

Ageing and Altruism: Cross-Sectional Evidence from Dictator Games in Sweden¹

Niklas Lyttkens*

Alexandra Tham**

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Department of Economics, Stockholm School of Economics

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Tutor: Erik Lindqvist

Abstract

We suggest that there is a positive but marginally declining ageing effect on altruistic preferences. By conducting Dictator Games on 82 Swedish psychology students with relatively large variation in age, we empirically test the relationship between ageing and altruistic preferences. Performing a number of regressions we initially control for level of education and income. When robustness checks are executed, these support our suggested age-altruism relationship. Further, we include controls for attitudes and general behaviour: political stance, religiosity and level of generalised social trust. We find our suggested age-altruism relationship to be robust to these controls as well. However, with a cross-sectional data set, the ability to separate ageing from cohort effects is limited.

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*21627@student.hhs.se

**21624@student.hhs.se

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1 Introduction

Does ageing nourish altruism? In order to examine this relationship, we conduct Dictator Games on students with relatively large variation in age. Subsequently, we perform a number of regressions, analysing the ageing effect while controlling for a set of other factors. Our main result is a positive but marginally declining ageing effect on Dictator allocations. In line with this, we also find that the fraction of people allocating half of their endowment or more increases in age. This implies not only that people become *more* generous with age, but also that the share of people with altruistic preferences *in general* is expected to increase as people grow older. However, as we utilise a cross-sectional data set we cannot fully distinguish between ageing effects per se and underlying cohort effects appearing in different generations in general. By adding variables measuring attitudes and general behaviour we try to distinguish these generational effects but find no evidence of their existence.

Already in the 18th century, thinkers such as Hume (1740²) and Smith (1759) suggested that there are other driving forces in the human behaviour than pure self-interest. Altruism is an other-regarding preference that has been suggested to be central in human behaviour. The word altruism was probably coined by the sociologist Comte (1830) and the phenomenon has later been discussed by numerous economists such as Becker (1976) and Samuelson (1993). Altruism can be defined as a desire to provide someone else with a favour without asking anything in return, i.e. it denotes a form of unconditional kindness (cf. Andreoni 1989, Cox et al. 2001).³

A wide range of experimental economists have found empirical evidence that people are not just self-interested monetary maximisers but that individuals also care for other people, implying that altruistic behaviour occurs. Furthermore, data measuring individuals' participation in volunteer programmes and charity activities are important evidence that other-regarding actions in terms of altruistic preferences do take place. In Sweden, monetary donations in 2009 were 0.15 percent of GDP (SFI 2010, Statistics Sweden 2011). In cases when private donations occur, they can be seen as an alternative to relying on the market (Titmuss 1971).

However, most economic models presented are still based on the idea of a self-interest hypothesis, i.e. that the material self-interest is what solely motivates every rational individual and thus maximises the individual utility. The efficient competitive market is an example of when this self-interest hypothesis is assumed to hold. Yet, a large amount of the economic activity takes place outside the realm of the efficient competitive market, leaving room for altruistic preferences to prevail among people.

Concerning the subject of ageing in other fields of economic research, Böhm-Bawerk (1889) introduced the thought that preferences for savings and consumption change with ageing as the future gets less remote (cf. Loewenstein 1992). This implies that each

² "Reason is, and ought only to be the slave of the passions, and can never pretend to any other office than to serve and obey them." Hume (1740, p. 264).

³ In mathematical terms an individual can be described as altruistic if the first partial derivative of the individual's utility function $U(x_1, x_2, \dots, x_N)$, with respect to $x_1, x_2, \dots, x_N$, is ≥ 0 . This means that the utility of an individual increases with the utility of other individuals (Fehr and Schmidt 2006).

individual's internal discount factor changes with ageing as future consumption choices become less uncertain. Moreover, studies in the field of finance have suggested that ageing affects individuals' preferences for risk aversion (cf. Morin and Suarez 1983, Riley and Chow 1992).

However, economic literature has to date not thoroughly examined the impact of ageing on altruism. Fehr and Schmidt (2006) suggest that altruistic preferences vary with many different variables, proposing age to be one of them. Furthermore, several experimental economists have *indicated* that altruism is increasing in age (cf. Bekkers 2007, Carpenter et al. 2008). However, as Bekkers (2007) and Carpenter et al. (2008) merely use age as a control variable, little can be said about the statistical and economical significance of the ageing effect on altruistic preferences.

A more established link between altruistic preferences and ageing would be of relevance to both theoretical and experimental economists as well as policymakers and fundraisers. For instance, welfare systems in countries such as the United States heavily rely on charitable giving. Also, taking altruism determinants into account will create larger prediction power of economic behaviour in times of demographical change, e.g. longer life expectancy of individuals in the population. Moreover, Williamson (2002) suggests that transaction costs increase as opportunistic behaviour, i.e. not acting altruistic, increases. Predicting altruism more accurately by taking age into account will thus provide explanatory value to variations in transaction costs.

The remainder of this paper is organized as follows: section 2 presents previous research on altruistic preferences as well as how these preferences are affected by ageing. Section 3 presents a simple altruistic utility function taking ageing into account with a brief discussion about how altruistic preferences are measured. Section 4 describes the methodology applied and the design of the economic experiment. Section 5 presents our empirical results. Section 6 concludes.

2 Previous Research

In economics, a few studies on altruism have touched on a potential relationship between ageing and altruism. Early papers such as Feldstein and Taylor (1976) and Reece (1979) identify a set of factors important for charitable giving, concluding that a positive relationship between age and donations exists.

Further, studies in neuropsychology have suggested that social preferences in terms of generosity and aggressiveness change with ageing as the level of some hormonal substances, such as testosterone, decline (Rushton et al. 1986). Rushton et al. control for genetic differences through the use of twin samples and find self-reported aggressiveness to decrease in age whereas self-reported generosity increases.

Banks and Tanner (1997) analyse a longitudinal dataset based on the Family Expenditure Survey in the United Kingdom during the period 1974 to 1996. They find the probability of young households participating in charitable events to be smaller than the probability of middle-aged households participating at the same point in time. They also find indications of a generational effect on altruism; the fraction of households in specific age groups participating in charitable events has changed over the period. Their results

show that the general trend in the United Kingdom is that people give more with age and also that people who are young today give less than people who were young 20 years ago.

In another study, List (2004) analyses ageing and altruism with three different datasets: one from a public good game⁴, one collected from a survey over a university capital campaign and one drawn from a Prisoner's Dilemma game show on television. List (2004) finds evidence of a link between age and social preferences. However, since this study analyses non-anonymous games, other motivators of donations such as social status and personal esteem are not controlled for. Consequently, List does not control for pure altruism but merely preferences of giving, regardless of whether self-interest or altruism is the driving force.

The most popular approach among economists when measuring altruistic behaviour is the Dictator Game (henceforth DG), developed in its current setting by Forsythe et al. (1994).⁵ The DG is a single person decision problem, set up in the following way: one player acts as a Dictator while the other player acts as a passive and anonymous Recipient. The role of the Dictator is to determine the allocation of an endowment between herself and the Recipient. The role of the Recipient is simply to passively accept the fraction of the total endowment that the Dictator has decided to donate. Thus, the DG has no strategic features in the sense that the Dictator's behaviour does not depend on the action of the Recipient in the game. The interpretation of the game is that the Dictator is assumed to be an egoist if she chooses to keep the total endowment to herself whereas she is assumed to have altruistic preferences if she chooses to donate a fraction of the endowment to the Recipient.

