w(h_i)(1 - v_i) - d_i. \end{aligned} \tag{2}$$

Here, w is a wage rate which depends on the individual's human capital, h_i, with $w' > 0$ and $w'' \leq 0$, and may therefore differ across individuals; l_i is the time spent in paid work and v_i the time spent in volunteer work, subject to the time constraint $l_i + v_i = 1$, total working time being normalized to unity; d_i is the amount of money that is spent on making cash donations. Utility derived from total donations g_i is determined by

$$g_i = a d_i + \overline{w} v_i. \tag{3}$$

This specification captures two ideas. First, due to imperfect knowledge about the effective use of d_i, the individual values each Euro spent on cash donations to a charity only subject to a factor $0 < a < 1$ when compared to a Euro spent on private consumption. (In addition, the strength of the gift motive measured by u_g may differ from the consumption motive u_c, but this is a distinct phenomenon.) Second, the individual is able to assess the productivity of a unit of time spent in volunteer work with the charity, and it attaches a fixed and uniform value $\overline{w}$ to each of these time units.

To motivate this assumption, a short digression may be required. Labour demand for unpaid work is unlimited, or it may be limited by the scope of activities of the charity and by its administrative capacities to engage more individuals. It is in any case constrained by the individuals' willingness to supply their services for free. The "productivity" of volunteer work is determined by each individual's abilities to contribute to the goals of the charity, and this need not only depend on the individual's skills. For instance, unqualified individuals may be able to collect more money in the streets in a given period of time than they would be able to produce in value added when working in a for-profit environment. At the same time, individuals with higher qualifications will often end up working as volunteers in positions which are less productive than these individuals are considered to be in the labour market: lawyers may run the organization's office, economics professors may do the accountancy stuff, and marketing experts may write, type-set and send out letters asking for financial support. Without loss in generality, we may thus simply assume that working for a charity has a perceived productivity $\overline{w}$ which is fixed and can be larger than, or smaller than a given individual's wage, $w(h_i)$.

Maximizing u^i in equation (1) subject to equations (2) and (3) yields the following first-order conditions.

$$\frac{u_c}{u_g} = a \tag{4}$$

$$\frac{u_c}{u_g} = \frac{\overline{w}}{w(h_i)} \tag{5}$$

It is easy to see that these conditions can be met simultaneously only if $\overline{w} = aw(h_i)$. In this case, the structure of giving is undetermined, since working with a charity for an hour is worth exactly the same as donating the proceeds from an hour of market work. Adjusted for their value in increasing individual utility, donating time or money are perfect substitutes then. In any other case, there will never be an interior solution to the problem we are looking at.

What is going on here becomes clear when equations (2) and (3) are combined to form

$$g_i = a\big(w(h_i)(1-v_i)-c_i\big)+\overline{w}v_i.$$

Totally differentiating this equation, with dg = 0, yields

$$\frac{\mathrm{d}c_i}{\mathrm{d}v_i} = \overline{w} - aw(h_i) \gtreqless 0.$$

If wage rates earned in paid work are high, consumption of private goods is reduced by increasing v_i and can be increased by reducing v_i, while total donations are kept constant. Hence, individuals with $aw(h_i) > \overline{w}$ will choose $v_i = 0$ and $g_i = ad_i$, that is, they will make cash donations only. To find an optimal solution regarding d_i, they have to equate the marginal utility derived from these donations, adjusted for their perceived value under asymmetric information, to the marginal utility of private goods consumption, in line with equation (4). By contrast, individuals with $aw(h_i) < \overline{w}$ will choose $d_i = 0$ and $g_i = \overline{w}v_i$, their behaviour being governed by equation (5). Since the time spent working to earn money is less productive than the time they spend in volunteer work, these individuals equate the marginal utilities of g_i and c_i adjusted for this differential.

The solution of the basic model has two implications that are not supported by empirical observations. It clearly predicts that the choice of d_i and v_i is an either–or decision. In addition, it also points to a tendency that poor people prefer to donate time, while rich people prefer to donate money.

4.2 Volunteer work as a screening device

Only a small change *vis-à-vis* the basic model is needed to introduce a screening effect of volunteer work which improves the individual's knowledge about the use the charity is making of d_i and, hence, affects the perceived value of making cash donations. Let us assume that a is a function of v_i, with $0 < a(v_i) < 1$ as before and with $a' > 0$ and $a'' \leq 0$. (In the most

basic case, we could simply assume that $a = v_i$, as v_i is restricted to be $0 \le v_i \le 1$ and will never assume one of the limiting values in this new variant of the model.)

