ON TIME AND MONEY DONATIONS

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Abstract

This paper investigates the determinants of time and money gifts. We first develop a behavioural model which accounts for both types of donations, as well as for decisions about domestic and market hours of work. We then investigate the issue empirically, using survey data for Italy. Results suggest that, according to the theoretical predictions, proxies for "warm glow", reputational concerns and (impure) altruism are important determinants of giving. Moreover, the unobservable determinants driving money and time donations are positively correlated, suggesting a certain degree of complementarity between the two decisions.

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Tutt'e tre stesero la mano verso colui che usciva [dall'osteria] con passo franco, e con l'aspetto rianimato: nessuno parlò; che poteva dir di più una preghiera? <<La c'è la Provvidenza!>> disse Renzo; e, cacciata subito la mano in tasca, la votò di que' pochi soldi; li mise nella mano che si trovò più vicina, e riprese la sua strada. La refezione e l'opera buona (giacchè siam composti d'anima e di corpo) avevano riconfortati e rallegrati tutti i suoi pensieri.

[A. Manzoni, I promessi sposi, Cap. XVII, 1840-42]

The three beggars stretched out their hands to Renzo, as he left the inn with a free step and reinvigorated air, but none of them spoke; what more could language have expressed? <<There's a God-send for you!>> said Renzo, as he hastily thrust his hand into his pocket, and, taking out his last pence, put them into the hand that was nearest to him, and went on his way. The refreshment, and this good work together (since we are made of both soul and body), had gladdened and cheered all his thoughts.

[A. Manzoni, I promessi sposi (The bethrothed), Vol. XXI. The Harvard Classics. New York: P.F. Collier & Son, 1909–14; Bartleby.com, 2001]

1 Introduction

It is commonly observed that, while sharing a common orientation toward democracy and a free market economy, Europe and U.S. differ widely about the role assigned to the State. One dimension in which differences are marked is in the numerous taxes, transfers and regulations that may be grouped under the label "Welfare State", i.e. all the public activities devoted to helping and protecting the poor. Recent papers (e.g. Alesina et al., 2001) have argued that European and U.S. Welfare States differ because American society is more racially fragmented, and this - in turn - might have shaped individual beliefs about what determines income. In particular, the authors suggest that according to data provided by the World Values Survey, U.S. citizens seem to believe personal income and wealth are mainly driven by individual effort, whereas Europeans are more prone to the idea that luck determines personal success.

Differences in attitudes between Europe and the U.S. may emerge also when volunteering, giving, and not for profit organisations are taken into account. Comparative studies are quite rare, due to data constraints, and explanations of the huge variations across countries are often linked to differences in government social spending; see e.g. the macro-structural approach discussed in Salamon and Sokolowski (2001), analysing differences in volunteering. Exploring dissimilarities in money giving between U.S. and U.K., Wright (2002) claims that "philanthropy" (in the U.S.) differ from "charity" (in the U.K.) with respect to the level of donations, the characteristics of donors, and even the methods used to donate; in particular, while the overwhelming majority of donations in the U.S. can be seen as a "planned activity" (with installments to be paid on a regular time base), giving in U.K. is more spontaneous and based on "spare change" methods. Once again, these differences are explained by the author with cultural diversities as for the role of the State and the attitudes toward money and wealth, as well as by the tax treatment of donations. More specifically, and according to the role assigned

to the State, tax incentives for money giving are well established and of significant size in the U.S. tax code since the eighteenth century, while until very recently, no general tax benefits for donors were available in the U.K., as in other European countries.

Coherently with these stylised facts, a large body of the empirical literature on time and money donations - mainly based on U.S. data - has been devoted to the estimation of the tax-price elasticity of money (and time) donations, while much less attention has been devoted to developing a behavioural model accounting for a full set of individual choices with respect to the allocation of income and time, more coherent with a "spare change" approach to giving. In this paper we try to fill this gap. We first present an extended static labour supply framework accounting for both types of donations, building on e.g. Duncan (1999). Endogenous income can be used for consumption of private goods or donations to charities, while time can be allocated to labour, volunteering, housework and leisure. Next, we test the predictions of the theoretical model on a cross-section of individuals drawn from a survey (*Indagine Multiscopo*) run by the Italian National Statistical Office (ISTAT) in 2000. To this end we build a system of simultaneous equations for limited dependent variables.

This paper's contribution to the literature is twofold. First, we build theoretical and empirical versions of a model that accounts simultaneously not only for choices about the two types of giving, but also for choices about other two important activities - household and market work - that are likely to be intrinsically related with charitable gifts, because of their impact on available time and income. Second, we investigate empirical correlations between the individual propensity to donate time and money.

Knowledge of whether time and money donations are correlated has relevant implications. From a positive point of view, it allows to shed light on the determinants of individuals' behaviour into important fields, where economic factors and social norms, as well as cultural effects, are intrinsically interconnected, and of which much more needs to be known. From a normative point of view, a better understanding of the mechanisms through which people reallocate time and money resources between voluntary work and money donations may have important policy implications, e.g. for the design of an optimal fund-raising or tax-deduction scheme.

Controlling for a set of observable individual characteristics - capturing individual tastes and economic constraints - as well as for the latent relationship between hours of work in the market and at home, main results indicate that voluntary work and money donations are positively related, i.e. a positive shift of time donations brings about a shift of the same sign in money donations, suggesting that time and money donations are somewhat complements in the utility function of each subject.

The paper is organised as follows. In the next section we review the literature focusing on time and money donations, from different perspectives (i.e. from an economic, sociological and psychological point of view). The third Section introduces the theoretical framework and discusses some implications for the empirical analysis. Section four describes the data and some descriptive facts about the relationship between volunteering and gifts of money, which are further investigated in Section five, that presents, in sequence, the econometric model and the main results. Concluding remarks follow.

2 Literature review

The theoretical and empirical literature has identified several variables that can affect the amount of money donations and of time volunteered. In this section we briefly review the relevant papers, grouping all the works according to the variables they consider. In particular, we focus on whether they consider individual preferences and attitudes, charities behaviour, or government behaviour as determinants of donations.

Individual preferences and attitudes. A first group of determinants of money and time donations is represented by people preferences and attitudes. However, identifying such variables within the utility maximisation framework, and distinguishing between different explanations, is not an easy task. Indeed, in his review Andreoni (2005) suggests that philanthropy is one of the greatest puzzles for economics, because a science based on precepts of self-interested behaviour does not easily accommodate a behaviour of such clearly unselfish sort. How can one reconcile unselfish actions with self–interest? Andreoni proposes five answers: a) charitable giving is not unselfish at all, because giving is directed at buying a certain future service (e.g. donations to opera houses to obtain new and better performances in the future); b) "enlightened self-interest" (a sort of "expected" reciprocity) suggests that people donate because they hope - in the event of being in needs in the future - to receive help from others; c) altruism, i.e. people care about well-being of others in their local community/social network (or of society at large), and cooperate to finance (impure) public goods; d) "warm-glow", i.e. people get utility from the *act* of giving itself; e) moral motivations and moral codes of conduct, that make economics ill-suited to explain philanthropic activities. All these variables - even the last one, that represents the "last refuge" for the economic theorist - have been considered in the literature by including additional terms to the utility function. For instance, (a), (b) and (d) above can be modelled by adding the amount of money donations (as e.g. in Smith and Chang, 2002), and the amount of hours volunteered or the value of time volunteered (as e.g. in Andreoni et al., 1996). Variable (c) can be included by either considering the individual contribution to the provision of a (pure) public good (e.g. Duncan, 1999; Andreoni, 2005), or the "total" utility derived from the contribution of both time and money. The implicit assumption is that the utility of other people is directly influenced by the amount of public good supplied, or by the total amount of charitable giving. Finally, variable (e) is related to a more rich model of human behaviour, and can be taken into account by modelling "intrinsic motivation", as in Benabou and Tirole (2003, 2006), building on psychological literature.

A great deal of theoretical research has been devoted in the last years by economists to include psychological factors as explanatory variables of philanthropic activity into a model of individual behaviour. The idea that psychological factors might play a role in explaining non-selfish behaviour is well grounded in the empirical literature. For instance, Lee et al. (1999) study similarities and differences in time, money and blood giving by referring to the concept of role-identity. The basic idea is that individuals have a role-identity as a donor, insofar as they are inserted in a network of social relationships. They identify several variables that can have an impact on role-identity: the expectations of others on our behaviour (which determines "social esteem"); the

presence of a close parent acting as a "model"; the past receipt of help, that can activate reciprocal behaviour; personal norms of moral obligations. All these variables influence individual preferences and attitudes, and impact on the utility people get from their decisions on how and to what extent donate.

Perhaps the most comprehensive theoretical model of prosocial behaviour is the one proposed by Benabou and Tirole (2006). They identify three different channels through which people can get utility from donations: intrinsic motivation, self-image, and social esteem. Intrinsic motivation refers to people being altruistic, i.e. people caring about the overall level of public good produced by a given organisation. The interest in their self-image can be interpreted as "warm-glow". In this way, individuals get satisfaction from the very act of giving as in Andreoni (1990) and Menchik and Weisbrod (1987). Social esteem is a more novel concept - at least in the economic literature - since it refers to people's concerns for reputation, i.e. to the fact that they care about how the others perceive them (i.e. whether they consider them as being altruistic or not). In this framework, donations act as a "signal" and are driven by the desire to appear generous and to receive social approval (e.g., Harbaug, 1998; Ellingsen and Johannesson, 2003). Ellingsen and Johannesson (2003) show that the informational content of time and money donation is different; in particular, giving time is better than giving money when signalling is the primary goal. Benabou and Tirole (2006) study how monetary and non-monetary incentives interact with these three behavioural determinants. They show that heterogeneity in motivations creates a signal-extraction problem, so that the use of e.g. monetary incentives affects the significance of observed behaviour, and feeds back on individuals' concerns for reputation

Charities behaviour. A second group of determinants is represented by charities' actions. The economic literature has analysed two different strategies for increasing donations, one based on fund-raising expenditures, the other based on publicly reporting the amount of past donations. As for the first strategy, Khanna and Sandler (2000) have suggested two countervailing effects of fund-raising expenditures: on the one hand, they can increase the amount of donations by giving relevant information to potential donors; on the other hand, individual contributions can decrease the higher is the fraction of donations spent for fund-raising, as this reduces their "effectiveness". The empirical literature generally finds the first effect to dominate the second one (e.g. Khanna and Sandler, 2000). As for the second strategy, Harbaugh (1998) studies the optimal reporting scheme for not-for-profits organisations that want to maximise the volume of collected donations. Benabou and Tirole (2006) suggest that greater publicity has a counter effect on pro-social behaviour, since it introduces additional noise in the "signal", as donations become suspected of being motivated just by social esteem.