Following Forsythe et al. (1994), the DG has been used by many economists when trying to assess whether real altruistic behaviour occurs and what factors have impact on such preferences (cf. Eckel and Grossman 1996, Henrich et al. 2001). Furthermore, using the DG, many behavioural economists have sought to identify sources of altruism by creating longitudinal datasets, enabling *controls* for but not thoroughly analysing ageing (cf. Bekkers 2007, Carpenter et al. 2008). Bekkers (2007) perform DGs providing the Dictators with a binary choice of keeping everything to herself or giving everything to a specific well-known charity organisation. Carpenter et al. (2008) on the other hand perform DGs with the possibility for the Dictator to donate a self-selected amount to a charity organisation of her own choice. Both Bekkers (2007) and Carpenter et al. (2008) control for age in probit models and find participants to be more probable to give a larger amount at a higher age.

However, as previous research, e.g. Bekkers (2007) and Carpenter et al. (2008), merely controls for age without analysing it thoroughly, there are substantial gains to be made from further looking at the age-altruism relationship. With a rigorous analysis of a new dataset, this paper seeks to fill this gap in research.

⁴ A public good game is played by a number of participants, $i, j, \dots, N$. Each participant can anonymously choose between keeping an endowment α or contributing with an endowment ε to the public good. If participant i contributes to the public good, every participant including i receives an endowment of $\varepsilon < \alpha$. Furthermore, if everyone contributes to the public good, then total payoff is $N * \sum_{i=1}^N \varepsilon_i > \sum_{i=1}^N \alpha_i$. This implies that choosing to contribute to the public good is socially optimal, but since $\varepsilon < \alpha$, playing α is a strictly dominant strategy for every participant. Thus, every participant choosing the dominant strategy keep α while still enjoying the public good, i.e. free ride.

⁵ Kahneman et al. (1986) were however the first to perform a kind of primitive DG.

3 Theory

When measuring altruism with the DG, it is important to remember that some basic assumptions are required. The first assumption is that the world consists of two individuals and also that the total utility of the Dictator solely depends on her own and the Recipient's utility, derived directly from the payoff obtained in the game. The second assumption is solely made for simplicity and states that both players walk into the game with no initial wealth.⁶

The problem concerning the initial wealth assumption is rather easy to practically address by controlling for the income among the individual participants. Furthermore, the point of the DG in this setting is not to measure altruistic behaviour from one person directed to another *specific* person. Instead we want to measure the degree of altruistic behaviour directed from one person to another person in general. Thus it is reasonable to assume that this behaviour sufficiently can be represented by the participants' actions in the game. In addition to this, laboratory experiments such as this enables for a wide array of controls. Consequently, the DG is suitable for testing the age-altruism relationship.

The degree of altruistic preferences is assumed to differ between individuals; some individuals are more concerned than other individuals of the well being of others. Given these varying altruistic preferences, every individual is assumed to act rationally in order to maximise their utility (Fehr and Schmidt 2006). The aim of the DG is to test the degree of Dictator i 's real altruistic preferences, θ_i . However, since θ_i is not measurable we need to make the assumption that θ_i increases weakly but strictly in Dictator allocation π_i . Given that the DG is played with real money, it will be costly to deviate from a behaviour that also would be prevalent in real world economic decisions. Thus, we argue this assumption to be reasonable.

In the DG, the total utility function of i is initially assumed to consist of three components: the individual utility v_i Dictator i gets from keeping endowment π_i , the utility u_j Recipient j gets from receiving endowment π_j and the individual weight θ_i that i puts on the utility of j . With this rationale, we assume the utility function

$$U_i[v_i(\pi_i), \theta_i, u_j(\pi_j)] = v_i(\pi_i) + \theta_i * u_j(\pi_j). \quad (1)$$

Furthermore, Dictators are assumed to maximise their utility subject to the budget constraints

$$\pi_i + \pi_j = \varphi \quad (2)$$

and

$$\pi_i, \pi_j \in [0, \varphi]. \quad (3)$$

In this setting, Dictator i chooses to keep π_i from the total endowment φ received at the beginning of the game, while donating the remaining amount, π_j to Recipient j . This

⁶ A theoretical reasoning upon this can be found in appendix A.

defines the budget constraint, described in equation (2). Note that π_i and π_j are non-negative parameters. Taking the budget constraints into account, we get

$$U_i[v_i(\pi_i), \theta_i, v_j(\varphi - \pi_i)] = v_i(\pi_i) + \theta_i * v_j(\varphi - \pi_i). \quad (4)$$

Since all participants are anonymous towards each other, the Dictators do not have any knowledge about the utility function of the Recipients. Dictators thus have to make an assumption about v_j . For simplicity, we assume everybody to have the same utility function, v , and that this is common knowledge. Thus, for a certain level of endowment π obtained by any participant $i, j, \dots, N$, $v_i = v_j = \dots = v_N$. This enables us to simplify equation (4) to

$$U_i[v(\pi_i), \theta_i, v(\varphi - \pi_i)] = v(\pi_i) + \theta_i * v(\varphi - \pi_i). \quad (5)$$

In order to take this model further, we have to make assumptions about the nature of v . First and foremost, it is reasonable to assume that more is better, i.e. that utility is strictly increasing in monetary payoff, *ceteris paribus*. Moreover, it is sensible to believe that the marginal utility $v(\pi)$, is decreasing in monetary payoff. This gives us the assumption of v being strictly concave, thus

$$\begin{cases} \frac{\partial v}{\partial \pi} > 0 \\ \frac{\partial^2 v}{\partial \pi^2} < 0 \end{cases}. \quad (6)$$

If (6) does not hold and the utility curve instead would be linear, any Dictator with a θ equal to $1 + \varepsilon$ would choose to allocate their total endowment, whereas any Dictator with a θ equal to $1 - \varepsilon$ would choose to keep their total endowment, given that ε is an insignificantly small but positive number. However, as concavity increases, the θ -interval not rendering corner solutions increases unambiguously. By maximising (5) with respect to π_i , we obtain

$$\frac{\partial U_i}{\partial \pi_i} = \frac{\partial v}{\partial \pi_i} - \theta_i * \frac{\partial v}{\partial (\varphi - \pi_i)} = 0 \quad (7)$$

which can be rearranged to

$$\theta_i = \frac{\partial v}{\partial \pi_i} / \frac{\partial v}{\partial (\varphi - \pi_i)}. \quad (8)$$

Taking the budget constraints into account, corner solutions, i.e. keeping or donating the entire endowment, yields

$$\frac{\partial v}{\partial 0} \leq \theta_i * \frac{\partial v}{\partial \varphi} \quad (9)$$

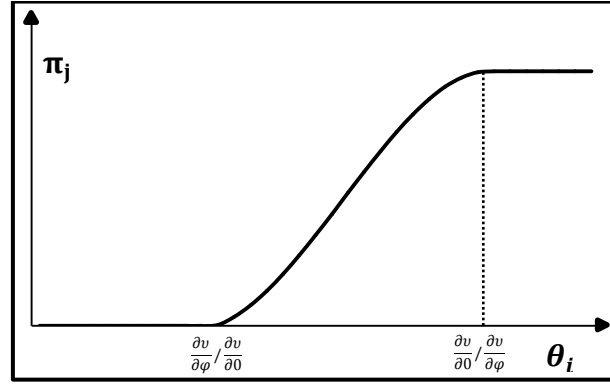
and

$$\frac{\partial v}{\partial \varphi} \geq \theta_i * \frac{\partial v}{\partial 0}. \quad (10)$$

Thus, by maximising the Dictator i 's utility function and taking the budget constraints into account, the Dictator chooses to keep

$$\pi_i^* = \begin{cases} 0 & \text{subject to } \theta_i \geq \frac{\partial v}{\partial 0} / \frac{\partial v}{\partial \varphi} \\ \pi_i & \text{subject to } \frac{\partial v}{\partial \pi_i} / \frac{\partial v}{\partial (\varphi - \pi_i)} = \theta_i \text{ if } \theta_i \in \left(\frac{\partial v}{\partial \varphi} / \frac{\partial v}{\partial 0}, \frac{\partial v}{\partial 0} / \frac{\partial v}{\partial \varphi} \right) \\ \varphi & \text{subject to } \theta_i \leq \frac{\partial v}{\partial \varphi} / \frac{\partial v}{\partial 0} \end{cases} \quad (11)$$

FIGURE I. FUNCTION INTERVAL



This figure shows how Dictator allocation, π_i , depends on θ_i . Corner solutions occur if $\theta_i \leq \frac{\partial v}{\partial \varphi} / \frac{\partial v}{\partial 0}$ or $\theta_i \geq \frac{\partial v}{\partial 0} / \frac{\partial v}{\partial \varphi}$.