Re-writing equation (3) as

$$g_i = a(v_i)d_i + \overline{w}v_i. \tag{3'}$$

and maximizing equation (1) subject to (2) and (3') leads to a new set of first-order conditions.

$$\frac{u_c}{u_g} = a(v_i) \tag{6}$$

$$\frac{u_c}{u_g} = \frac{a'(v_i)d_i + \overline{w}}{w(h_i)} \tag{7}$$

For individuals whose wage rate is low, with $a(v_i)w(h_i) < \overline{w}$, nothing much changes. Working for the charity, they also obtain information regarding the effectiveness of monetary donations. But since an hour of work supplied to the charity is worth more for them than donating the money earned in an hour of paid work, they still choose $d_i = 0$ and $g_i = \overline{w}v_i$, so that equation (7) simplifies to equation (5) for these individuals. A difference against the basic model is that the threshold for an optimal amount of d_i to become positive, $\overline{w} = a(v_i)w(h_i)$, is endogenous now. More importantly, for individuals with wage rates $w(h_i) \ge \overline{w}/a(v_i)$, conditions (6) and (7) can be fulfilled simultaneously.

Combining the two equations and solving for d_i leads to an optimal amount of cash donations of

$$d_i^* = \frac{a(v_i)w(h_i) - \overline{w}}{a'(v_i)} > 0 \tag{8}$$

in this case. Substituting $a\eta/v_i$ for a' and solving for v_i leads to an optimal amount of time spent in voluntary work of

$$v_i^* = \eta \frac{a(v_i)d_i^*}{a(v_i)w(h_i) - \overline{w}} > 0. \tag{9}$$

Here, η is the elasticity of the perceived impact of cash donations, a, with respect to working as a volunteer, v_i: $\eta = (\partial a/a)/(\partial v/v) = a'v_i/a > 0$ if $v_i > 0$. Without adding additional structure to the model, we are still unable to determine an optimal composition of total charitable giving, g_i. But we can at least show that, with the screening effect of v_i under asymmetric information regarding the effectiveness of d_i, total giving will consist of positive values of any of its two components.

Furthermore, looking at the comparative statics of this model, we can also show that

$$\frac{\mathrm{d}d_i}{\mathrm{d}h_i} > 0, \quad \text{while} \quad \frac{\mathrm{d}v_i}{\mathrm{d}h_i} \gtrless 0$$

(see Appendix A.1 for closer inspection). Individuals with higher qualifications h_i, hence higher wages $w(h_i)$, will unambiguously make higher cash donations d_i. At the same time, the fraction of total time spent working as a volunteer, v_i, may increase or decrease with the level

of qualifications, depending on the properties of the utility function u^i. It will definitely increase with h_i, if the elasticity of u_c with respect to c, $\upsilon = -u_{cc}c/u_c > 0$, is smaller than the share of optimal consumption in total monetary expenditure, $c_i^*/(c_i^* + d_i^*)$ (see, again, Appendix A.1). This may, or may not, hold true as a general feature of u, or possibly over different ranges of income or consumption. There is thus leeway for a broader class of cases with a positive relationship between qualifications and time spent in volunteer work, but this is not an essential feature of the solutions we are interested in. In any case, we now have a genuine interior solution of this model where both types of giving are being exhibited at the same time.

The model we have sketched here highlights that donating time and money can be complements, rather than substitutes, in charitable giving. There may be other explanations leading to a parallel effect, but our explanation rests on a clear-cut mechanism solving a problem of asymmetric information which may plausibly arise in this area. Also, it does not require any special pre-dispositions in the individual motives for making donations of either form to charitable organizations. Provided that our reasoning applies, middle and high-income individuals will tend to supply both cash donations and time spent in volunteer work, even though pure make-or-buy considerations and individual productivities suggest to rely on cash donations only. As a feature which is empirically less plausible, our model still predicts that poorer individuals should tend to supply volunteer work and never money if they are basically motivated to be charitable. Assuming that their preferences are different is clearly not attractive from a methodological point of view. Note, however, that the time spent in paid or unpaid work can probably not be adjusted with sufficient freedom to meet any marginal conditions for optimal time use if consumption of c_i falls below some critical lower limit. Including this as an additional feature in our model would not add to the understanding of the screening mechanism we are mainly interested in.