Government behaviour. A third group of determinants of time and money donations is government behaviour. Governments can influence individuals by using both sides of the public budget. On the one hand, a strand of literature has explored the crowding-out effect of government grants, on the premise that public and private donations are close substitutes. Khanna and Sandler (2000) have shown that - contrary to expectations - public grants crowd-in private donations, since they can be considered a signal of quality for the services produced by not-for-profit organisations. In a similar

vein, Day and Devlin (1996) find a crowding-in effect of government expenditure also for volunteering. Considering both time and money donations, Simmons and Emanuele (2004) conclude instead that there exists a crowding-out effect, but its impact is only minimal. On the other hand, many authors have considered the impact of tax deductibility on money donations, by calculating the elasticity to their tax price. For instance, Andreoni et al. (1996) have determined that eliminating tax deductibility in the U.S. would imply a 5.7% loss in donations. Notice however that the point estimates of this elasticity widely differ across studies: for instance, Randolph (1995) reports a coefficient of -0.51, while Auten et al. (2002) of -1.26. Moreover, in the almost unique study based on European data, Khanna and Sandler (2000) do not include tax rates in their price measure of giving, considering instead fund raising and administration expenditures. They motivate this choice by the very modest impact of tax deductibility in the U.K..

While we accept that, especially in the U.S., both government and charities behaviour can have a sizeable impact on time and money donations for the presence of widespread tax incentives, in this paper we follow a "spare change" approach to giving, and claim that - at least in Europe, as in other countries where tax incentives are less important - choices are primarily driven by individual preferences and attitudes[1]. Coherently, in the next section, we develop a general theoretical framework for understanding charitable giving, enriching the standard model of labour supply, and derive some testable predictions on individual behaviour.

3 Theoretical framework

Our behavioural model extends the static labour supply framework to account for both time and money donations, and for domestic work. The primary scope of the model is to derive a set of working implications to be tested in the empirical analysis.

Following Benabou and Tirole (2006) we assume that charitable contributions of time and money can affect utility through three different channels. First, directly from the very act of giving, i.e. by "warm-glow" private consumption motives as in Andreoni (1990). Second, indirectly through a "social signal" or the "prestige motive", according to which giving is driven by the desire to appear generous and to receive social approval (e.g. Harbaug, 1998; Ellingsen and Johannesson, 2003). Finally, through the consumption of an (impure) public good produced by a charity using volunteer labour and money donations from a community of individuals.

Since we focus on a particular form of prosocial behaviour which requires time (i.e. volunteering), differently from previous studies we also make explicit account of the fact that time donation is not the sole relevant alternative to non-market labour. More specifically, we keep both hours volunteered and time devoted to domestic work distinguished from leisure. In particular, we assume that houseworking is used to

[1] Evidence on this point is available through survey data. See e.g. Wright (2002) for UK, showing that when individuals are asked on whether they would like to give to charity in order to reduce their own tax bill, 52% disagreed and only 14% agreed. Similar findings are observed also for Italy.

produce services that may have market substitutes (see e.g. Gronau, 1977 for home production; Menchik and Weisbrod, 1987 for volunteer labour supply).

We proceed as follows. We first present a set of results for a simplified version of the model, which we label the "baseline model", assuming that: people do not have specific preferences for time versus money donations (i.e. the two forms of giving are perfect substitutes); the production of the public good depends on the *value* of overall donations; what matters for social prestige is the *value* of individuals' time and money contributions. While, taken together, these assumptions impose quite strong restrictions on individual and social behaviours, they considerably simplify the analysis and, more importantly, allow in many cases to derive sharp predictions for the empirical analysis. Next, we also explore what happens if - for whatever reason - agents do not perceive time and money donations as perfect substitutes. This is done by assuming that people, both at the individual and at the social level, may have specific preferences for volunteering (or for money donations). This allows us to develop a deeper understanding of the factors underlying optimal decisions about the two forms of giving, which is a key issue to be discussed in the empirical analysis.

3.1 The Baseline Model

We assume well-informed and rational individuals who seek to maximise their utility subject to a time constraint and an (endogenous) budget constraint[2]. For a generic person living in a community populated by J individuals, individual preferences may be represented by the following utility function[3]:

$$U = U\left(c, t^l, d, q, G\right) \tag{1}$$

where c is the money value of a composite consumption good, t^l are hours of leisure, d is the total value of donations, q is a non-tradeable "reputational good" or "social esteem", and G is an (impure) public good produced by a charity. We assume that the utility function U is continuous, twice differentiable, and (strictly) quasi-concave. We further assume that consumption goods can be either purchased on the market (c^m) or produced within the household (c^h) using a certain amount of time (t^h), given the (strictly) concave function $f(\cdot)$:

$$c = \left(c^m + c^h\right) = \left[c^m + f\left(t^h\right)\right] \tag{2}$$

[2] In our theoretical framework we do not model explicitly the behaviour of charities, i.e. the demand side of volunteering and money donations. We assume that not-for-profit organisations are willing to assume as many volunteers as supplied at the prevailing wage. This implies that we can treat observed hours of volunteering as coming from optimal supply decisions and not from a mixture of demand and supply forces. We argue that this simplifying assumption might be plausible if the cost of volunteers was zero. We also note that, in practice, the behaviour of charities seems to be primarily driven by the availability of volunteers, so that an excess of supply in volunteering is quite rare. Moreover, as Duncan (1999) has shown, not-for-profit organisations will never be "constrained", i.e. receive more time donations than they actually require. In our (public and private) consumption model we also abstract from investments motives in time donations as in Menchik and Weisbrod (1987), a point explored empirically by e.g. Day and Devlin (1998).

[3] To simplify the notation, we suppress the individual-specific index i.

Thus, c^m and c^h are perfectly substitutable, and housework hours do not provide utility *per se* to the individual - as it would be, for example, in the case of childcaring activities - but only to the extent that they provide a substitute for market goods[4]. As in Duncan (1999), we also assume that people care only about the *total* value of donations:

$$d = v + m$$

where v is the value of time giving and m is the amount of money donations (i.e. time and money donations are perfectly substitutable). The value of volunteering v is given by the product of hours of giving (l^v) and their contribution to the production of the charity, i.e. the individual productivity of voluntary labour (α):

$$v = \alpha l^v \tag{3}$$

In other words, if a doctor decides to donate time, it is not indifferent for herself, for the others and for the charity if he works a certain number of hours for Doctors Without Borders or, say, for feeding the homeless. In particular, we also assume that $\alpha \leq w$, i.e. that people's productivity when volunteering can be at best equal to their productivity in the market. Moreover, according to the literature on volunteering and money donations, "social esteem" is produced by both the (individual) value of time volunteered and charitable money contributions:

$$q = q\left(v + m\right) \tag{4}$$

Finally, individuals derive utility also from the total amount of the (impure) public good produced by charities using the (total) collected value of time (as labour input) and money donations (as capital input) in the community[5]:

$$G = G\left(V + M\right) = G\left(\sum_j \alpha_j t_j^v + \sum_j m_j\right) \tag{5}$$

Thus, we allow for different individuals to provide different amounts of inputs in the production of the charity; notice also that the total labour input V is measured in efficiency terms. Both q and G are assumed to be (strictly) quasi-concave functions[6].

The assumption that agents are interested in the total value of altruistic activities, and not in the way in which they are divided into their money and time components, makes our setting similar to the one proposed, among others, by Duncan (1999) in his mixing public-private consumption model of money and time gifts. Differently from him, we explicitly recognise that, in addition to "warm-glow" motives, also reputation mechanisms may be important determinants of donations as a *private* consumption good, besides *public* consumption good.

Individual choices are subject to time and money constraints as follows:

[4] The extension to the case in which domestic work yields directly utility it is quite straightforward. See Kooreman and Kaptein (1987) for a model where housework also contribute to leisure.

[5] Notice that G is not a measure of government expenditures, but of private contributions to the provision of a public good, that can supplement public provision.

[6] Under this assumption, given the parameters, a unique cost-minimising solution in the production of the impure public-good exists.

$$t^l + t^h + t^v + t^n = T \tag{6}$$

$$c^m + m + w(t^l + t^h + t^v) = wT + y \tag{7}$$

where T is total time available for economic activities (hence net of the amount of time devoted to commuting), t^n are paid working hours, w is the (exogenous) wage rate, y is the (exogenous) unearned income. The wage rate is individual-specific, as we claim that individuals are heterogeneous in both their preferences and their productivity in the labour market[7]. Since consumption of market goods and services will not be explicitly treated in the empirical analysis, for simplicity we also assume that c^m is strictly positive at the optimum. The other choice variables of the individual - labour supply, hours of domestic work, volunteering, and money donations - can be either zero or positive at the optimum, depending on preferences and exogenous parameters (wages, productivity when volunteering, and non labour income)[8].

Using the time constraint to express the model in terms of hours of paid work instead of leisure, and substituting the budget constraint into the utility function for c^m, utility maximisation for each individual in the community implicitly define best response functions for time uses and money donations. Accounting for strategic interactions in the provision of the "impure" public good and for the heterogeneity of preferences across individuals, the $i-th$ person functions may be expressed as follows:

$$t^{j*} = t^{j*}(\alpha, w, y, G_{-i}; Z_j, \varepsilon_j) \geq 0, \qquad j = n, h, v; \tag{8}$$

$$m^* = m^*(\alpha, w, y, G_{-i}; Z_m, \varepsilon_m) \geq 0 \tag{9}$$

where $G_{-i} \equiv G\left(\sum_{k \neq i} \alpha_k t_k^v + \sum_{k \neq i} m_j\right)$, i.e. the time and money donations of all the other individuals in the local community, the Z's are standard vectors of demographic factors accounting for heterogeneity of agents' preferences, and ε's are individual-specific taste shifters, which are unobserved to the researcher and that influence optimal decisions[9]. According to this formulation, the set of observed choice determinants may not exactly overlap. Unobserved individual effects in (8) are assumed to be specific to each equation. However, since some unobserved preference shifters may be important determinants of each decision rule, errors may be correlated across equations. This is

[7] For simplicity, we thus assume that the opportunity cost of volunteering, as well as of other non market activities (leisure and houseworking) is the market wage. Duncan (1999) shows that, in a model where money and time contributions serve just to provide a public good, the wage equals the opportunity cost of time: otherwise, the charity would be better hiring someone else to do the job and the contributor would give only money. See also Brown and Lankford (1992) for a discussion over this issue.