As illustrated in figure I, an increase in θ_i unambiguously increases i 's propensity to donate, as keeping the total endowment to herself becomes more costly.⁷

Operationalising the Theory

As suggested in section 2, altruistic preferences, θ_i is conditional on a set of variables such as socio-economical factors, demographical factors etcetera, which we denote by $\mathbf{Y}$. This paper more specifically seeks to investigate whether age, denoted by $\mathbf{t}$, is an important variable in the function

$$\theta_i = \theta_i(\mathbf{t}, \mathbf{Y}). \quad (12)$$

To investigate the relationship between individual altruistic preferences θ_i and age $\mathbf{t}_i$, we estimate

⁷ We cannot however distinguish between preferences among Dictators choosing π_i according to the corner solutions, 0 or φ . For instance, the interpretation of an allocation from Dictator i with a θ_i equal to $\frac{\partial v}{\partial \varphi} / \frac{\partial v}{\partial 0}$, i.e. on the verge of allocating some amount will be same as the interpretation of an allocation from another Dictator k with a negative θ_k , i.e. who gets strictly positive utility from the Recipient being worse off.

$$(\pi_j)_i = \alpha + \tau_i \beta + \gamma_i \delta + u_i, \quad (13)$$

where $(\pi_j)_i$ represents the allocation that i chooses to make to j , which is a proxy for θ_i , α is the intercept and the vector τ_i is a set of different age specifications, e.g. age squared and age cubed. β and δ are coefficient vectors. u_i is the error term.⁸ In section 5, we empirically test (13).

Utilising a Cross-sectional Design

When studying age, cohort effects and age effects are always perfectly correlated. This implies that it is impossible to entirely control for aspects such as growing up at a certain time and thus being influenced by a certain social trend, which in turn affects social preferences. Consequently, there might be underlying cohort effects appearing in different generations. These generational effects might in turn be the true causal factor of age varying with social preferences.

In order to isolate the ageing effect per se and control for generational effects in particular the most preferable way to design this experiment would be to run the same experiment with the same Dictators, multiple times over a long period. However, despite the fact that a panel design would be practically hard to execute, another caveat is that one would also have to take the role of participating in repeated games into account. It is reasonable to believe that every participant will be affected by a repeated game design. The fact that the participants view the game differently after participating numerous times would most likely affect their actions, reflected in π_j . In other words, it is probable that participants deviate from rational behaviour if participating in repeated games. Thus, π_j would no longer be a good proxy for θ_i .

Further, even though the panel data design enables adjustments for fixed effects, some cohort effects would still be present since the general social environment can be assumed to affect participants in all rounds. Consequently, the possibilities of drawing inference to the general population would be small in cases of panel data design.

Since panel data design is hard to implement and not expected to improve validity, we use a cross-sectional design, i.e. all participants take part in one experiment at one specific point in time. In this paper we write ageing effects, but bear in mind that generational effects also might be present. In the next section follows a thorough description of how our experiments were conducted.

4 Experimental Design

One potential problem using the DG, referred to by Camerer and Thaler (1995), is its sensitivity to context effects such as game design as well as sample choice. This can be seen through the wide array of results obtained in different studies conducting the DG. For instance, the mean allocation to Recipients in Hoffman et al. (1996) is nine percent of the

⁸ In our estimated models, we assume u_i to be independently and identically distributed with $u_i \sim N[0, \sigma_\epsilon^2]$. Due to our large sample, this assumption is however not expected to be needed, but it is important to keep in mind that a potential nonnormality in our error terms may cause a slight bias in our estimated model (Wooldridge 2005, p. 778).

total endowment, while Ellingsen et al. (2010) find the corresponding figure to be twenty four percent. Furthermore, even though contextual settings are kept fixed, one also has to assume that experiment participants respond equally to these context effects (Andreoni and Miller 2002).

Subject Pool

As frequently used in other studies performing DGs, we also used a subject pool of students.⁹ However, meanwhile most such studies are executed with students in business and economics, we conducted our experiments on students in psychology. More specifically, we conducted the experiments on students enrolled in an academic programme in psychology as well as a postgraduate programme in psychotherapy at the Stockholm University and the Karolinska Institute.^{10, 11} We chose this sample since it is advantageous for several reasons. First and foremost, it is a group with a large age variation, which is a basic requirement when studying ageing. Secondly, it is a relatively homogenous group regarding attitudes and general behaviour, which indirectly creates controls for qualitative non-measurable variables. A sample with a large diversity in perceptions and beliefs might render results difficult to interpret, making it harder to isolate the specific ageing effect.

However, several problems come with using this specific sample of students instead of a random sample of the entire population. A crucial assumption in this setting is that the specific subject pool is not systematically differently affected by central components of altruistic preferences compared to the general population. This assumption is not expected to hold in all cases. For instance, getting admission to psychology and psychotherapy programmes in Sweden is generally difficult, implying that these students are above average in intelligence.¹² This limits our possibilities of making conclusions about the general population based on our results.

Furthermore, our subject pool is expected to be more generous than the general population since psychologists can be assumed to have more other-regarding preferences than the general population. This is not a problem however, since the aim of this paper is not to solely measure altruistic preferences, but trends in altruistic preferences emerging from ageing.

Another potential problem with our subject pool is that people choosing to study psychology at an older age might be systematically different from those choosing to do this at a younger age. For instance, a person enrolling in a psychology programme at the age of 50 face other pecuniary incentives than those at the age of 20. This can for instance be explained by the fact that a 20-year old can enjoy her expected income for 40 years, while a 50-year old face a corresponding expected income for 10 years. This can potentially create a bias in our sample.

⁹ Another common way is using either a representative or a random sample of the entire population.

¹⁰ The regular psychology programme runs for 5 years, while the psychotherapy programme is a 3 year programme of half-time studies, since it is intended for the students to work clinically half-time meanwhile studying.

¹¹ The experiments took place between the 14th of March and the 4th of April 2011.

¹² Admittance to psychology programmes in Sweden generally requires top (or just below) GPA from upper secondary school.

Even though using a specific group of students limits the possibilities of drawing inference about the population in general, this subject pool is still rather advantageous for our study. Further, multiple studies show that students' behaviour in general is not systematically different from the general population (cf. Fehr et al. 2003, Bellemare and Kröger 2003).

Conducting the Experiment

While the setup of the DG is rather simple, its outcomes are heavily dependent on game design.¹³ In our game, all participants were assigned the allocator role in order to maximise the number of observations.^{14, 15} Further, we used real money in the experiment since this gives the advantage of increasing experiment reliability due to the fact that it is costly for a participant not to take the experiment seriously. Additionally, since the aim of the experiments is to test economic theory built on an assumption of utility maximisation, its' outcomes are quite straightforwardly interpreted using pecuniary incentives (Hertwig and Ortmann 2001). Using real money is also convenient since it is used in most studies in experimental economics. Thus it increases the comparability of our study with other studies.