5.   Complementarity of time and cash donations: empirical results

Really testing our model is difficult and requires data of a different nature than those that exist. For doing so, it would be clearly useful to know not only whether individuals are engaged in charitable giving in one way or another, plus the type of organization or the broader field of activities they are supporting. Rather, one would wish to see the amounts of time and/or money put in and probably also the particular charity receiving donations. What is even more important is that data should reflect the timing of donations, ideally with a longitudinal structure which allows for disentangling a "causal" impact of volunteering on monetary gifts, as the one hypothesized in our model, from pure time, life-cycle and cohort effects. What we can do in this paper, however, is to fully work out the complementary features of donating time and money showing up in our multi-country micro-data set in a more rigorous fashion.

5.1 Data, methods and descriptive statistics

The 2002/03 round of the ESS contains representative samples of individual-level data from 22 European countries[1] and provides detailed information concerning charitable behaviour and other forms of civic engagement. As was already mentioned, it surveys this kind of behaviour by means of a list with twelve different types of organizations that may receive cash or time donations. Respondents were asked to pick all types of organizations to which they donated time or money within the last 12 months. Therefore, each donation can be attributed to a specific purpose, or field of activity, but we cannot say anything about the intensity of donations, i.e., the amount of money that has been donated or the number of hours spent on working as a volunteer. Furthermore, we focus on donations that are directed towards organizations and neglect all kinds of informal help provided to neighbours and friends, as motivation for the latter may be different and our ideas regarding asymmetric information may not apply, at least not in a similar way.

Usually, individual propensities to devote time or cash to charitable organizations (and some other forms of civic engagement) can be analysed using two single probit models. However, since we are specifically interested in potential linkages between these two types of charitable giving, both equations have to be estimated simultaneously. Therefore, we conduct a bivariate probit regression. A bivariate probit consists of two simultaneous equation, one for the binary decision to devote time to a charitable organization or not and one for the decision to make cash donations or not. Both types of behaviour are regressed on the same list of independent variables (which is provided in table 2, together with a few basic descriptive statistics). Next to the influence of all these co-variates on the propensities to donate time or money, we are specifically interested in the correlation between the two activities that can also be inferred from a bivariate probit regression.

At the individual level, we control for gender, age, education, marital status and general health status (as subjectively perceived). Since the potential donors' income and employment status is assumed to be important for decisions to donate either money or time, variables reflecting both characteristics are included in our analysis. The expectation is that people who are working full-time have relatively more money and less time, so that they tend to make more cash donations and will engage less in volunteering, and vice versa. The ESS covers income in terms of total household net income, categorized in twelve groups. To reflect cross-country differences in income levels, we generate variables indicating whether income is above, below or close to the national average. We re-categorize differentiated information regarding the employment status forming five categories that we think could be relevant here:

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[1] The data set covers Austria, Belgium, Switzerland, the Czech Republic, Germany, Denmark, Spain, Finland, France, Great Britain, Greek, Hungary, Ireland, Israel, Luxembourg, the Netherlands, Norway, Poland, Portugal, Sweden and Slovenia. Here, the Czech Republic and Switzerland have to be excluded, since questions concerning donations were dropped there. Compared to the illustrative data used in Section 3, we also exclude data from Israel from the empirical analysis, due to problems in providing additional macro-level controls in a comparable fashion.