[8] Corner solutions implicily define a set of reservation wages (or reservation prices in the case of money donations) - one for each constrained choice variable - that replace market wages and depend on preferences. An explicit allowance for corner solutions will be made in the empirical analysis.

[9] Variation in demographic characteristics and unobserved factors is aimed at capturing differential preferences in dimensions likely to affect supply decisions, whereby individuals with certain characteristics and preferences select different combinations of paid work, domestic work, donations and volunteering.

an important issue which will be directly addressed in the empirical analysis.

Details on the derivation of optimality conditions are given in Appendix 1. We find that, given the perfect substitutability between home-produced and purchased services, in equilibrium agents work at home to the extent that their marginal productivity of an hour of this type of work is higher than an hour's market wage: $\partial f(t^h)/\partial t^h > w$; otherwise they are better off by earning labour income to purchase goods and services in the market[10]. As in the standard labour supply model, paid work decisions are driven by the comparison of total marginal costs (in terms of leisure reduction) and benefits (the value of goods consumption): denoting U_k the first derivative of the utility function with respect to the generic $k-th$ argument, for individuals offering a positive amount of hours we have $U_{t^l} = wU_c$; otherwise $U_{t^l} > wU_c$ and time for paid work is zero.

As for donations, our results are similar to Duncan (1999), except for the fact that here we explicitly account for an additional rationale to donate (i.e. signalling altruism to receive social approval). As shown in the appendix, FOCs for time and money donations take the following form:

$$[t^v] \quad : \qquad \alpha(U_d + U_q + U_G) \leq U_{t^l} \tag{10}$$

$$[m] \quad : \qquad w(U_d + U_q + U_G) \leq wU_c \tag{11}$$

where the LHS is the value of the marginal utility for both types' donations. Equality holds whenever t^v and m are positive. Given the perfect substitutability between volunteering and money gifts, it is relatively straightforward to show that only three types of strategies can be optimal, defining Nash equilibria. First, if conditions are not binding, individuals do not contribute at all ($t^v = 0; m = 0$). Second, individuals donate money but do not volunteer; this occurs when volunteering is either less productive than paid work ($\alpha < w$), therefore less attractive than money gifts, or as productive as working ($\alpha = w$) but when optimal hours of work are zero. Finally, when $\alpha = w$ the two FOCs collapse into a single equation which defines only the total value of contributions d, so that any combination of time and money giving which amounts to that value is optimal. However, if $\alpha \leq w$ there are no equilibria with positive volunteering and zero money donations. The intuition behind this result is that optimal choices of m and t^v are driven only by efficiency considerations: since individuals do not have specific tastes for one charitable activity against the other, preferences play a little role, and decisions are purely a matter of comparing opportunity costs.

3.2 Extending the Baseline Model

The modelling approach discussed so far neglects at least two important aspects. First, *coeteris paribus*, some people may not be totally indifferent between "warm-glow" derived from volunteering and money donations. In particular, a direct involvement in the provision of services by a not-for-profit organisation, through the supply of unpaid work may deliver *per se* more utility than the simple offering of a money gift. Second, as discussed in the previous section, there are several reasons why signalling altruism

[10] However, if an individual prefers consuming self-produced goods and services (think e.g. to care-giving), she may work at home even if her productivity at home is lower than in the market.

through voluntary work or money does make a difference for individuals' reputation: Ellingsen and Johannesson (2003) suggest that "time is not money", in the sense that gifts of time are valued more than gifts of money because they are able to signal more altruism. Similarly, Lee et al. (1999) argue that voluntary work is more affected by others' expectations than gifts of money. In a slightly different setting, Prendergast and Stole (2001) show that in many circumstances non monetary gifts - such as time gifts - are offered by a donor instead of more efficient cash transfers because the latter are seen as impersonal and carrying a "stigma effect" for reputation. Indeed, in equilibrium the signalling power of time gifts arise exactly because, in principle, they are *inefficient* relative to cash.

In the light of our framework, preferences for time donations versus cash transfers can be accounted for by means of the following modified utility function:

$$U\left(c\left(c^m, f\left(t^h\right)\right), t^l, d(v,m), q\left(v,m\right), G\left(V+M\right)\right) \tag{12}$$

where for simplicity we have retained the assumption that what matters for the provision of the public good is the total value of the endowment available to charities. However, this extended model allows for the two giving activities being different goods, at least from the two perspectives of warm-glow and reputation building. In particular, we assume that for some people volunteering may matter more than money donations for warm-glow ($U_v > U_m$) and/or reputation ($\partial q/\partial v > \partial q/\partial m$)[11].

Quite intuitively, the result is that agents with preferences for volunteering (or for whom donating time is more effective in the production of social esteem) may now find optimal to volunteer even if the opportunity cost of time is higher than the value of money contributions. In the Appendix 1, it is shown that this happens whenever voluntary work possesses a larger utility pay off in terms of intrinsic preferences and/or signaling motives than the difference in opportunity costs between paid and unpaid work. However, having a strict preference for volunteering does not necessarily invalidate the qualitative results obtained in the perfect substitutability case, i.e. it does not necessarily imply a positive supply of voluntary labour. For example, suppose that the utility premium from volunteering is positive but small in absolute value. Then, the fact that its associated opportunity cost is higher than its productive contribution would be enough to prevent people from donating time.

In the remaining part of the section we discuss the implications of the models in terms of individuals' behaviour, both within the benchmark and the extended model. This will allow us to derive useful insights for the empirical analysis.

3.3 Implications

According to the baseline model, if individuals are less productive in volunteering than in the labour market, then the conditional probability $\Pr(m^* > 0 | t^{v*} > 0)$ should be equal to 1, while $\Pr(t^{v*} > 0 | m^* = 0)$ should be zero (e.g., Andreoni et al., 1996). The same result emerges also in the unrestricted model, whenever for all agents the utility

[11] Of course, one can also observe that for some individuals money donations would be preferred to time donations. However, this will strengthen the results obtained with the "baseline model". In particular, it can be easily shown that only money donations would be observed in equilibrium.

pay off of volunteering is lower than its opportunity cost.

More in general, some agents may have specific tastes for volunteering, as in the extended model, and find profitable to depart from the optimal behaviour implied by the baseline model, e.g. by supplying hours of voluntary labour despite $\alpha < w$. Still, whenever the largest share possesses a productivity in volunteering which is much lower than market productivity, the number of departing individuals may be negligible. This implies that the conditional probability $\Pr(t^{v*} > 0|m^* > 0)$ should be larger than $\Pr(t^{v*} > 0|m^* = 0)$. The opposite happens when the difference between α and w is small: in this case, even a weak preference for volunteering may be enough to increase the supply of time donated.

In addition, if the value that people attaches to social esteem is large, we might expect higher overall donations, as a consequence of reputation mechanisms. We may thus think that social esteem drives choices when the expectations of others are important, e.g. when the person is part of a social network. Moreover, if time matters more than money in the production of reputation, we also expect a higher impact of social networks on the probability of volunteering than of cash donations. In the light of our theoretical model, the net impact of reputation mechanisms on charitable contributions can be analysed by explicitly including measures of the importance of social networks in the vector of observed characteristics Z.

These predictions can be summarised in the following two main working hypothesis for the empirical analysis, following from Propositions (1) and (3) in Appendix 1. Assuming that $\Pr(\alpha < w) > \Pr(\alpha = w)$, then:

- **Hypothesis 1:** If some people have specific preferences for volunteering for both warm-glow or reputation mechanisms, but for the largest fraction: (i) volunteering is valued more than money donations, but only to a small extent; and/or (ii) the opportunity cost of volunteering is much higher than its contribution to charities, we expect that:

$$\Pr(m^* > 0) > \Pr(t^{v*} > 0)$$
$$\Pr(t^{v*} > 0|m^* > 0) > \Pr(t^{v*} > 0|m^* = 0)$$
$$\Pr(m^* > 0|t^{v*} > 0) > \Pr(m^* > 0|t^{v*} = 0)$$

i.e. that the probability of volunteering is higher among those who also give money[12]. Thus, if only the total value of gifts matters and money and time donations are perfect substitutes, optimality conditions are determined by efficiency considerations. But if we assume that the two types of giving are different goods, individuals heterogeneity in preferences plays a key role.

- **Hypothesis 2:** If agents care about the others and/or they belong to a social network, so that social esteem is an important determinant of satisfaction, the

[12] Under the hypothesis of perfect substituability of time and money donations for all individuals, the corresponding last two conditions would appear as follows: $\Pr(m^* > 0|t^{v*} > 0) = 1$; $\Pr(t^{v*} > 0|m^* = 0) = 0$ and $\Pr(m^* > 0|t^{n*} = 0) > 0$; $\Pr(t^{v*} > 0|t^{n*} = 0) = 0$.

probability to optimally choose a positive amount of donations is higher because of the reputation rationale:

$$\begin{aligned} \Pr(m^* &> 0|network\_yes) > \Pr(m^* > 0|network\_no) \\ \Pr(t^{v*} &> 0|network\_yes) > \Pr(t^{v*} > 0|network\_no) \end{aligned}$$

Moreover, since time matters more than money, we also expect that[13]:

$$\Pr(t^{v*} > 0|network\_yes) > \Pr(m^* > 0|network\_yes)$$

Besides predictions about charitable activities, our behavioural model gives several additional insights concerning, for example, the relationship between market and domestic work. For example, under the assumption that productivity at home is lower than productivity (or, more precisely, wages) in the market, we also expect that $\Pr(t^{h*} = 0|t^{n*} = 0) = 0$ and $\Pr(t^{h*} = 0|t^{n*} > 0) = 1$. More in general, even if productivity in domestic work is lower than its opportunity cost, an individual may decide to work at home but not in the market if she prefers home produced goods and services with respect to those purchased on the market.