In order to maximise the number of participants, we conducted the experiments during breaks or directly after lectures.¹⁶ As an introduction, we made an oral presentation about the experiment. In this presentation, subjects were told that they were about to make decisions regarding real money and thus would be compensated with real money. Throughout the experiment, we did not use the actual word "experiment". Instead, we consistently used the word "exercise" in order to frame the experiment as naturally as possible. Moreover, to minimise disturbance among students and standardise inter-experiment performances, the participants were asked not to talk to each other. Further, they were told to raise their hands if they had any questions.

During the introduction the subjects were also told they were completely anonymous towards all other participants in the experiment. However, due to administrative reasons we were not able to keep them completely anonymous towards ourselves, i.e. the experiment was single blind. Performing the experiment on a single blind basis is expected to make Dictators offer a larger fraction of the total endowment to Recipients than if the same experiment would be double blind (Eckel and Grossman 1996). This is most likely explained by the phenomenon called warm-glow giving, which postulates that there are some impure altruists giving for the sake of giving, rather than what giving actually contributes to the recipient (Andreoni 1990).^{17, 18} In general, warm-glow giving is a problem

¹³ See appendix C for a complete manuscript of oral presentation, written instruction and questionnaire in the original language, Swedish as well as translated into English.

¹⁴ However, due to thesis budget constraints, only one third of the Dictators' decisions were realized.

¹⁵ They were also all assigned the roles of Recipients, which they were told afterwards.

¹⁶ Naturally, participating in the experiment was completely voluntary.

¹⁷ Warm-glow giving is defined as giving based on the feeling from the mere act of giving, rather than the utility giving creates for the Recipient. Let $U_j(\pi_j)$ denote the utility individual j gets from a donation from individual i . A pure altruist would have a utility function of $U_i = U_i[\pi_i, U_j(\pi_j)]$ whereas a completely impure altruist driven by warm-glow would have a utility function of $U_i = U_i(\pi_i, \pi_j)$.

when measuring altruism since controls for warm-glow giving are hard to execute. In our case however, this is not a problem if we can assume that preferences for warm-glow giving do not interact with ageing. In order to minimise the warm-glow effect, we framed the game to appear as anonymous as possible towards ourselves. For instance, even though participants were informed in the introduction that we would need their addresses, they were asked to fill in their addresses only after they had made their allocation choices.

After the oral introduction, written instructions about the game were handed out to the participants. These instructions were also attempted to be formulated as neutrally as possible. In the instructions, the Dictators were asked to distribute an endowment of 100 SEK¹⁹ between themselves and the Recipients. When the allocation choice was made, the participants were told to place their response paper in an envelope, whereupon they were given a questionnaire to fill in. When this was done, they handed over both their response paper and questionnaire in sealed envelopes. The money was distributed in arrears by mail in order to keep student anonymity towards each other.

Addressing Potential Alternative Motivators

In order to isolate altruism as a motivator for voluntary transactions, it is important to keep other motivators in mind. Schokkaert (2006) summarises different potential motivators underlying donations; self-interest, reciprocity, norms and pure altruism. Below, we provide a description on how these affect the design and outcome of our experiments and how we address potential problems that follow.

Within the motivator self-interest, there are according to the Schokkaert framework two sub-motivators: material self-interest and social prestige. Material self-interest means increased consumption benefits derived from giving, e.g. giving money to the poor in order to keep them from stealing. This can be assumed not to have invoked any power on our experiment since each Recipient was completely unknown to every Dictator. Social prestige is however something that we may not have controlled for completely since we were not able to conduct the experiment on a double blind basis.

The effect of reciprocity implies a potential positive effect on voluntary transactions from the Dictator in order to mitigate possible punishments from the Recipient. However, since there are no strategic elements in the DG and the Recipient is anonymous towards the Dictator, this is assumed to have no implications for our experiments.

The third motive of voluntary transactions is people making a larger donation due to social norms. However, this has no implications for the allocations in the DG due to anonymity in the game.

Having controlled for the above mentioned motivators potentially underlying voluntary transactions, we can investigate whether pure altruism varies with ageing.

¹⁸ This sort of problem does not occur when conducting double blind experiments. This is because all choices of the participants are completely anonymous and thus the allocator does not enjoy any utility emerging from others seeing her seemingly altruistic actions.

¹⁹ At the time of the experiment 100 SEK corresponded to approximately €11.

5 Empirical Results

Our main result is a positive but marginally declining effect of ageing on Dictator allocations. In line with this, we also find the fraction of people allocating half of their endowment or more to increase in age. This implies not only that people become *more* generous with age, but also that the share of people with altruistic preferences *in general* is expected to increase as the population ages. However, utilising a cross-sectional data set, we cannot fully distinguish between ageing effects per se and underlying cohort effects appearing in different generations. By adding variables measuring attitudes and general behaviour we try to distinguish these generational effects but find no evidence of their existence.

Data Description

In total, we had 82 participants. However, due to some missing values from the questionnaire²⁰, our different regressions are based on 74 to 80 observations. As can be read from table I, values were missing randomly rather than on a systematic basis. This implies that our missing data merely decreases statistical significance instead of creating a bias.

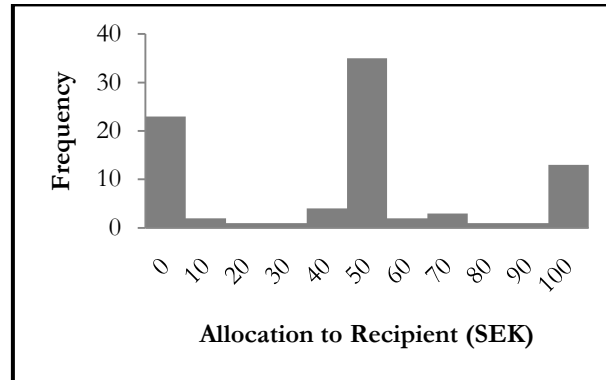
TABLE I. DESCRIPTIVE STATISTICS

	N	Mean	Std. Dev.	Min	Max	Unit
Allocation	82	45.8	33.0	0	100	SEK
Age	80	29.5	9.16	20	54	Years
Male	82	0.24	0.43	0	1	Dummy
Education	78	3.01	2.45	0.5	9	Years
Average Income	81	12.0	10.8	5	45	SEK/month (1000's)
Expected Income	81	30.2	7.23	5	55	SEK/month (1000's)
Religious	82	0.29	0.46	0	1	Dummy
View on Personal Responsibility	81	2.77	1.11	1	5	Qualitative
Trust	82	2.45	1.01	1	5	Qualitative
Psychotherapy Programme	82	0.17	0.38	0	1	Dummy

Allocation indicates amount allocated from Dictator to Recipient. *Male* takes a value of 1 if male and 0 if female. *Education* indicates years of university studies completed. Both *Average Income* and *Expected Income* are measured in intervals. A respondent choosing a specific income interval is assigned the mean value of this interval. I.e. a respondent with a monthly income in the 10 000–15 000 SEK interval takes the value of 12.5. *Expected Income* refers to the respondents self-reported expected average income in five years. Concerning the variable *Religious*, a respondent going to church or equivalent on a frequent basis takes the value of 1, whereas a respondent never attending religious events takes the value of 0. The variable *View on Personal Responsibility* is measured as follows: 1 indicates that the respondent completely thinks that people should take responsibility for their own actions, whereas 5 indicates that the respondent thinks that people should take responsibility for their own actions only to a very low degree. *Trust* is measured in a similar way as personal responsibility: 1 indicates that the respondent completely thinks that other people can be trusted, 5 indicates that the respondent thinks that other people cannot be trusted at all. *Psychotherapy Programme* takes the value of 1 if enrolled in the psychotherapy programme and 0 if enrolled in the psychology programme.

²⁰ See appendix C for a copy of the questionnaire used.