Table 2: Descriptive statistics for the variables used

Variable	Observations	Mean	Standard Deviation
Cash donations	36,419	0.268	0.443
Time donations	36,419	0.178	0.383
Gender			
Female	36,419	0.526	0.499
Age	36,187	46.536	18.269
Income			
Low	36,419	0.343	0.475
Average	36,419	0.141	0.348
High	36,419	0.495	0.500
Missing	36,419	0.020	0.142
Family Status			
Married	36,419	0.542	0.498
Divorced or separated	36,419	0.076	0.265
Widowed	36,419	0.090	0.286
Single	36,419	0.288	0.453
Missing	36,419	0.004	0.062
Employment Status			
In paid work or service	36,419	0.489	0.500
Unemployed, job seeking	36,419	0.030	0.170
Retired or permanently sick	36,419	0.228	0.420
In education	36,419	0.087	0.282
Non-employed	36,419	0.154	0.361
Missing	36,419	0.005	0.073
Education			
Less than lower education	36,419	0.179	0.383
Lower secondary completed	36,419	0.233	0.423
Upper to post-secondary	36,419	0.375	0.484
Tertiary	36,419	0.206	0.404
Missing	36,419	0.007	0.083
Health status			
Very good	36,419	0.241	0.428
Good	36,419	0.427	0.495
Fair	36,419	0.253	0.435
Bad	36,419	0.079	0.269
Missing	36,419	0.001	0.028
Happiness	36,267	7.368	1.963
Religiosity	36,204	5.014	2.936
Conservatism	31,709	5.050	2.130
Fiscal revenue per GDP	36,357	45.005	6.334
Share of social expenditure	36,357	52.670	4.881

Source: European Social Survey (2002/03 round), unweighted observations; Eurostat.

individuals who are (i) in paid work, community or military service; (ii) unemployed, looking for a new job; (iii) retired, permanently sick or disabled; (iv) in education; or (v) non-employed, i.e., not looking for a job, but mainly engaged in housework, etc. We also include variables indicating a number of individuals' subjective attitudes. For instance, happiness and religiosity are measured metrically based on ten-point scales. The higher the relevant values, the happier respectively the more religious respondents tend to be. Finally, we control for individuals political preferences, also measured by a ten-point "right–left" scale, with a high value of the conservatism variable indicating right-wing positions.

Explaining charitable behaviour by individual characteristics alone may be insufficient. There is a lively discussion about contextual factors influencing donations of time or money. We therefore include variables reflecting potentially relevant parts of the institutional background that vary considerably across countries, such as total fiscal revenues per GDP and social expenditure per total government expenditure . In addition to that, we control for unobserved heterogeneity across countries by including country dummies in our estimates.

5.2   Estimates

Table 3 presents the marginal effects that can be calculated from the results of the bivariate probit model and adds some information regarding the model's fit.[2] All estimates shown here were run with unweighted data.[3] First, two-single equation models for cash and time donations are estimated in separation. Then both equations are fitted simultaneously, as a constant-only and as a full model. Log-likelihoods of all estimations are provided in table 3. In a likelihood-ratio test, the difference between the sum of *Log-likelihood$_1$* + *Log-likelihood$_2$* and *Log-likelihood$_{full}$* points to a significant improvement in the goodness of the fit. Hence, the two equations are not independent from each other. The significant value of the correlation coefficient, rho, basically tells the same story. Its size and sign indicate that there is a substantial, positive correlation of the residuals of the two equations. Based on our data and by our model, cash and time donations cannot be considered as substitutes.

By construction, each of the columns in table 3 exhibits the marginal effects that can be computed after bivariate probit regression for one of the possible outcomes: only cash donations, only time donations, time *and* cash donations, and no donations at all. Marginal effects are calculated at the mean of each variable or, in the case of binary variables, for discrete changes from 0 to 1. Our main findings are as follows. Men are less likely to donate money than women, but they tend to donate time more often than women do; they are also more likely to donate both time and money simultaneously. Consequently, being a male has a negative effect in the fourth column, i.e., for donating nothing. We also find an inversely *U*-shaped impact of age. Even though we are controlling for the individuals' physical condition, charita-

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[2] The list of coefficients that are the immediate result of the estimations can be found in Appendix A.2. Results for country dummies are omitted here and can be obtained upon request.
[3] We also ran estimates with weighted data. Results are reported in Appendix A.2 and do not differ substantially.

ble activities mainly take place when people are middle-aged, and the probability of making donations declines at higher ages.

Regarding the possibility of a substitution between different types of charitable behaviour due to opportunity costs, income is crucial among our variables. Results in the first column show coefficients with expected signs. Individuals whose income is above the national average are more likely to donate cash only than those with an income below the average. Since high income tends to render cash donations relatively cheaper than spending time, this reflects the idea that cash and time donations are basically substitutes. However, this type of relationship is challenged in the following columns. Column 2 shows a significant positive impact of average income compared to low income on the probability to donate time only. The impact of higher income is weakly significant, but not negative, as would be required by the idea of substitutability. Column 3 shows a positive and highly significant impact of income at or above the national average. The higher income, the more likely individuals are to engage in both types of charitable behaviour. Even donors with a high income tend to donate time *and* money simultaneously, although this is relatively more expensive for them than simply donating (even higher amounts of) money. Column 4 confirms this pattern with strongly significant, negative effects of average or higher income for the probability of making no donations at all.