The remaining part of the paper contains the empirical analysis, which has the primary scope to ascertain to what extent the results implied by the theory fit the data. To this purpose, the next section contains an introductory descriptive analysis, which will be integrated and completed by the econometric investigation in Section 5.

4 Data and Descriptive Statistics

The data used in this paper originate from the 2000 wave of the *Indagine Multiscopo*, a cross-sectional survey yearly administered by the National Statistical Office (ISTAT) to a representative sample of the Italian population. The survey is designed to provide micro-level information on several aspects of everyday life, from dwelling conditions, to education, health status, labour market behaviour, and time use. Each year, a sample of nearly 20,000 households (about 60,000 individuals) is interviewed. Detailed information on the sampling frame and other aspects of the Survey may be found in ISTAT (2001). For the purposes of the present paper, the estimation sample has been restricted to household heads and spouses aged 25-60 if men and 25-55 if women. The resulting sample includes 11,331 men and 11,038 women, with an employment rate of 85% and 54% respectively. On the other hand, 39% of the sample of women report being a housewife.

The survey enables identification of individual time and money donations thanks to specific items of the questionnaire. On the money donations front, individuals are asked whether they have given any money to associations or charities over the 12 months

[13] We stress that these probability shifts should not be interpreted as causal effects. While in our model we have treated the production of reputation (and the size of the community to which each individual belongs) as an exogenous mechanism, in practice the social network may be partly endogenously determined. For example, it may be that individuals more altruistic are more likely to enlarge their network and, at the same time, to be more concerned about social esteem. For this reason, particular care should be used in the empirical evaluation of these effects.

Table 1: Sample probabilities of time and money donation

Probabilities	*Women*	*Men*
$\Pr(t^{v*} > 0)$	9.95	12.88
$\Pr(m^* > 0)$	19.30	21.71
$\Pr(m^* > 0, t^{v*} > 0)$	5.70	7.78
$\Pr(m^* = 0, t^{v*} = 0)$	76.45	73.20
$\Pr(m^* > 0, t^{v*} = 0)$	13.61	13.92
$\Pr(m^* = 0, t^{v*} > 0)$	4.25	5.10
$\Pr(m^* > 0 \vert t^{v*} = 0)$	15.11	15.98
$\Pr(m^* > 0 \vert t^{v*} > 0)$	57.29	60.42
$\Pr(t^{v*} > 0 \vert m^* = 0)$	5.26	6.51
$\Pr(t^{v*} > 0 \vert m^* > 0)$	29.52	35.85

prior to the interview. The survey contains a separate question on whether interviewees gave money to political parties, and we do not count these as cases of money donations. As for time donations, the survey asks individuals if (over the last 12 months) they work without being paid for volunteering associations, non-volunteering associations, political parties or trade unions, and we exclude the two latter possibilities from our definition of volunteering[14]. Our definitions are grounded in the literature and are aimed at isolating charitable behaviour from donations that are more likely to bring some indirect monetary reward to the individual, e.g. by "investing" in representation. In each case, we are only able to observe whether donations took place, but not the amounts contributed or the hours volunteered.

The survey also reports detailed information on aspects of the individual use of time and - as we have discussed in the theoretical section - such information plays a crucial role in characterising donations, as long as individuals decide whether or not to donate while managing also other dimensions of their life, namely time in the labour market and time at home. Both variables are recorded in the ISTAT survey in terms of (average) weekly hours of market and domestic work, separately. In particular, the latter includes both houseworking and caregiving activities.

Table 1 provides some descriptive statistics on time and money donations in our sample, separately for men and women. Money donations are more frequent than time donations, and men donate more than women do. By looking at the two outcomes in conjunction, the Table indicates that the vast majority of either sub-sample does not donate, whereas some 13 percent chooses to donate money but not time. Looking at conditional frequencies suggests that donations on the two fronts are somewhat positively associated: the incidence of money donations rises by approximately four times if one compares individuals who do not donate time with those who do, and the increase in time donations is nearly six-fold contrasting non-donors with donors of money.

The selection of independent variables for the econometric model has been based

[14] We also experimented using a restrictive definition of volunteering (i.e. for volunteering associations only) and found results to be robust to the change of definition. Throughout the paper, we refer to results obtained using the enlarged definition of volunteering only.

on the economic framework developed in the previous Section, as well as on existing research and data availability. In particular, we assume that observed outcomes of optimally behaving agents reflect both individual characteristics affecting preferences and economic constraints, as well as variables for the work status. A description of the regressors used in the empirical analysis and summary statistics are presented in Appendix Table A.1. The meaning of regressors' labels is in most cases self-evident.

5 Econometric Model

The evidence presented in Table 1 may not be fully informative about the correlations between time and money donations because of compositional effects that plague descriptive statistics. A fuller understanding of these relationship requires a multivariate analysis. This section presents the simultaneous equations model that we use to investigate the four processes of interest discussed in the previous Section: money donations (m), volunteering (t^v), (log of) hours of market work (t^n), (log of) hours of domestic work (t^h). Since, as discussed in the Section 4, we have information on the continuous variable in the last two cases, but only on the (discrete) decision whether to donate time and/or money, the model consists of two probit and two tobit equations, and we allow for free cross-processes correlations in the unobservables.

The four latent outcomes for individual i are:

$$\begin{aligned} t^{j*} &= X_j\beta_j + \varepsilon_j, \quad j = n, h, v \\ m^* &= X_m\beta_m + \varepsilon_m \\ \varepsilon &= (\varepsilon_n, \varepsilon_h, \varepsilon_v, \varepsilon_m) \sim MVN(\mathbf{0}, \mathbf{\Omega}) \end{aligned} \tag{13}$$

where the vector of errors ε is assumed to follow a multivariate normal distribution (MVN) of dimension 4 with covariance matrix $\mathbf{\Omega}$. Equations in (13) are linear specifications of the demand functions in (8), where the X's vectors contain both individual characteristics and proxies for labour and non labour income, which are not observed in the data. In particular, we included variables accounting for age, education, household size, marital status, living areas (distinguishing both geographical location and city size), health, employment status of the partner - in order to account for the role of the household in influencing individual choices -, holding of health/life insurances - to capture individual attitudes toward risk. We further account for the influences of economic conditions by including variables related to the individual's judgement about the adequateness of household economic resources and the occurrence of difficulties in purchasing necessary items. Finally, we included indicators for whether the individual reports having friends and/or participating to religious celebrations. In the light of our theory, the former is aimed at capturing whether the individual belongs to a social network, which, in turn, should affect the concern to signal altruism because of prestige motivations and social pressure; besides signalling motives, the latter should also measure the degree of altruism and "warm-glow" motivations. Thus, we expect these variables to be negatively correlated with donations, and, to the extent to which volunteering is more valued than money gift, a stronger association with the former. All the remaining variables affecting individual choices are included in the unobservable

terms ε's.

The mapping between latent propensities and observed behaviour is as follows. For processes t^v and m (volunteering and money donations) we only know whether the action took place, a $0-1$ variable. Therefore, we observe

$$D^v = I(t^{v*} > 0); \qquad D^m = I(m^* > 0)$$

where $I(\cdot)$ is an indicator function which takes value 1 whenever its argument is true, and zero otherwise. In the remaining two processes we observe continuous hours of work (either in the market and at home) but with a mass point at zero. According to the labour supply model developed in the previous section, we can interpret those mass points as corner solutions in a welfare maximisation problem in which the unconstrained optimum would be negative. Therefore the observational rule is the following:

$$H^j = \max\left\{t^{j*}, 0\right\}, \quad j = n, h$$

where H stands for (log of) observed working hours. The above implies that the first two variances in $\mathbf{\Omega}$ must be normalised to 1. The remaining coefficients in $\mathbf{\Omega}$ are free. A detailed description of the likelihood function for the model is in Appendix 2. Taken together, the relationships above describe a system of seemingly unrelated regression equations for limited dependent variables, two probits and two tobits.

6 Empirical Results

Since factors and tastes underlying time allocation decisions typically have a strong gender component, the analysis is conducted separately for men and women. The complete set of estimates of our four equation model is reported in Appendix 3. Overall, our findings are consistent with the existing evidence (e.g. Menchik and Weisbrod, 1987; Brown and Lankford, 1992; Freeman, 1997). Key observable characteristics have similar effects on the two types of giving and across genders, see probit results in Table A.2 col. Eq. 1 and Eq. 2. The probability of positive charitable gifts is generally increasing in schooling and age (with a concave profile) for both men and women. Moreover, people from northern regions are more likely to donate (and especially to volunteer) than people from the South, a result fairly common in Italy where large differences exist in the level of income as well as in the presence of not-for-profit organisations across regions. Also living in urban areas is positively associated with giving, but there is a U-shaped relationship between both volunteering and money donations, and the size of the area[15]. Interestingly, holding a life/health insurance have a positive impact on giving, probably capturing an income effect as well as the individual propensity toward risks[16]. The negative coefficients associated with "time commuting" variables in the gender-specific volunteering equations reveal the importance of the time constraint

[15] Notice that, in our framework, the geographical variables included in regressions pick up also the effect of local not-for-profit and government behaviour, as well as of G_{-i} in Eq. (8).

[16] Notice that individual propensity toward risks can be associated to individual beliefs about what determines income. If one thinks luck is an important determinant of income, then she will be more likely to pay for an insurance, and - *coeteris paribus* - to donate more.

on individual decisions[17]. On the other hand, time spent travelling to the job place is negatively related to money donations (but significant only for men), probably because commuting time proportionally reduces income available for consumption goods. Judging to have adequate economic resources (one of our measures of the financial and economic situation of the households) matters for money donations, coefficients taking the expected sign for both men and women. Moreover, only for the former, we also find a positive impact of an adequate economic situation on volunteering, a point hinting at possible gender differences in the pattern of donations.