FIGURE II. ALLOCATION HISTOGRAM

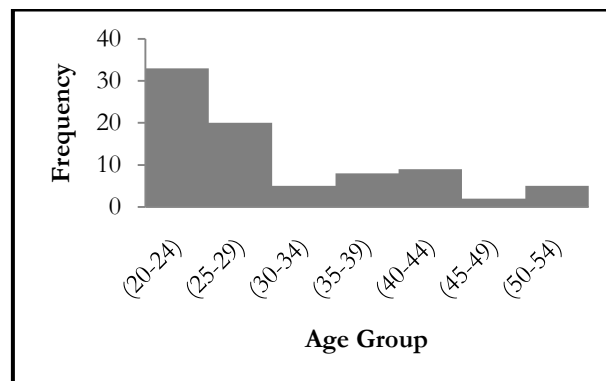


Each stack represents the number of allocations from Dictator to Recipient in each ten-SEK interval.

The mean donation among the Dictators is 45.8 percent of the total endowment. Compared to previously performed studies, this number is unusually high. For instance, Camerer (2003, p. 56) notes that mean donations are usually about 10 to 30 percent of the total endowment. However, as indicated in figure II, 23 percent of our Dictators gave nothing, which is within the standard interval for DG experiments. Forsythe et al. (1994) as well as studies replicating the DG setup of Forsythe et al., normally find 15 to 45 percent of the Dictators giving nothing (cf. Hoffman et al. 1996).

One possible explanation of our higher mean donation is the use of psychology students instead of either business students or a representative sample of the entire population, which are usually used as subject pools. Another possible explanation of our higher mean donation is the DG's sensitivity to framing. The fact that we are students and not researchers employed by an academic institution may have a positive impact on the donated amount. Other students utilising the DG get substantially higher mean allocations than regular researchers. For instance, Bonde and Priks (2008) find a mean allocation of 37.9 percent of the total endowment. Further, Forsythe et al. (1994) conduct their experiments on a double blind basis, whereas we conduct our experiments on a single blind basis, which is expected to increase donations (Hoffman et al. 1996).

FIGURE III. AGE HISTOGRAM

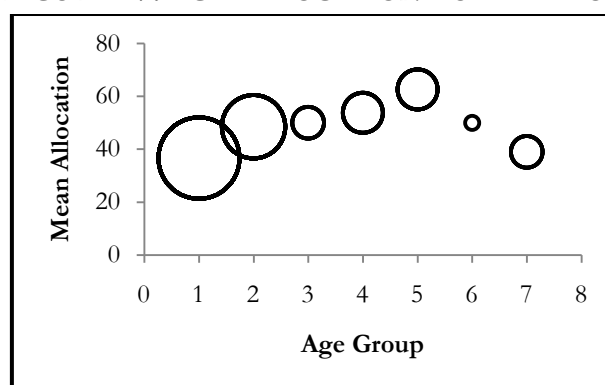


Each stack represents the number of participants in every age group in our sample.

The age of our participants ranges from 20 to 54 years. The mean age is 29.5 years. Figure III illustrates the age distribution among the participants. The age range of our

sample is justifiable as several studies have shown altruistic preferences to be significantly different among people in higher ages as well as among younger children (cf. Feldstein and Taylor 1976, Camerer 2003, p. 65, List 2004). In addition, psychologists have previously used a similar age range, from 19 to 60 with a mean of 30 years, when measuring ageing effects on social preferences (cf. Rushton et al. 1986). Furthermore, internal discounting among people is expected to change over time and this to a larger extent in higher and lower age ranges (Becker and Mulligan 1997). Thus, our theory is most probable to have more explanatory power in the age range of our sample. Consequently, looking at this specific range makes it possible to adequately draw inference about ageing effects on altruistic preferences, but limited to our age range. Figure IV gives an indication of the relationship between age and allocations.

FIGURE IV. AGE-ALLOCATION BUBBLE PLOT



Bubble size indicates number of observations in each age group. The age groups are divided into 5-year intervals. Age group 1 contains participants in the age range of 20-24, age group 2 participants in the age range of 25-29 and so on, up to age group 7 with participants in the age range of 50-54.

In line with previous research we use education as a control variable (cf. Banks and Tanner 1997, Andreoni and Scholz 1998). Higher level of education is expected to increase Dictator allocation. Furthermore, in order to address the previously discussed issue of participants walking into the game with different amounts of wealth, we control for their average income. Since the subject pool consists of students, many of the participants are in the lowest income group, indicating that they live on study grants and loans.²¹ Consequently, a better approximation for the wealth of our participants is their expected income in five years. An increase in this variable is expected to influence Dictator allocation through a positive relationship.

Bonde and Priks (2008) analyse the role of general political standing and altruistic preferences in Sweden. They show that a more left-orientated standpoint has a positive correlation with Dictator allocation. In order to control for general political standing, we use a proxy variable for political standpoint. Our proxy measures the participant's attitude towards whether she thinks that the individual should take responsibility for herself in society. The greater value this variable takes, the more inclined towards a left-wing oriented standpoint the individual is.

²¹ These on aggregate amounted for about €900 per month during the time of the experiments.

Further, we want to control for some other variables measuring attitudes and general behaviour. Since it has been shown that a more religious stance has a positive impact on altruistic preferences, we also control for religiosity (Schokkaert and Van Ootegem 2000). A dummy variable measuring a frequent participation in religious events is used in order to proxy for religiosity. We expect its coefficient to take a positive value.

Previous research further suggests that the degree of individual generalised social trust is expected to have an impact on altruistic preferences (Bekkers 2003, 2007). As an individual's general level of trust decreases, Dictator allocation is expected to decrease. The intuition behind this is that people with a low degree of trust in others suspect that the allocated amount would fall into bad hands. Since it has been shown that trust is a variable with a non-linear appearance, we use dummy variables in order to control for the different trust levels (Bekkers 2003).

Evidence of a Positive but Marginally Declining Ageing effect

To investigate the relationship between age and donations in the DG, we initially perform five regressions of which the results can be seen in table II.

TABLE II. REGRESSIONS OF AGE ON DONATION²²

	(1)	(2)	(3)	(4)	(5)
Age	0.496 (0.403)	4.740 (3.146)	8.332** (3.527)	7.306** (3.579)	7.268* (3.695)
Age squared		-0.061 (0.045)	-0.102* (0.048)	-0.088* (0.048)	-0.088* (0.051)
Education			-3.440 (2.491)	-2.478 (2.536)	-2.423 (2.811)
Expected Income				2.833 (2.132)	2.839 (2.151)
Expected Income Squared				-0.056 (0.034)	-0.056 (0.034)
Psychotherapy Programme					-0.719 (15.392)
Constant	30.458** (12.423)	-36.166 (50.528)	-92.657 (56.102)	-110.237* (65.107)	-109.936* (65.899)
F-statistic	1.52	1.69	2.45*	2.10*	1.73
N	80	80	76	75	75
R ²	0.019	0.042	0.093	0.132	0.132
Adjusted R ²	0.007	0.017	0.055	0.069	0.057

All regressions are estimated by OLS. * indicates that the estimate is significant on a 10% level, ** indicates that the estimate is significant on a 5% level, *** indicates that the estimate is significant on a 1% level. Non-robust standard errors are reported as heteroskedasticity can be rejected,²³ performing Breusch-Pagan heteroskedasticity tests on all regressions. The F-statistic represents a joint significance test for all variables in respective regressions.

²² All regressions are tested for gender differences by including the variable *Male*. This variable is never significant on any conventional level and is thus not included in the regressions presented in table II.

²³ Due to our relatively small sample size, heteroskedasticity is not expected to be found in these tests. Nevertheless, using heteroskedasticity robust standard errors does not change the size of the standard errors to a large extent.