While family status does not appear to have significant effects (apart from a weak effect of being single in column 2), the results for employment status convey a similar story as those for income. Basically, one might expect employed individuals to donate more money than time compared to non-employed individuals, due to stronger limits on their time budget. Conversely, non-employed individuals should donate more time than money. What we actually find is that, compared to individuals in paid work or service, all other categories exhibit a significant, negative impact on donating cash only. Making only time donations is by and large independent from employment status (with an exceptional, significantly positive effect of being in education and a weakly significant, positive effect of being non-employed). Regarding the probability of doing both, being unemployed and looking for a new job has a strongly significant, negative effect compared to being in paid work or service (while the special effect of being in education remains).[4] This is again confirmed *e contrario* through results for the probability of doing nothing. In any case, tightening or relaxing time constraints through formal employment does not lead to corresponding reductions or expansions in the time devoted to volunteer work.

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[4] This pattern is stable in estimates where we distinguish only between three categories of the employment status (being employed, unemployed or retired).

Table 3: Marginal effects derived from a bivariate probit regression

	cash = 1 time = 0	cash = 0 time = 1	cash = 1 time = 1	cash = 0 time = 0
Male (Reference: female)	-0.018***	0.021***	0.014***	-0.017***
Age	0.001	0.002**	0.004***	-0.007***
Age squared	0.000	-0.000***	-0.000***	0.000***
Income (low)				
Average	0.005	0.008**	0.015***	-0.028***
High	0.019***	0.005*	0.019***	-0.043***
Family Status (married)				
Divorced or separated	0.000	-0.004	-0.005	0.009
Widowed	-0.006	-0.001	-0.005	0.013
Single	0.003	-0.006*	-0.006	0.009
Employment status (Paid work or service)				
Unemployed, seeking job	-0.041***	-0.006	-0.031***	0.078***
Retired or permanently sick	-0.023***	0.006	-0.008*	0.024**
In education	-0.032***	0.038***	0.022***	-0.029**
Non-employed	-0.022***	0.007*	-0.006	0.020**
Education (upper to post-secondary)				
Less than lower secondary	-0.063***	-0.007*	-0.045***	0.115***
Lower secondary completed	-0.030***	-0.006*	-0.026***	0.061***
Tertiary	0.054***	0.003	0.045***	-0.102***
Health status (good)				
Very good	0.002	0.005*	0.008**	-0.015**
Fair	-0.007	0.001	-0.003	0.009
Bad	-0.007	-0.010**	-0.017***	0.035***
Happiness	0.001	0.003***	0.004***	-0.008***
Religiosity	0.006***	0.003***	0.007***	-0.016***
Conservatism	-0.002*	-0.001*	-0.002***	0.005***
Fiscal revenue per GDP	0.040**	-0.030**	-0.012	0.002
Share of social expenditure	-0.007	-0.009	-0.017**	0.033**
N	5,799	2,533	3,962	24,125

$Log\text{-}likelihood_{\text{equation 1}}$	-16,914.046
$Log\text{-}likelihood_{\text{equation 2}}$	-13,915.144
$Log\text{-}likelihood_{\text{simultaneous, constant-only model}}$	-32,340.232
$Log\text{-}likelihood_{\text{full model}}$	-29,611.754
ρ	0.513***

Standard errors and results for missings and country dummies are not reported and can be obtained upon request. *** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Data sources: European Social Survey (2002/03 round), unweighted observations; Eurostat (country-level controls).

Education appears to be important as well (and it is interesting in itself with respect to our theoretical model, as we are able to control for income, not for earnings). While lower education appears to reduce the probability of pure time donations, we find a positive impact of higher achievements in education on donating cash as well as on donating cash and time simultaneously, and a negative impact on donating nothing at all. Another potentially powerful hint regarding the issue of substitutability vs. complementarity is given by the individuals' physical condition. A very good health status increases the probability of making time donations only, and a bad condition decreases it. The same applies to the probability of making donations in either form. Both findings are plausible, since health issues may constrain individuals' opportunities to work for a salary as well as on a voluntary basis. (That is, the same effect already shows up in the effects of the potential donors' employments status.) What is remarkable, however, is the absence of any significant effects for the probability of making cash donations only. One would assume that individuals who decided to support a charitable organization choose the easiest way for them for doing so. In terms of health status, this should imply that individuals suffering from a disease tend to substitute volunteering through financial support in a significant fashion. But they actually don't, which points once again to a complementary relationship between time and cash donations.