Unsurprisingly, individuals living in poor families (i.e. where there are problems in purchasing subsistence goods, such as food and health care) donate less than the others. On the contrary, a similar pattern does not emerge for the supply of voluntary labour, which seems to be less affected by economic contingencies, and driven more by intrinsic motivations: even if it would have a positive money payoff, in bad times agents are on average not willing to substitute hours of unpaid volunteering with market activities. About other individual characteristics, results are less clear-cut: having a partner is overall negatively related to donations only for women. Moreover, while there exists a U-shaped relationship between the number of children and volunteering for men, the same pattern does not emerge for women; in particular, the impact is negative but almost never statistically significant at the usual levels of confidence. These ambiguous findings probably depend on two forces working in opposite directions: on the one hand, having more children reduces available time and income; on the other hand, people more altruistic (i.e. that are likely to donate more) may have preferences for having more children.[18]

As for the employment status of the partner, a variable accounting for choices at the household level, results show clear gender differences. Having a spouse employed significantly increases the probability of money donations for men, while - all else equal - an employed partner has a negative effect (only marginally statistically insignificant) on the probability of volunteering for women. The coefficients on the two variables intended to capture individual motivations and tastes in the provision of voluntary work and money donations are significant and with the expected sign: in particular, the lack of friends is associated with lower incentives to contribute, and the effect is stronger for volunteering than for money donations. Thus, reputational concerns seem to matter in the provision of charitable contributions: *coeteris paribus*, a person tied to a social network has a higher probability to volunteer and give money, giving support to our previous Hypothesis 2. However, it is hard to think at this effect as causal, as those who are intrinsically less motivated in giving (either for altruistic or egoistic motivations) may have also been less likely to develop (or to be concerned about) social interactions. Moreover, similar results holds for the variable capturing religious participation. While we are not able to disentangle the single contribution of d, q and G, these findings suggest that their overall contribution is not negligible[19].

[17] Not surprisingly, time spent commuting has a negative impact also on the other alternative uses of time, i.e. paid and domestic work.

[18] Similar results, but for the number of children, are not novel in the literature: see e.g. Vaillancourt (1994) and Carlin (2001).

[19] Using a unique dataset combining experimental measures of altruism, survey measures of other

Table 2: Cross equation errors covariances

	Women		*Men*	
	Coef.	*z-stat*	*Coef.*	*z-stat*
$Cov(\varepsilon_m, \varepsilon_{t^v})$	0.523	25.02	0.556	30.28
$Cov(\varepsilon_{t^n}, \varepsilon_{t^v})$	−0.009	−0.75	−0.039	−2.14
$Cov(\varepsilon_{t^h}, \varepsilon_{t^v})$	0.017	1.42	0.041	1.48
$Cov(\varepsilon_{t^n}, \varepsilon_m)$	−0.050	−0.97	−0.007	−0.35
$Cov(\varepsilon_{t^h}, \varepsilon_m)$	0.012	0.70	0.328	4.89
$Cov(\varepsilon_{t^n}, \varepsilon_{t^h})$	−0.096	−9.67	−0.671	−15.75
$Var(\varepsilon_{t^n})$	1.511	21.74	1.095	23.25
$Var(\varepsilon_{t^h})$	0.419	35.61	10.710	31.82

Note: $\varepsilon_m, \varepsilon_{t^v}, \varepsilon_{t^n}, \varepsilon_{t^h}$ are the error terms in the money donations, volunteering, paid labour and household labour equations, respectively.

Interestingly, for both men and women, while social networks' ties are always more important than religious participation in the case of volunteering, the difference between the two coefficients is not statistically significant in the case of money donations[20]. One possible interpretation hinges upon the "moral obligation" discussed in Freeman (1997), i.e. that individuals feel more obliged to volunteer than to give money when asked.

Finally, we briefly comment tobit results in Appendix Table A.2 col. Eq. 3 and Eq. 4 for domestic and market working hours. First, for standard controls in labour supply equations (e.g. education, age, regions, ...) results are unsurprising and in line with previous studies. In addition, we report a negative sign for dummies aimed at capturing difficulties in purchasing necessary goods, but in this case there is a clear reverse causality problem. Interestingly, we find that as the number of children in the household increases, men optimally react by working more, while women reallocate more time to child care and domestic work. This is consistent with our behavioral predictions, i.e. that there is a negative correlation between working at home and in the market. Accordingly, agents allocate time to the one or the other activity depending on the existence of a comparative advantage, with women being more productive at home (or being more discriminated at work) than men. Gender differences emerge also considering the employment status of the partner. On the one hand, having a spouse employed significantly increases the number of both hours of paid work and of domestic work for men. On the other hand, an employed partner has a positive impact on the number of hours of domestic work for women, while the negative effect on the number of hours of paid work is only marginally statistically significant.

In order to investigate the inter-relationships between time and money donations, Table 2 reports the whole set of cross-equations errors' covariances, separately for men

factors (like reputational concerns), and the number of hours volunteered by volunteer firefighters, Carpenter and Myers (2007) move in the direction of disentagling these three possible determinants of donations. They find a significant positive effect of altruism and reputational concerns.

[20] This results is based on testing the equality of the two coefficients on *no_friends* and *no_church* separately in the equations for volunteering and money donations. The p-values for the LR tests statistics are the following: LR(men, volunteering) $\Pr(\chi_{(1)})$=0.021; LR(men, money don.) $\Pr(\chi_{(1)})$=0.231; LR(women, volunteering) $\Pr(\chi_{(1)})$=0.108; LR(women, money don.) $\Pr(\chi_{(1)})$=0.662.

and women[21]. First, we notice that time and money donations appear strongly and positively correlated: an upward shift in the supply of volunteering is on average associated with an increase in money donations. This evidence suggests that, at least from the point view of unobserved attitudes, the two types of giving do not "compete" with each other, but - on the contrary - they appear activities which are undertaken in quite strong conjunction. We also notice that the correlation has a similar magnitude for both men and women, and is quite close to estimates by Brown and Lankford (1992)[22]. Second, other covariances are statistically significant. In particular, we observe a negative association between domestic and paid work, greater in magnitude for men than women[23].

The variance in hours of domestic work for the men sub-sample is more than 20 times greater than that characterising the women sub-sample, while variances are very close in the case of market work. Results also show a positive (somehow statistically weak) association between houseworking and volunteering, again for both genders. By converse, results for other covariances seem to differ between the two sub-samples; moreover, covariances are significant only for men. In particular, for this sub-sample, we find a negative association between market work and volunteering, and a positive correlation between hours of domestic work and money donations. To justify our simultaneous equation approach we also run a formal test aimed at capturing the separability between the unobservable determinants of giving decisions and the set of other time uses (domestic and market work). Results are reported in the last rows of Appendix Table A.2. Quite interestingly, strong gender differences emerge: the two set of processes are not separable for men, while they are for women. Overall, the whole set of estimated covariances suggests that the budget constraint is more important for men, while the time constraint matters more for women. In other words, men seems to allocate their time uses considering only two opportunities, both paid and unpaid work, and leisure (the item excluded here), but do not adjust across different types of work (whether paid or unpaid). On the contrary, women's choices distinguish between leisure and work, as well as within the two dimensions of work (paid and unpaid, domestic and voluntary labour). Our results then confirm systematic differences by sex found in the previous literature (e.g., Andreoni and Vesterlund, 2001), with men more likely to react to changes in the "opportunity costs" of giving than women.

Estimations' results can also be used to predict joint and conditional probabilities of money and time donations. Predictions for an individual endowed with mean characteristics are reported in the first column of Table 3. By fixing personal attributes, such an exercise allows dealing with the compositional effects that blur descriptive statistics.

We find that, for both men and women, the probability to volunteer is positive, but lower than the probability to donate money. As regards joint densities, obtained con-

[21] As we normalised variances to 1 in the probit equations, for time and money donations the estimated covariances coincide with correlation coefficients.

[22] These observations strengthen our results. However, covariances between unobservables pick up all the determinants we were not able to control for in our model, hence their sign can be influenced by a misspecified model. An example of omitted variable that could induce a positive covariance between time and money donations is the productivity parameter α.

[23] About the latter result, also Kalenkosky et al. (2005) report a negative correlations between market hours of work and housework, although their analysis is restricted to childcaring activities.

Table 3: Predicted probabilities: Base and stylised individuals

	Base individ (1)		*Base&No motiv* (2)		*Base&Fin. diff* (3)		*Base&Risk av* (4)	
Probabilities	*women*	*men*	*women*	*men*	*women*	*men*	*women*	*men*
$\Pr(t^{v*}>0)$	8.54	11.28	3.25	4.37	6.89	11.45	12.95	14.35
$\Pr(m^{*}>0)$	16.20	24.76	10.98	17.28	8.44	16.56	25.99	34.11
$\Pr(m^{*}>0, t^{v*}>0)$	4.13	7.15	1.53	2.74	2.31	5.70	7.66	10.31
$\Pr(m^{*}=0, t^{v*}=0)$	79.39	71.09	87.29	81.08	86.97	77.68	68.71	61.84
$\Pr(m^{*}>0, t^{v*}=0)$	12.06	17.61	9.44	14.54	6.13	10.85	18.32	23.80
$\Pr(m^{*}=0, t^{v*}>0)$	4.40	4.13	1.72	1.63	4.58	5.74	5.29	4.03
$\Pr(m^{*}>0 \mid t^{v*}=0)$	13.19	19.85	9.76	15.21	6.58	12.26	21.05	27.79
$\Pr(m^{*}>0 \mid t^{v*}>0)$	48.44	63.35	47.15	62.67	33.51	49.82	59.14	71.87
$\Pr(t^{v*}>0 \mid m^{*}=0)$	5.25	5.49	1.93	1.97	5.00	6.88	7.15	6.12
$\Pr(t^{v*}>0 \mid m^{*}>0)$	25.53	28.87	13.99	15.86	27.36	34.44	29.48	30.23

Base individual: individual endowed with sample mean characteristics.
Base & No motivat.: base individual + no motivations (has not friends,does not go to church).
Base & Financial diffic.: base individual + financial difficulties (five items of difficult purchasing).
Base & Risk aversion: base individual + risk aversion (has health and life insurance).

trolling for the correlation between unobserved determinants of both giving processes, it seems that - among the various potential combinations - the one in which people do not give at all is by far the most likely. Interestingly, while the joint likelihood of giving both time and money is less than 10%, there is a probability of around 15% of money donations and no volunteering. Moreover, although small, there is a share of people who are expected to contribute with only time donations. Moving to conditional probabilities, we notice that, consistently with our theoretical predictions, donating money is positively associated with the probability of volunteering.