As can be seen when comparing regression (1) and (2), adding a squared age term substantially increases the statistical explanatory power of the regression.²⁴ Thus, we include the squared term in the rest of our regressions in this paper, enabling control for a declining marginal impact of age on donations.^{25, 26} It is reasonable to believe that ageing in this interval has a positive but marginally declining effect on altruism. Moreover, an ocular observation of figure IV also indicates a positive but marginally declining functional relationship.

From the results of our regressions, we first and foremost note that the coefficient for age is positive, while the coefficient for age squared is negative. This means that we, as expected, have a positive but marginally declining ageing effect on Dictator allocations in our sample.²⁷

Further, we note a drastic increase in magnitude of the age coefficients when controlling for education. The absolute value of the two coefficients almost doubles. Moreover, after controlling for education, the two age variables are both jointly and independently significant on acceptable levels. What is surprising, however, is that the sign on the education coefficient is negative, contradicting some previous research (cf. Andreoni and Scholz 1998, Schokkaert and Van Ootegem 2000). Nevertheless, in our study the coefficient for education is never significant on any conventional level. One possible reason for these results might be the low variation in the education variable. This low variation in combination with a relatively small sample has possibly caused a situation in which we cannot fully control for this variable.

Along with the variable measuring expected average income, we add a squared term of the expected average income variable, enabling control for a positive but marginally declining effect of wealth on allocations. The coefficients of the expected income variables consistently carry their expected signs, but are never statistically significant on any conventional levels. However, they seem to contribute to the function in terms of improving R^2 and adjusted R^2 . While adding these, we also observe that the magnitude of the two age coefficients decline, indicating that income increases in ageing.

Further, as a robustness check, we include a dummy variable controlling for a potential significant difference between the group of students enrolled in the psychology and the psychotherapy programme. However, when including this additive constant, it is neither statistically significant, nor does it have an impact on R^2 or adjusted R^2 to any large extent. This is reassuring.

When controlling for the above discussed variables in the regressions seen in table II, ageing seems to have an economically as well as statistically significant effect on allocations in the DG. The interpretation of regression (4) in table II is that an individual who is 30

²⁴ R^2 more than doubles and adjusted R^2 almost triples. The age coefficient in regression (1) in table II has a p-value of 22 percent, whereas both age coefficients jointly have a p-value of 19 percent.

²⁵ When performing a joint F-test for the variables age and age squared we find them jointly significant at a 5 percent level for regression (3) and jointly significant at the 10 percent level for regressions (4) and (5) in table II.

²⁶ Adding cubic and quartic terms of age do not improve our regressions.

²⁷ Note that Dictator allocation, in regressions (2) to (5) in table II, reaches its maximum between the ages of 39-42, *ceteris paribus*, which is displayed in figures B2 to B5 in appendix B. A potential explanation of this result might be the use of a relatively small sample regarding the higher ages. The main intuition is however the same.

years old chooses to allocate 28.87 SEK²⁸ more than an individual who is 20 years old, *ceteris paribus*. Moreover, both R^2 and adjusted R^2 have increased substantially from regression (1) to (5), implying that although age seems to be of importance, other variables are also necessary to control for in order to determine social preferences.

The Share of Altruists Increase in Age

Given the results of a positive but marginally declining ageing effect we continue by examining how the *probability* of acting in line with altruistic preferences²⁹ changes with ageing. Doing this, we use Eckel's and Grossman's (1996) definition of altruism, i.e. allocating 50 percent or more of the total endowment to Recipient. We investigate this probability by performing a Linear Probability Model. The dependent variable is a dummy stating whether the participant has altruistic preferences according to Eckel's and Grossman's (1996) definition or not. The probability model using this regressand is applied to the same regressors as in table II. The results from our regressions are shown in table III below.

TABLE III. PROBABILITY MODEL OF DICTATOR GIVING HALF OR MORE

	(1)	(2)	(3)	(4)	(5)
Age	0.008 (0.006)	0.075* (0.045)	0.130*** (0.047)	0.112** (0.047)	0.124** (0.048)
Age squared		-0.001 (0.001)	-0.002** (0.001)	-0.001** (0.001)	-0.002** (0.001)
Education			-0.061* (0.031)	-0.049 (0.033)	-0.066* (0.037)
Expected Income				0.031 (0.025)	0.029 (0.025)
Expected Income Squared				-0.001 (0.000)	-0.001 (0.000)
Psychotherapy Programme					0.219 (0.175)
Constant	0.410** (0.190)	-0.646 (0.730)	-1.477* (0.757)	-1.544* (0.864)	-1.636* (0.864)
F-statistic	1.81	2.28	3.92**	3.09**	2.77**
N	80	80	76	75	75
R ²	0.024	0.051	0.104	0.121	0.134
Adjusted R ²	0.012	0.027	0.067	0.058	0.057

All regressions are estimated by OLS. * indicates that the estimate is significant on a 10% level, ** indicates that the estimate is significant on a 5% level, *** indicates that the estimate is significant on a 1% level. Reported standard errors are robust.³⁰ The F-statistic represents a joint significance test for all variables in respective regressions.

²⁸ This is calculated on exact numbers from the regression outputs. However, as the numbers in the table are rounded, recalculating this figure by using the numbers in the table will render a result different from the one in the text. Naturally, the exact numbers from the regression outputs can be obtained from the authors.

²⁹ Strictly speaking, from our definition of altruism in footnote 3, anyone allocating more than nothing has altruistic preferences. However, here the altruism definition is merely a technicality enabling econometrical robustness checks.

³⁰ An effect of using a Linear Probability Model is that the standard errors always will be heteroskedastic as long as the probability depends on any of the independent variables. This due to the fact that a binary

The regressions in table III tell us that, holding other factors fixed, the effect of ageing on the probability of acting in line with altruistic preferences is positive but marginally declining.³¹ Throughout regression (3) to (5) the two age coefficients are statistically significant on conventionally acceptable levels.³² Interpreting the results in regression (4) we see that an individual who is 30 years old is 45 percentage points³³ more probable to act in line with altruistic preferences than an individual who is 20 years old. Thus, from the regressions in table III we conclude that the probability of acting in line with altruistic preferences significantly increases with ageing. This result is reassuring and acts as a robustness check for the results obtained in table II.

Moreover, as for the case of table II, controlling for a potential significant difference between students enrolled in the psychology and the psychotherapy programme changes the age coefficients only to a small extent. Also, R^2 and adjusted R^2 remain almost the same. Again, we can be reassured by our robustness check.³⁴

Attitudes and General Behaviour

It is possible that the positive, but marginally declining, ageing effect on altruistic preferences shown above is partly canalised through variables measuring attitudes and general behaviour, which in turn also affect altruistic preferences. For instance, individuals may become more trusting in general when they grow older. Thus, they may also become more altruistic through the positive relationship between trust and altruistic preferences (cf. Bekkers 2003, 2007). Consequently, simply including trust as a control variable along with age might generate a different interpretation of the age variable compared to the interpretation when trust is not included.

Since our aim is to measure the real effect of ageing, directly including variables measuring attitudes and general behaviour in a regression could be problematic. Controlling for attitudes and general behaviour in regression (4) in table II might create an over control for altruistic behaviour, since measuring Dictator allocation in some sense also may be described as measuring attitudes and general behaviour. If we include variables measuring attitudes and general behaviour, we have to be certain that these variables do not disturb the *ceteris paribus* interpretation of age, i.e. that they do not correlate with the variable age to a large extent. In order to check for the potential risk of over controlling, we run regression (4) in table II again. However, we substitute the dependent variable Dictator allocation with each of the three variables measuring attitudes and general behaviour in three separate regressions, shown in table IV.

dependent variable will have a variance depending on the independent variables as $Var(y|x) = p(x)[1 - p(x)]$, where $p(x)$ reflects the probability of y taking the value of 1 and $p(x) = \beta_0 + \beta_1 x_1 + \dots + \beta_k x_k$ (Wooldridge 2005, p. 259). Consequently, we report heteroskedasticity robust standard errors.