Our analysis also includes variables reflecting a few subjective attitudes of potential donors that serve as additional controls, making sure that our results are not driven by unobserved factors which could plausibly matter as well. Among these, individual happiness appears to have no impact on the propensity to make cash donations only, but positively influences the probability of making time donations and doing both. Religiosity has a strongly significant, positive impact on all kinds of charitable behaviour. Being politically conservative reduces the probability of donating time only or donating time and money, but it has no influence on pure cash donations.

Finally, to control for the institutional context shaped at the national level we include two macro-level indicators – fiscal revenue per GDP and the share of social expenditure in total government expenditure. While these measures (and our approach) are rough compared to specialized studies, none of these yields evidence in favour of the well-known crowding-out hypothesis. Although we employed country-level fixed effects as additional controls for cross-country heterogeneity, these results should be treated with some caution.

6. Conclusion

A major motivation for this paper was to study in-depth the co-variation of time spent in volunteer work and donations of money as the two basic forms of how individuals engage in charitable giving. The bulk of the relevant literature considers only one of these phenomena in isolation, while the literature dealing with both types of behaviour is rather scarce. There, donating money or time is often understood as a typical "make-or-buy" decision, which would imply the two are substitutes. However, what we observe regarding this issue using data taken

from the European Social Survey points to a considerable degree of complementarity between these two types of activities. Groups of individuals who donate cash or act as volunteers are not perfectly overlapping, but a considerable share of all donors gives both time and money to charitable organizations. Donors even tend to make donations in either form to similar – and probably identical – organizations.

As an interesting sub-task, we develop a theoretical model which would explain this complementarity and imply a particular timing of volunteering and monetary gifts where the former increases the probability of the latter as it may help in overcoming an asymmetreic-information problem. Potential donors are usually not perfectly informed about a charitable organization they are inclined to support, its goals, its precise activities, its effectiveness and its reliability. This may limit their willingness to donate money. However, when participating in the charity's activities as a volunteer individuals gain insights into the performance of this particular organization and may even learn more about other organizations of a similar type working in the same field or pursuing similar purposes. In any case, volunteering may entail an element of screening which leads to more, or higher, financial gifts and systematically links the two forms of giving to each other.

We then proceed to showing more rigorously that there is indeed a strong complementarity between time and cash donations using a bivariate probit regression in which individual propensities to making donations of either form are estimated simultaneously. Marginal effects of all the variables we include in this estimation – most importantly, income and employment status, with numerous further controls – are much in line with our reasoning. Clearly, this does not amount to directly testing our theoretical explanation. To move in this direction, longitudinal data would be needed from which the sequence of moves in each donor's giving history can be re-constructed in much detail. In order to confirm the existence and significance of informational constraints, survey questions on donors' perceptions could also be useful. Other motives such as growing empathy or loyalty or strategic aspects, such as donating money to an organization to improve one's own position in its hierarchy, are conceivable as well. However, we think it plausible to attach some importance to the problem of asymmetric information in the context of charitable giving and conclude that it offers an interesting, potential explanation for what we observe in reality.

Appendix A.1: Comparative statics of the screening model (Section 4.2)

If conditions (6) and (7) are expected to hold true under varying levels of qualifications, h_i, we must have that

$$\frac{\mathrm{d}z}{\mathrm{d}h_i} = -\frac{\partial(\frac{\partial u}{\partial z})/\partial h_i}{\partial(\frac{\partial u}{\partial z})/\partial z_i} \quad \text{with} \quad z \in \{d_i, v_i\}. \tag{A.1}$$

The denominator on the right-hand side of equation (A.1) ought to be negative by the second-order condition of the maximization problem, so that the direction of effects of h_i for optimal values of d_i and v_i, is determined by the sign of the numerator.