In order to gauge the associations between personal attributes and outcomes, Table 3 also presents predicted probabilities for different stylised individuals, who are similar to the one endowed with mean characteristics, except for some relevant aspects. Column (2) shows that if we remove participation to religious celebrations and having friends (our proxies for both warm glow and prestige motivations), marginal probabilities of donations sharply decrease (-61% for volunteering; -32% for money gifts). A similar pattern emerges for both joint and conditional probabilities. This gives a quantitative measure of the importance of motivations to explain giving behaviours. In column (3) we experiment how giving is affected by the economic situation and the economic constraint. In this case, the difference between the base and the individual in financial difficulties is given by the fact that for the former it is difficult to purchase a number of necessary goods. Results show that, while the probability of volunteering decreases to a small amount, there is a sharp drop in that of giving money, and, moreover, in the likelihood to contribute with both time and money. In other words, the economic situation of the household matters for individual giving decisions, more for money than for time donations. Finally, we also investigate how charitable behaviours are influenced by preferences toward risk. According to Column (4) in Table 3, both time and money donations of risk averse individuals are significantly higher than the average. One possible interpretation could be that those who dislike risk may be more

favourable to redistribution: indeed, since they typically attach more weight than the average to chance as a determinant of individual wealth and income, they may also be more inclined to donate as a form of reciprocity towards those who have been less lucky.

Summarising, our empirical results seem consistent with a model in which the amount of charitable activities depends on the individual preferences and decisions about the allocation of time between different alternatives. In particular, in a world where i) agents are more productive at paid work than when volunteering, and ii) they may have specific preferences for time versus money donations (for example, because of reputational concerns), our results suggest that choices are mainly driven by efficiency considerations, lending support to the baseline model.

7 Concluding Remarks

In this paper we have theoretically and empirically developed a behavioural model of time and money donations, including also labour supply and the time devoted to household production among the set of individual choices. We propose a general framework for understanding individual choices, where utility for prosocial behaviours stems from three sources: "warm-glow", social esteem, and altruism (i.e. individual propensity to contribute to the provision of impure public goods).

Results from the empirical model that simultaneously accounts for individual decisions over money donations, volunteering, hours of market work, and hours of domestic work support comparative static predictions from the theory, and show that money and time donations correlates positively. Moreover, confirming previous literature, there is a different pattern of correlations across genders, as for the time uses and giving, stressing the importance of using a behavioural model to fully characterise individual decisions to donate. In particular, men are more likely to react to changes in the "opportunity costs" of giving than women. Finally, most of the variables that the literature deems to be important determinants of individual behaviour turn out to be significantly associated with the decision on whether or not to volunteer. In particular, proxies for "warm-glow", social esteem, and altruism significantly affect the probabilities of giving, and underline the importance, suggested by the theory, of taking into account the impact of reputational concerns in the analysis of individual decision making.

References

[1] Alesina A., Glaeser E., Sacerdote B., 2001. Why doesn't U.S. has a European style Welfare State? Brookings Paper on Economics Activity Fall, 187-278.

[2] Andreoni J., 1990. Impure altruism and donations to public goods: a theory of warm-glow giving. The Economic Journal 100(401), 464-477.

[3] Andreoni J., 2005. Philanthropy. In: L. A. Gerard-Varet, S. C. Kolm and J. Ythier (Eds.), Handbook of Giving, Reciprocity and Altruism, Amsterdam: North-Holland.

[4] Andreoni J., Gale W.G., Sholz J.K., 1996. Charitable contributions of time and money, mimeo.

[5] Andreoni J. and Vesterlund L., 2001. Which is the Fair Sex? Gender Differences in Altruism. Quarterly Journal of Economics 116 (1), 293-312.

[6] Auten G. E., Sieg H., Clotfelter C. T., 2002. Charitable giving, income, and taxes: An Analysis of panel data. American Economic Review 92 (1), 371-382.

[7] Becker G. S., 1965. A Theory of the Allocation of Time. The Economic Journal 75, 493-517.

[8] Benabou R., Tirole J., 2003. Intrinsic and Extrinsic Motivations. Review of Economic Studies 70, 489-520.

[9] Benabou R., Tirole J. (2006) Incentives and Prosocial Behaviour, American Economic Review, 96(5): 1652-1678.

[10] Bergstrom T., Blume L., Varian H.,1986. On the private provision of public goods. Journal of Public Economics 29, 25-49.

[11] Brown E., Lankford H., 1992. Gifts of money and gifts of time Estimating the effects of tax prices and available time. Journal of Public Economics 47, 321-341.

[12] Carlin P. S., 2001. Evidence on the Volunteer Labour Supply of Married Women. Southern Economic Journal 67 (4), 801-824.

[13] Carpenter J., Myers C. K., 2007. Why Volunteer? Evidence on the Role of Altruism, Reputation, and Incentives. IZA DP No. 3021.

[14] Day K. M., Devlin R. A., 1996. Volunteerism and Crowding Out: Canadian Econometric Evidence. Canadian Journal of Economics 29 (1), 37-53.

[15] Day K. M., Devlin R. A., 1998. The Payoff to Work without Pay: Volunteer Work as an Investment in Human Capital. Canadian Journal of Economics 31 (5), 1179-1191.

[16] Duncan B., 1999. Modeling charitable contributions of time and money. Journal of Public Economics 72, 213-242.

[17] Ellingsen T., Johannesson M., 2003. Time is not Money. mimeo, Department of Economics, Stockholm School of Economics.

[18] Freeman R., 1997. Working for nothing: the supply of volunteer labor. Journal of Labor Economics 15, S140-S166.

[19] Gronau R., 1977. Leisure, home production and work - the theory of the allocation of time revisited. Journal of Political Economy 85(6), 1099-1123.

[20] Harbaugh W.T., 1998. What do donations buy? A model of philanthropy based on prestige and warm-glow. Journal of Public Economics 67, 269-284.

[21] ISTAT, 2001. Indagine Multiscopo sulle Famiglie: Aspetti della Vita Quotidiana. Roma: Istituto Nazionale di Statistica.

[22] Kalenkosky C. M., Ribar D. C., Stratton L. S., 2005. Parental child care in single-parent, cohabiting, and married-couple families: time-diary evidence from the United Kingdom. American Economic Review 95(2), 194-198.

[23] Khanna J., Sandler T., 2000. Partners in giving: The crowding-in effect of UK government grants. European Economic Review 80, 1157-1167.

[24] Kooreman P., Kapteyn A., 1987. A disaggregated Analysis of the Allocation of Time within the Household. Journal of Political Economy 95(2), 223-249.

[25] Lee L., Piliavin J.A., Call V.R., 1999. Giving time, blood and money: similarities and differences. Social Psychological Quarterly 62(3), 276-290.

[26] Menchik P.L., Weisbrod B.A., 1987. Volunteer Labour Supply. Journal of Public Economics 32, 159-183.

[27] Prendergast C., Stole L., 2001. The non-monetary nature of gifts. European Economic Review 45, 1793-1810.

[28] Randolph W. C., 1995. Dynamic income, progressive taxes, and the timing of charitable contribution. Journal of Political Economy 103 (4), 709-738.

[29] Salamon L. M., Sokolowski W., 2001. Volunteering in Cross-National Perspective: Evidence from 24 Countries. Working Papers of the John Hopkins Comparative Nonprofit Sector Project, no. 40, Baltimore: The John Hopkins Center for Civil Society Studies.

[30] Simmons W. O., Emanuele R., 2004. Does government spending crowd out donations of time and money? Public Finance Review 32 (5), 498-511.

[31] Smith W., Chang C., 2002. Shipping the good apples out: a note on contributions of time and money. Economics Bulletin 10(1), 1-14.

[32] Vaillancourt F., 1994. To Volunteer or Not: Canada, 1987. Canadian Journal of Economics 27 (4), 813-826.

[33] Wright K., 2002. Generosity versus Altruism: Philanthropy and Charity in the US and UK. Civil Society Working Paper, 17, London School of Economics.

Appendix 1: The Model(s)

In this appendix, we discuss a formal derivation of main predictions from the models presented in Section 3.

The baseline model. We start with the baseline specification. Substituting (2)-(5) in (1), the individual utility maximisation problem can be stated as follows:

$$\begin{aligned} \max_{\{c^m t^h, t^n, t^v, m\}} & U\left(c^m + f\left(t^h\right), t^l, \alpha t^v + m, q\left(\alpha t^v + m\right), G\left(V + M\right)\right) \\ & s.t.\ c^m = w(T - t^l - t^h - t^v) + y - m \\ & t^l = T - (t^h + t^v + t^n) \\ & 0 \leq t^l + t^h + t^v \leq T, \quad t^l, t^h, t^v, m \geq 0 \end{aligned} \tag{14}$$

Plugging the budget constraint into the utility function and using the time constraint to express utility in terms of hours of paid, domestic and volunteer work, utility appear as follows:

$$U\left(wt^n + y - m + f\left(t^h\right), T - t^h - t^v - t^n, \alpha t^v + m, q\left(\alpha t^v + m\right), G\left(V + M\right)\right)$$

FOCs from the maximisation problem are the following:

$$\left[t^h\right] \quad : \quad U_c \frac{\partial f(t^h)}{\partial t^h} \leq U_{t^l} \tag{15a}$$

$$[t^n] \quad : \quad U_c w \leq U_{t^l} \tag{15b}$$

$$[t^v] \quad : \quad \alpha\left(U_d + U_q + U_G\right) \leq U_{t^l} \tag{15c}$$

$$[m] \quad : \quad U_d + U_q + U_G \leq U_c \tag{15d}$$

where U_k, which indicates marginal utility of $k = c, t^l, d, q, G$, is a function of all the variables affecting utility levels. Equality conditions hold whenever the corresponding variable is strictly positive at the optimum. However, non-negativity constraints may be binding for some individuals leading to corner solutions.