³¹ Note that Dictator allocation, in regressions (2) to (5) in table III, reaches its maximum between the ages of 39-42, *ceteris paribus*, which is displayed in figure B7 to B10 in appendix B.

³² When performing a joint F-test for the variables age and age squared we find them jointly significant at a 1 percent level for regression (3) and jointly significant at the 5 percent level for regressions (4) and (5) in table III.

³³ This is calculated on exact numbers from the regression outputs. However, as the numbers in the table are rounded, recalculating this figure by using the numbers in the table will render a result different from the one in the text. Naturally, the exact numbers from the regression outputs can be obtained from the authors.

³⁴ Cf. figure B9 and B10 in appendix B.

TABLE IV. TESTING ATTITUDES AND GENERAL BEHAVIOUR

	(1)	(2)	(3)
Dependent variable	Personal responsibility	Religious	Trust
Age	0.026 (0.127)	-0.002 (0.053)	0.115 (0.113)
Age squared	0.000 (0.002)	0.000 (0.000)	-0.002 (0.002)
Education	0.021 (0.091)	-0.059 (0.037)	0.017 (0.080)
Expected Income	0.012 (0.075)	0.026 (0.027)	-0.012 (0.067)
Expected Income Squared	0.000 (0.001)	0.000 (0.000)	0.000 (0.001)
Constant	2.658 (2.308)	-0.280 (0.921)	0.892 (2.057)
F-statistic	1.22	1.81	1.38
N	74	75	75
R ²	0.083	0.101	0.091
Adjusted R ²	0.015	0.042	0.025

All regressions are estimated by OLS. No estimates are statistically significant on any conventional level. Reported standard errors in regression (2) are robust since it is a binary variable.³⁵ Other standard errors are reported non-robust. The F-statistic represents a joint significance test for all variables in respective regressions.

From the results of the regressions in table IV we see that none of the age variables are statistically significant on any conventional level. Hence, it seems like the ageing effect is not canalised through our variables measuring attitudes and general behaviour. This result is reassuring and enables us to adequately control for attitudes and general behaviour.

³⁵ See footnote 30 for derivations.

TABLE V. REGRESSIONS OF AGE ON DONATION³⁶

	(1)	(2)
Age	7.096** (3.556)	9.214** (3.576)
Age Squared	-0.086* (0.048)	-0.119** (0.049)
Education	-2.666 (2.542)	-2.224 (2.512)
Expected Income	2.758 (2.110)	2.072 (2.074)
Expected Income Squared	-0.050 (0.034)	-0.041 (0.033)
View on Personal Responsibility	6.344* (3.390)	7.602** (3.314)
Religious		17.152** (8.380)
Trust (reference: 5)		
1		65.574** (31.499)
2		64.767** (30.936)
3		51.121 (31.339)
4		62.177* (31.889)
Constant	-126.583* (65.147)	-214.820*** (74.348)
F-statistic	2.37**	2.31**
N	74	74
R ²	0.175	0.290
Adjusted R ²	0.101	0.164

All regressions are estimated by OLS. * indicates that the estimate is significant on a 10% level, ** indicates that the estimate is significant on a 5% level, *** indicates that the estimate is significant on a 1% level. Non-robust standard errors are reported as heteroskedasticity can be rejected³⁷ performing Breusch-Pagan heteroskedasticity tests on all regressions. The F-statistic represents a joint significance test for all variables in respective regressions.

Initially, we include the variable measuring political stance, i.e. personal responsibility. This variable is statistically and economically significant and takes on the expected positive

³⁶ All regressions are tested for gender differences by including the variable *Male*. This variable is never significant on any conventional level and is thus not included in the regressions presented in table V.

³⁷ Due to our relatively small sample size, heteroskedasticity is not expected to be found in these tests. Nevertheless, using heteroskedasticity robust standard errors does not change the size of the standard errors to a large extent.

sign; a more left wing approach is associated with a higher degree of Dictator allocation.

In order to further control for attitudes and general behaviour, we add variables controlling for generalised social trust as well as religiosity in regression (2) presented in table V.³⁸ When adding these variables the explanatory power of the model, in terms of R^2 and adjusted R^2 , increases significantly.

The coefficient of the variable measuring religiosity takes a positive sign and is statistically and economically significant as expected. To control for the potentially non-linear effect of trust on donations, we include dummies for each level of generalised social trust. The interpretation of regression (2) in table V is that an individual who is 30 years old chooses to allocated 32.67 SEK³⁹ more than an individual who is 20 years old, *ceteris paribus*. Controlling for the trust effect, we see that participants reporting the lowest level of trust⁴⁰ also make substantially lower Dictator allocations, whereas an increasing degree of trust has a significantly larger economical impact on Dictator allocation. These variables are significant on conventional levels. However, the effect of having an average degree of trust⁴¹ is not statistically significant on any conventional level.

As discussed in section 3, a generational effect might be present in the age variable. If generational effects can be assumed to be correlated with attitudes and general behaviour, we to some extent actually control for generational effects by adding variables measuring attitudes and general behaviour. The fact that the shift in the age coefficients, comparing regression (2) in table V with regression (4) in table II, is small disables us to draw any conclusions about a potential existence of a generational effect. However, even though the variables within the scope of this paper do not show any indication of a generational effect, we cannot conclude that such effect is not present.

It is important to remember that including other variables measuring attitudes and general behaviour might render a different result. However, further controlling for generational effects through attitudes and general behaviour may be problematic since suitable variables most likely are correlated with age and thus create a situation where over controlling prevails. Consequently, the presence of a generational effect remains unidentified.

As can be seen in regression (2) in table V, including the variables measuring political stance, religiosity and generalised social trust increases both R^2 and adjusted R^2 drastically, compared to regression (4) in table II. This implies that these variables are important when determining Dictator allocations. However, as the shift in the age coefficients is small when including the additional variables in table V, we conclude that the functional form of age is robust when using our controls for attitudes and general behaviour.⁴² Consequently, ageing is not canalised through our variables measuring attitudes and general behaviour. Thus, our

³⁸ When performing a joint F-test for the variables age and age squared in table V, we find them jointly significant at a 10 percent level for regression (1) while at a 5 percent level for regression (2).

³⁹ This is calculated on exact numbers from the regression outputs. However, as the numbers in the table are rounded, recalculating this figure by using the numbers in the table will render a result different from the one in the text. Naturally, the exact numbers from the regression outputs can be obtained from the authors.

⁴⁰ I.e. reporting the value five on the scale ranging from one to five.

⁴¹ I.e. reporting the value three on the scale from one to five.

⁴² Note that Dictator allocation, in regressions (1) and (2) in table V, *ceteris paribus*, reaches its maximum at the age of 39 and 41 respectively, which is displayed in figure B11 to B12 in appendix B.

main result of a positive but marginally declining effect of ageing on allocations remains robust.

6 Conclusion

The results from our experiments suggest that there is a positive but marginally declining ageing effect on altruism, which is proxied by allocations in the DG. In line with this, we find the fraction of people allocating half of their endowment or more to be increasing in age. We further seek to identify an existence of a generational effect, but without success. Yet, with a cross-sectional data set, our ability to completely separate generational effects from ageing effects is limited. Finally, we find the age-altruism relationship to be robust to controls for attitudes and general behaviour.

The results in this paper give an intuition of the economic importance of ageing on altruism. However, due to our sample age range, possibilities of conclusions concerning the functional form specifications for old people as well as children are limited.