Assessing equation (A.1) for d_i leads to

$$\frac{\mathrm{d}d_i}{\mathrm{d}h_i} = \frac{\overbrace{u_{cc}w'(1-v_i)}^{-} - \overbrace{u_{gc}aw'(1-v_i)}^{+}}{\underbrace{u_{cc} - u_{cg}a - u_{gc}a + u_{gg}a}_{-}} = \frac{\overbrace{u_{cc}w'(1-v_i)}^{-} - \overbrace{u_{gc}aw'(1-v_i)}^{+}}{\underbrace{u_{cc} - 2u_{cg}a + u_{gg}a}_{-}} > 0, \tag{A.2}$$

if u_{cg} and u_{gc} are symmetric.

Assessing the equation for v_i leads to

$$\frac{\mathrm{d}v_i}{\mathrm{d}h_i} = \frac{\overbrace{u_{cc}ww'(1-v_i)}^{-} + \overbrace{u_c w'}^{+} - \overbrace{u_{gc}(a'd_i + \overline{w})w'(1-v_i)}^{+}}{\underbrace{u_{cc}w^2 - 2u_{cg}(a'd_i + \overline{w})w + u_{gg}(a'd_i + \overline{w})^2}_{-} + \underbrace{u_g a''d_i}_{-\text{ or } 0}} \gtrless 0. \tag{A.3}$$

The denominator of equation (A.3) is unambiguously negative (our assumption that $a'' \leq 0$ does not make a difference here). The u_{cc}-term and the u_{gc}-term in the numerator therefore point to a positive relationship between h_i and v_i, while the u_c-term works in the opposite direction. If the marginal utility of c is high (at relatively low levels of c_i), individuals with high opportunity costs (high h_i) may thus devote less time to volunteer work than individuals with lower wages. However, depending on the properties of the utility function u^i, h_i and v_i may well move in the same direction.

For $u_{gc} = 0$ (e.g., with a utility function that is additively separable between the two arguments c_i and g_i), a condition for equation (A.3) to be unambiguously positive reads

$$-u_{cc}w(h_i)(1-v_i^*) > u_c.$$

Since $w(h_i)(1-v_i) = c_i + d_i$ by the financial budget constraint, this can be transformed into

$$\upsilon \equiv -\frac{u_{cc}c}{u_c}\bigg|_{c=c_i^*} < \frac{c_i^*}{c_i^* + d_i^*} < 1.$$

Appendix A.2: Additional empirical results

Table 4: Coefficients and standard errors derived from bivariate probit regression, unweighted

	Cash donations		Time donations	
	Coefficients	Standard errors	Coefficients	Standard errors
Male (Reference: female)	-0.012	0.017	0.140***	0.018
Age	0.014***	0.003	0.023***	0.004
Age squared	0.000***	0.000	-0.000***	0.000
Income (low)				
Average	0.059**	0.026	0.090	0.028
High	0.118***	0.020	0.099	0.021
Family Status (married)				
Divorced or separated	-0.017	0.030	-0.038	0.033
Widowed	-0.036	0.035	-0.026	0.040
Single	-0.008	0.024	-0.046	0.026*
Employment status (Paid work or service)				
Unemployed, seeking job	-0.239***	0.052	-0.157***	0.058
Retired or permanently sick	-0.095***	0.029	-0.005	0.032
In education	-0.030	0.037	0.222***	0.039
Non-employed	-0.086***	0.026	0.006	0.029
Education (upper to post-secondary)				
Less than lower secondary	-0.361***	0.029	-0.225***	0.032
Lower secondary completed	-0.176***	0.022	-0.130***	0.024
Tertiary	0.290***	0.021	0.181***	0.022
Health status (good)				
Very good	0.030	0.020	0.052**	0.022
Fair	-0.031	0.021	-0.009	0.023
Bad	-0.076**	0.036	-0.117***	0.041
Happiness	0.017***	0.005	0.028***	0.005
Religiosity	0.042***	0.003	0.040***	0.003
Conservatism	-0.012***	0.004	-0.014***	0.004
Fiscal revenue per GDP	0.086	0.070	-0.167*	0.085
Share of social expenditure	-0.074	0.046	-0.103**	0.050
Constant	-0.467	4.561	12.081**	5.239
ρ				0.515***

Results for missings and country dummies are not reported and can be obtained upon request.
*** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Data sources: European Social Survey (2002/03 round), unweighted observations; Eurostat (country-level controls).