Proposition 1 *Whenever $\alpha < w$ optimal hours volunteered cannot be positive, while money donations can be either zero or positive. When $\alpha = w$ both time and money donations can be positive. In this case, the contributor is indifferent between the two forms of giving, since what matters for her utility is the total value of donations $d = (v + m)$.*

Proof. Suppose $\alpha < w$ first. Denoting the marginal utility of donations as $A = U_d + U_q + U_G$, suppose first that (15d) holds with inequality: $A < U_c$. Thus, the marginal utility of money donations is lower than that of goods and services, so that $m = 0$. But then $wA < wU_c$ and also $\alpha A < wU_c$. Using (15b) this means that, no matter what the agent decides about working in the market or not (either $U_c w = U_{t^l}$ or $U_c w < U_{t^l}$), it is always true that $\alpha A < U_{t^l}$. But then, by the (15c), the optimal supply of voluntary work is zero. The opposite cannot be true: suppose that $\alpha A = U_{t^l}$. (i.e. $t^v > 0$). Then, $wA > U_{t^l}$, which contradicts the condition for $m = 0$. Assume now $m > 0$, so that $wA = wU_c$. But then, $\alpha A < wU_c \leq U_{t^l}$, which means that hours

volunteered will be always zero. Notice that it can also be that money donations are positive and hours of paid work are zero.

Let's now consider the $\alpha = w$ case. Now the combination $(m > 0; t^v > 0)$ can be optimal: in fact, suppose $t^v > 0$, $\alpha A = wa = U_{t^l}$. Then, the chain of inequalities linking FOCs for time and money donations (through paid work) takes the following form: $wA \leq wU_c \leq U_{t^l} = wA$. It is immediate to show that: donations cannot be zero $(wA < wU_c)$; agents would not donate hours without working in the market. In other words, interior solutions require $\alpha = w$: however, since (15c) and (15d) collapse into a single expression, FOCs only define the optimal total value of gifts $d = (m + \alpha l^v)$, but not its two components separately. Thus, the two forms of giving are perfect substitutes at the optimum from the individual's perspective. ■

Proposition 2 *People do not work in the market but work at home only if they are more efficient in the latter than in the former activity.*

Proof. Using (15a) and (15b), we have that $U_c \frac{\partial f(t^h)}{\partial t^h} \leq U_{t^l}$ and $U_c w \leq U_{t^l}$. Suppose $\frac{\partial f(t^h)}{\partial t^h} < w$: then whenever $U_c w = U_{t^l}$ $(t^n > 0)$ it must be that $U_c \frac{\partial f(t^h)}{\partial t^h} < U_{t^l}$ $(t^h = 0)$, and viceversa. If $\frac{\partial f(t^h)}{\partial t^h} = w$, then $t^n > 0$ and $t^h > 0$. ■

To fully characterise optimal allocations we need to account for strategic interactions in the provision of the impure public good. As in any Nash-type game, in deciding her best strategy, individuals take the actions of other community members as exogenously given. Thus, FOCs result in Marshallian demand (supply) functions for the three different uses of time and for money donations, all of them depending on the value of gifts of others and on parameters: $t_i^{j*} = t_i^{j*}(\alpha_i, w_i, y_i, G_{-i}) \geq 0, \quad j = n, h, v; \qquad m_i^* = m_i^*(\alpha_i, w_i, y_i) \geq 0$.

As shown by Bergstrom et al. (1986) and, more recently, Andreoni (1990) and Duncan (1999), a (maybe not unique) Nash equilibrium in pure strategies for this class of games exists under fairly general conditions, that here are assumed to hold[24]. In our case, a Nash equilibrium is an allocation of private consumption of goods, paid hours of work, domestic work, volunteer labour and money gifts such that, given the donations of others, every person is donating her optimal amounts.

The extended model. The extended model possess a more complex structure of preferences, which can be summarised by the following utility function:

$$U\left(c\left(c^m, f\left(t^h\right)\right), t^l, v, m, q\left(v, m\right), G\left(V + M\right)\right)$$

while, of course, time and budget constraints are the same as in the baseline model. In this case, conditions for an optimum take the following form

[24] In particular that $0 < U_G < 1$.

$$\left[t^h\right] \quad : \quad U_c \frac{\partial c}{\partial c^h} \frac{\partial f(t^h)}{\partial t^h} \leq U_{t^l} \tag{16a}$$

$$[t^n] \quad : \quad U_c w \leq U_{t^l} \tag{16b}$$

$$[t^v] \quad : \quad \alpha \left(U_v + U_q \frac{\partial q}{\partial v} + U_G \right) \leq U_{t^l} \tag{16c}$$

$$[m] \quad : \quad U_m + U_q \frac{\partial q}{\partial m} + U_G \leq U_c \tag{16d}$$

We now use these conditions to prove the proposition below:

Proposition 3 *Suppose that $\alpha < w$. Suppose further that $U_v > U_m$ and $\partial q/\partial v = \partial q/\partial m$. Then $l^v > 0$ can be an optimal behaviour whenever the value of the utility gain from "warm-glow" volunteering more than compensate its opportunity cost in the production of public good and social esteem. Suppose now that $U_v = U_m$ and $\partial q/\partial v > \partial q/\partial m$. Then, $l^v > 0$ whenever the more efficient production of reputation more than compensate the efficiency loss of using volunteering instead of money gifts to produce the public good and to contribute to "warm-glow" utility.*

Proof. Assume $U_v > U_m$ first. Define $C = U_q + U_G$. Suppose $l^v > 0$, then combining the last three FOCs we obtain: $wU_m + wC \leq wU_c \leq U_{t^l} = \alpha U_v + \alpha C$ and, therefore, $\alpha U_v - wU_m \geq (w - \alpha)C > 0$. The RHS is the value of the marginal utility gain, which must offset the value of the loss suffered in the components of utility others than "warm-glow". A similar line of reasoning can be used for (ii) $\partial q/\partial v > \partial q/\partial m$. In that case, the condition is: $\left(\alpha \frac{\partial q}{\partial v} - w \frac{\partial q}{\partial v}\right) U_q \geq (w - \alpha)D > 0$, where $D = U_m + U_G$, which proves the result. ■

Appendix 2: The Likelihood function

In order to derive the likelihood function of this model it is useful to define the following set of indices:

$$\begin{aligned} k_v &= 2D^v - 1; \quad k_m = 2D^m - 1 \\ k_j &= 2I(H^j > 0) - 1; \quad j = n, h \end{aligned}$$

where D_i^v and $D_i^m$are observed binary indicators for volunteering and money donations respectively: and where H_i^n and H_i^h are paid and housework hours. For individuals on a corner solution in both work time and domestic time supply, the contribution to the likelihood function are as follows:

$$L_1 = \Phi_4(\Xi; \Sigma)$$

where Φ_p denotes the cumulative density function (c.d.f.) of the multivariate normal distribution of dimension p, Ξ is a vector of upper integration points with typical element $k_j x_j' \beta_j$, $j = v, m, n, h$; $\Sigma = K\Omega K$, and K is a diagonal matrix with non-zero elements equal to the k indices defined above.

When only the optimal hours of work (process H^n) are positive, we observe their optimal amount in the data. We can therefore condition the probability for the remaining three outcomes on the observed hours of work, and thence write the joint probability as the product of the conditional probability and the unconditional probability of the conditioning variable: $\Pr(D^m, D^v, H^h, H^n) = \Pr(D^m, D^v, H^h | H^n) \times \Pr(H^n)$. Likelihood contributions take the following form:

$$L_2 = \Phi_3(\Xi\_H^n; \Sigma\_H^n)\phi(\varepsilon_n)$$

where $\phi(\cdot)$ denotes the density function of the univariate normal distribution, a $\_H^n$ suffix indicates conditioning on hours of work, and the arguments of the multivariate normal CDF are derived from the moments of the conditional multivariate normal distribution. Likelihood contributions for the case in which only hours of domestic work are positive (L_3) take an analogous form.

Finally, when the optimal hours of both market and domestic work are positive, the sequential conditioning can be expressed as follows: $\Pr(D^m, D^v, H^h, H^n) = \Pr(D^m, D^v | H^h, H^n) \times \Pr(H^h | H^n) \times \Pr(H^n)$. Resulting likelihood contributions are of the form:

$$L_4 = \Phi_2(\Xi\_H^h H^n; \Sigma\_H^h H^n)\phi(\varepsilon_h | \varepsilon_n)\phi(\varepsilon_n)$$

Given a sample of size N indexed by i, and defined $j_i = I(k_{ji} > 0)$, $j = n, h$; the log-likelihood of the model is:

$$\textstyle\sum_i [n_i h_i \log L_{1i} + (1 - n_i) h_i \log L_{2i} + (1 - h_i) n_i \log L_{3i} + (1 - n_1)(1 - h_i) \log L_{4i}] \quad (17)$$

Note that our model is analogous to Seemingly Unrelated Regression except we use a nonlinear estimation technique to account for lower limit constraints and partial observability. The computational burden posed by evaluation of multivariate normal integrals is tackled by means of simulation-based estimation.