Table 5: Coefficients and standard errors derived from bivariate probit regression, weighted

	Cash donations		Time donations	
	Coefficients	Standard errors	Coefficients	Standard errors
Male (Reference: female)	-0.009	0.017	0.151***	0.018
Age	0.014***	0.003	0.021***	0.004
Age squared	0.000**	0.000	-0.000***	0.000
Income (low)				
Average	0.063**	0.026	0.082***	0.028
High	0.134***	0.020	0.105***	0.021
Family Status (married)				
Divorced or separated	-0.015	0.032	-0.051	0.034
Widowed	-0.042	0.038	-0.038	0.043
Single	-0.019	0.025	-0.038	0.027
Employment status (Paid work or service)				
Unemployed, seeking job	-0.268***	0.052	-0.168***	0.057
Retired or permanently sick	-0.101***	0.030	-0.007	0.033
In education	-0.057	0.036	0.193***	0.038
Non-employed	-0.097***	0.026	0.008	0.028
Education (upper to post-secondary)				
Less than lower secondary	-0.347***	0.029	-0.223***	0.032
Lower secondary completed	-0.167***	0.022	-0.120***	0.024
Tertiary	0.276***	0.021	0.179***	0.022
Health status (good)				
Very good	0.027	0.020	0.046**	0.021
Fair	-0.021	0.021	0.005	0.023
Bad	-0.041	0.037	-0.075*	0.041
Happiness	0.017***	0.005	0.031***	0.005
Religiosity	0.041***	0.003	0.039***	0.003
Conservatism	-0.012***	0.004	-0.015***	0.004
Fiscal revenues per GDP	0.219***	0.073	-0.082	0.085
Share of social expenditure	-0.063	0.046	-0.088*	0.049
Constant	-6.998	4.600	7.408	5.169
ρ				0.523***

Results for missings and country dummies are not reported and can be obtained upon request.
*** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Data sources: European Social Survey (2002/03 round), weighted observations; Eurostat (country-level controls).

Table 6: Marginal effects derived from bivariate probit regression, weighted

	cash = 1 time = 0	cash = 0 time = 1	cash = 1 time = 1	cash = 0 time = 0
Male (Reference: female)	-0.019***	0.022***	0.016***	-0.019***
Age	0.001	0.002***	0.003***	-0.006***
Age squared	0.000	-0.000***	-0.000***	0.000***
Income (low)				
Average	0.007	0.007*	0.014***	-0.028***
High	0.022***	0.005	0.022***	-0.048***
Family Status (married)				
Divorced or separated	0.002	-0.006	-0.007	0.011
Widowed	-0.006	-0.002	-0.007	0.016
Single	-0.001	-0.004	-0.006	0.010
Employment status (Paid work or service)				
Unemployed, seeking job	-0.046***	-0.005	-0.034***	0.085***
Retired or permanently sick	-0.024***	0.007	-0.008*	0.026***
In education	-0.035***	0.036***	0.017***	-0.018
Non-employed	-0.024***	0.009**	-0.007	0.022***
Education (upper to post-secondary)				
Less than lower secondary	-0.059***	-0.008*	-0.045***	0.112***
Lower secondary completed	-0.028***	-0.005	-0.025***	0.058***
Tertiary	0.050***	0.003	0.044***	-0.097***
Health status (good)				
Very good	0.002	0.004	0.007**	-0.013**
Fair	-0.006	0.002	-0.001	0.005
Bad	-0.002	-0.007	-0.011**	0.021*
Happiness	0.001	0.003***	0.005***	-0.009***
Religiosity	0.006***	0.002***	0.007***	-0.016***
Conservatism	-0.001	-0.001**	-0.003***	0.005***
Fiscal revenue per GDP	0.064***	-0.028**	0.008	-0.043*
Share of social expenditure	-0.006	-0.008	-0.015**	0.028*
N	5,734	2,539	4,023	24,041

Log-likelihood equation 1	-16,933.889
Log-likelihood equation 2	-14,024.569
Log-likelihood simultaneous, constant-only model	-32,309.605
Log-likelihood full model	-29,681.567
ρ	0.524***

Standard errors and results for missings and country dummies are not reported and can be obtained upon request. *** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Data sources: European Social Survey (2002/03 round), unweighted observations; Eurostat (country-level controls).

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