Appendix 3: Variables' description and estimation results

Appendix Table A.1: Variables description and summary statistics

Variable description	Means	
	Women	Men
Volunteer	0.099	0.129
Money donor	0.193	0.217
Log(weekly hours of paid work)	1.862	3.124
Log(weekly hours of domestic work)	3.251	1.162
Age	41.142	44.362
Children (base= no children):		
has 1 child	0.090	0.115
has 2 children	0.167	0.217
has 3 children	0.061	0.079
has 4 children or more	0.018	0.024
has partner	0.836	0.842
has partner * partner employed	0.716	0.399
Max schooling degree (base=no/elementary education):		
has BA	0.088	0.100
has high school	0.312	0.290
has junior high school	0.079	0.067
has lower degree	0.343	0.369
Lives in: (base=inner city):		
outer city	0.129	0.128
town with size<2000	0.057	0.064
town with 2.001 <size< 10.000	0.246	0.251
town with 10.001 <size<50.000	0.256	0.248
town with size >50.000	0.160	0.157
not employed	0.472	0.152
Region (base=North west):		
North east	0.186	0.190
Centre	0.194	0.189
South	0.234	0.229
Islands	0.115	0.115
Commuting costs:		
Commuting time variable	0.032	0.129
Commuting time missing	0.495	0.182
Commuting time (minutes)	9.249	15.345
Economic situation (base=situation worst):		
Economic situat. as last year	0.617	0.627
Economic situat. better last year	0.133	0.135
Economic resources adequate	0.709	0.728
Number of basic goods of difficult purchasing (base= no goods):		
1 basic good diffic. purchase	0.070	0.064
2 basic goods diffic. purchase	0.045	0.042
3 basic goods diffic. purchase	0.035	0.028
4 basic goods diffic. purchase	0.017	0.015
Preferences and social attitudes:		
Health insurance	0.168	0.283
Life insurance	0.262	0.357
Perceives bad health	0.043	0.042
Has not friends	0.134	0.110
Does not go to church	0.097	0.171
N. observations	11,038	11,331

Appendix Table A.2: Results for a Two probit – two tobit simultaneous model: Simulated maximum likelihood estimates

	Women								Men							
	Eq. 1: probit		Eq. 2: probit		Eq. 3: tobit hours paid		Eq. 4: tobit hours		Eq. 1: probit		Eq. 2: probit		Eq. 3: tobit hours paid		Eq. 4: tobit	
Dep. Var.	volunteer		money donor		work		domestic		volunteer		money donor		work		hours domestic	
	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z
Age	0.003	0.1	0.067	2.79	0.072	2.33	0.057	5.82	0.028	1.32	0.044	2.31	0.089	6.67	0.036	1.4
Age squared	0.000	0.58	-0.001	-2.37	-0.001	-2.47	-0.001	-5.64	0.000	-1.15	0.000	-1.67	-0.001	-7.9	0.000	-1.19
has 1 child	-0.072	-0.87	0.310	4.25	0.135	1.46	0.031	0.96	0.093	1.32	0.021	0.33	-0.017	-0.39	0.072	0.84
has 2 children	-0.089	-1.19	0.103	1.56	0.109	1.25	0.118	4.3	0.172	2.84	-0.011	-0.2	0.114	2.9	-0.060	-0.79
has 3 children	-0.158	-1.55	-0.081	-0.92	0.149	1.37	0.145	4.36	0.190	2.4	-0.041	-0.56	0.092	1.8	-0.278	-2.41
has 4 children or more	-0.072	-0.42	-0.115	-0.73	0.308	1.54	0.093	1.57	0.160	1.2	-0.122	-0.98	0.389	4.11	-0.112	-0.52
has partner	0.007	0.09	-0.134	-1.92	0.032	0.32	0.278	9.64	0.023	0.4	-0.004	-0.08	-0.079	-2.16	-0.435	-6.8
has partner * partner employed	-0.127	-1.89	0.007	0.12	-0.130	-1.71	0.057	2.58	0.036	0.89	0.158	4.41	0.081	3.31	0.180	3.65
has BA	0.861	9.79	0.899	11.76	0.008	0.08	-0.192	-5.61	0.850	10.86	0.794	11.83	0.126	2.55	0.005	0.05
has high school	0.585	7.99	0.663	10.78	0.033	0.44	-0.055	-2.38	0.596	9.22	0.562	10.33	0.028	0.72	-0.004	-0.04
has junior high school	0.416	4.55	0.434	5.6	-0.067	-0.59	0.003	0.09	0.504	6.24	0.364	5.05	-0.065	-1.31	0.197	2.03
has lower degree	0.195	2.75	0.170	2.84	-0.032	-0.47	0.001	0.03	0.284	4.59	0.195	3.76	-0.016	-0.44	0.024	0.3
outer city	0.164	3.02	0.069	1.45	0.099	1.6	0.060	2.86	0.189	3.73	0.116	2.52	0.058	1.86	-0.047	-0.87
town with size<2000	-0.164	-2.75	-0.123	-2.43	0.026	0.41	0.033	1.45	-0.116	-2.05	-0.004	-0.09	-0.034	-1	-0.042	-0.69
town with 2.001 <size< 10.000	-0.443	-6.98	-0.459	-8.5	-0.140	-2.04	0.130	6.04	-0.414	-7.15	-0.324	-6.45	-0.092	-2.65	-0.137	-1.96
town with 10.001 <size<50.000	-0.297	-3.93	-0.453	-7.18	-0.364	-3.84	0.091	3.29	-0.228	-3.32	-0.212	-3.52	-0.138	-3.22	-0.196	-2.19
town with size >50.000	0.285	3.28	0.241	3.39	0.100	1.23	0.106	3.58	0.252	2.88	0.249	3.62	0.033	0.7	-0.014	-0.17
North east	0.399	4.04	0.242	2.84	0.099	0.95	0.093	2.66	0.752	8.3	0.347	4.32	-0.082	-1.59	-0.012	-0.11
Centre	0.454	6.03	0.295	4.82	0.198	2.64	0.122	4.76	0.615	8.23	0.411	6.88	0.020	0.52	0.002	0.02
South	0.199	2.62	0.215	3.51	0.025	0.33	0.079	3.1	0.428	5.68	0.285	4.79	-0.031	-0.79	-0.002	-0.02
Islands	0.198	2.43	0.064	0.94	-0.070	-0.84	0.039	1.39	0.189	2.31	0.123	1.91	-0.081	-2.03	0.088	1.17
Commuting time variable	-0.092	-0.79	-0.095	-0.96	-0.073	-0.69	-0.011	-0.25	-0.216	-3.2	-0.224	-3.99	-0.078	-2.78	-0.066	-0.99
Commuting time missing	-0.018	-0.32	-0.176	-3.64	-4.321	-96.68	0.491	23.11	0.058	0.94	-0.114	-2.08	-2.903	-43.76	-1.281	-14.04
Commuting time (minutes)	-0.005	-2.85	-0.002	-1.24	-0.001	-0.63	-0.001	-1.54	-0.003	-2.04	-0.002	-1.54	-0.002	-3.22	-0.002	-1.68
Economic situat. as last year	0.071	1.32	-0.014	-0.3	0.014	0.28	-0.100	-5.53	-0.065	-1.32	-0.086	-2.03	0.023	0.76	-0.019	-0.33
Economic situat. better last year	0.111	1.54	0.037	0.61	0.181	2.7	-0.140	-5.5	-0.057	-0.85	-0.026	-0.45	0.082	2.1	-0.038	-0.56
Economic resources adequate	0.060	1.1	0.113	2.37	0.033	0.59	0.011	0.56	0.108	2.01	0.134	3.03	0.079	2.53	0.125	2.03

Appendix Table A.2: - Continued -

1 basic good diffic. purchase	0.080	0.94	-0.005	-0.07	-0.171	-2.31	-0.015	-0.54	-0.015	-0.18	0.017	0.24	-0.015	-0.28	0.046	0.45
2 basic goods diffic. purchase	0.086	0.82	-0.018	-0.19	-0.029	-0.24	-0.023	-0.65	-0.125	-1.18	0.060	0.67	-0.048	-0.61	0.127	0.98
3 basic goods diffic. purchase	0.151	1.12	0.043	0.36	-0.081	-0.52	-0.050	-1.25	-0.084	-0.6	-0.262	-2.18	-0.178	-2.37	-0.135	-0.72
4 basic goods diffic. purchase	-0.121	-0.56	-0.405	-1.92	-0.726	-2.27	-0.172	-2.52	0.012	0.07	-0.268	-1.38	-0.400	-3.13	-0.237	-1.01
Health insurance	0.182	3.65	0.203	4.58	0.087	1.34	-0.024	-1.18	0.134	3.25	0.161	4.35	0.128	5	-0.029	-0.66
Life insurance	0.123	2.76	0.238	6.09	0.004	0.08	-0.037	-2.1	0.088	2.16	0.227	6.41	0.079	3.23	-0.046	-1.07
Perceives bad health	-0.004	-0.04	0.071	0.84	-0.018	-0.19	-0.033	-0.89	-0.130	-1.25	-0.038	-0.43	-0.218	-3.14	-0.172	-1.34
Has not friends	-0.343	-5.32	-0.122	-2.35	-0.072	-1.11	0.068	3.21	-0.382	-5.7	-0.195	-3.61	0.039	1.05	-0.064	-0.86
Does not go to church	-0.193	-2.82	-0.152	-2.65	0.051	0.77	-0.107	-4.06	-0.188	-3.66	-0.110	-2.5	-0.028	-0.99	-0.041	-0.77
Constant	-2.272	-4.17	-2.823	-5.96	1.956	3.27	1.722	8.88	-2.630	-5.6	-2.625	-6.36	1.789	6.23	1.477	2.84
$Cov(\varepsilon_t,\varepsilon_m)$	0.523	25.02							0.556	30.28						
$Cov(\varepsilon_{tn},\varepsilon_{tv})$	-0.009	-0.75							-0.039	-2.14						
$Cov(\varepsilon_{th},\varepsilon_{tv})$	0.017	1.42							0.041	1.48						
$Cov(\varepsilon_{tn},\varepsilon_m)$	-0.050	-0.97							-0.007	-0.35						
$Cov(\varepsilon_{th},\varepsilon_m)$	0.012	0.7							0.328	4.89						
$Cov(\varepsilon_{tn},\varepsilon_{th})$	-0.096	-9.67							-0.671	-15.75						
$Var(\varepsilon_{tn})$	1.511	21.74							1.095	23.25						
$Var(\varepsilon_{th})$	0.419	35.61							10.710	31.82						
Test of model separability into giving decisions and other time uses (§)					chi2(4) = 3.72 Prob > chi2 = 0.4455								chi2(4) = 36.02 Prob > chi2 = 0.0000			
Log pseudolik					-45,15								-61,02			
Number obser.					11,038								11,331			
Wald chi2(36)					434.2								574.89			

Note: the 4-equation model is estimated simultaneously by maximum simulated likelihood, using a GHK simulator with 20 Halton draws. Excluded categories are: has no children, no or primary education, lives in inner city, north-west, economic situation worst than 1 year before, one out of five subsistence goods of difficult purchasing.

§: H0 is $Cov(\varepsilon_{tn},\varepsilon_{tv}) = Cov(\varepsilon_{th},\varepsilon_{tv}) = Cov(\varepsilon_{tn},\varepsilon_m) = Cov(\varepsilon_{th},\varepsilon_m) = 0$

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