Our results are somewhat different from previous studies in the sense that we have a substantially higher share of Dictators offering their entire endowment. Still, the trends in our data set are mainly in line with previous research. Even though our subject pool puts constraints on the possibilities to draw general conclusions about the entire population, we are reassured by the fact that our results are similar to previous research. Moreover, we find it important not to put focus on the exact numbers of the estimated coefficients in our regressions, but on the functional form of the effect of ageing on altruistic preferences.

This paper has sought to fill the gap in the research of ageing and altruism. However, since cohort effects in terms of generational effects might affect the interpretation of ageing, we suggest future research to look more deeply into this matter. For instance, as generational issues can be assumed to be culturally conditioned, future studies might want to make more extensive cultural controls.

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Appendix A

Here we relax the assumption that Dictators solely base their decisions on their allocated amount. Instead they are also assumed to take their own as well as their anonymous Recipient's wealth, ω_i and ω_j into account. Assuming this we can theoretically show why a rich person with a relatively low θ still possibly could give away a substantial amount of the entire endowment. By maximizing the utility function, the Dictator chooses to keep

$$\pi_i^* = \begin{cases} 0 & \text{subject to } \theta_i \geq \frac{\partial v}{\partial \omega_i} / \frac{\partial v}{\partial (\omega_j + \varphi)} \\ \pi_i & \text{subject to } \frac{\partial v}{\partial (\omega_i + \pi_i)} / \frac{\partial v}{\partial (\omega_j + \varphi - \pi_i)} = \theta_i \text{ if } \theta_i \in \left(\frac{\partial v}{\partial (\omega_i + \varphi)} / \frac{\partial v}{\partial \omega_j}, \frac{\partial v}{\partial \omega_i} / \frac{\partial v}{\partial (\omega_j + \varphi)} \right) \\ \varphi & \text{subject to } \theta_i \leq \frac{\partial v}{\partial (\omega_i + \varphi)} / \frac{\partial v}{\partial \omega_j} \end{cases} \quad (14)$$

This indicates that all people act in relation to their own situation. Let Dictator i be a relatively poor person, thus assuming Recipient j to be better off initially. Applied to equation (14), we get that she might not want to share any of φ , even though she has other-regarding preferences. Note that since all other variables are given, the only component that matters in this utility maximization problem is still Dictator i 's preferences.

Appendix B

FIGURE B1

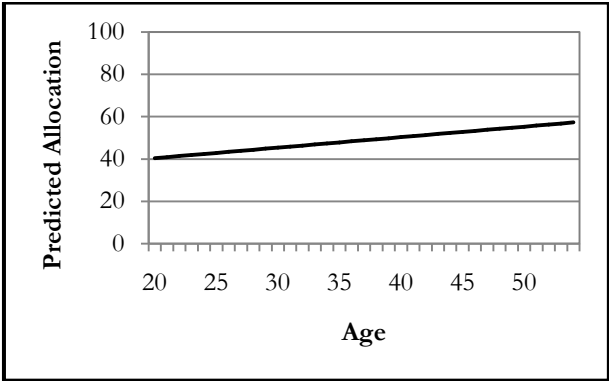


Table II, OLS regression 1. *Allocation* measured in SEK is the dependent variable. *Age* measured in years is the independent variable.

FIGURE B2



Table II, OLS regression 2. *Allocation* measured in SEK is the dependent variable. *Age* and *Age Squared* measured in years are the independent variables.

FIGURE B3



Table II, OLS regression 3. *Allocation* measured in SEK is the dependent variable. *Age*, *Age Squared*, and *Education* are the independent variables. *Education* is kept fixed. *Age* and *Age Squared* are measured in years.

FIGURE B4

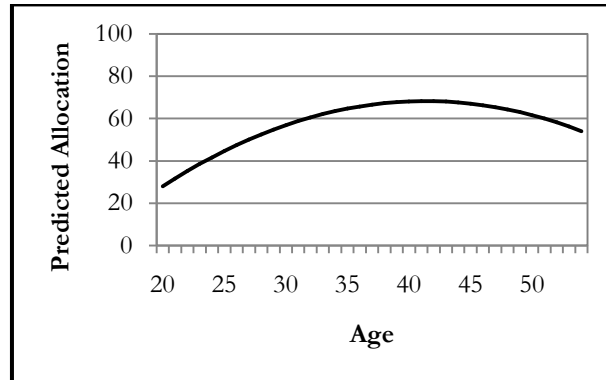


Table II, OLS regression 4. *Allocation* measured in SEK is the dependent variable. *Age*, *Age Squared*, *Education*, *Expected Income* and *Expected Income Squared* are the independent variables. *Education*, *Expected Income* and *Expected Income Squared* are kept fixed. *Age* and *Age Squared* are measured in years.

FIGURE B5

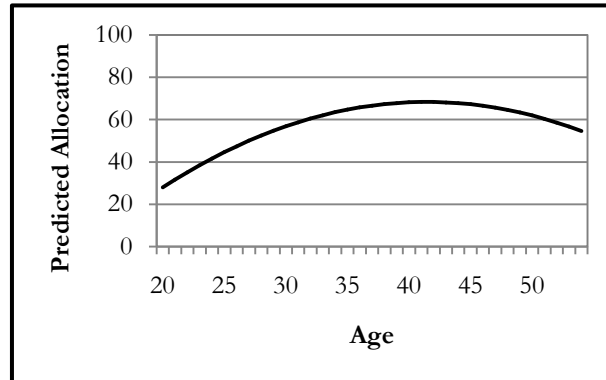


Table II, OLS regression 5. *Allocation* measured in SEK is the dependent variable. *Age*, *Age Squared*, *Education*, *Expected Income*, *Expected Income Squared* and *Psychotherapy Programme* are the independent variables. *Education*, *Expected Income*, *Expected Income Squared* and *Psychotherapy Programme* are kept fixed. *Age* and *Age Squared* are measured in years.

FIGURE B6

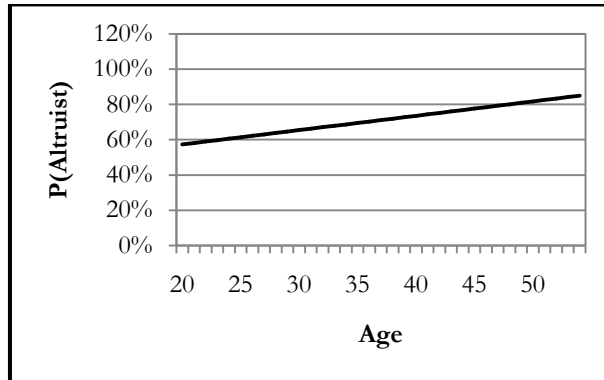


Table III, OLS Linear Probability Model regression 1. Probability of acting as an altruist according to Eckel's and Grossman's (1996) definition is the dependent variable. *Age* is the independent variable. *Age* and *Age Squared* are measured in years.

FIGURE B7

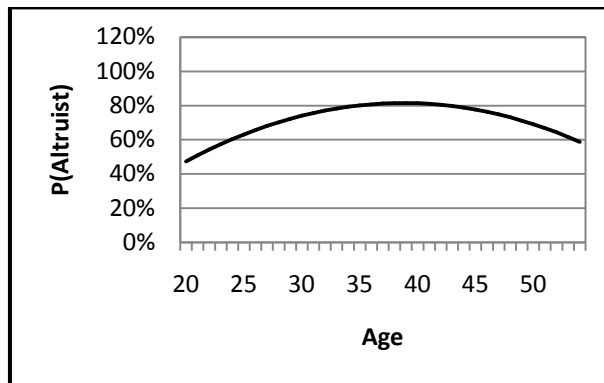


Table III, OLS Linear Probability Model regression 2. Probability of acting as an altruist according to Eckel's and Grossman's (1996) definition is the dependent variable. *Age* and *Age Squared* are the independent variables. *Age* and *Age Squared* are measured in years.

FIGURE B8

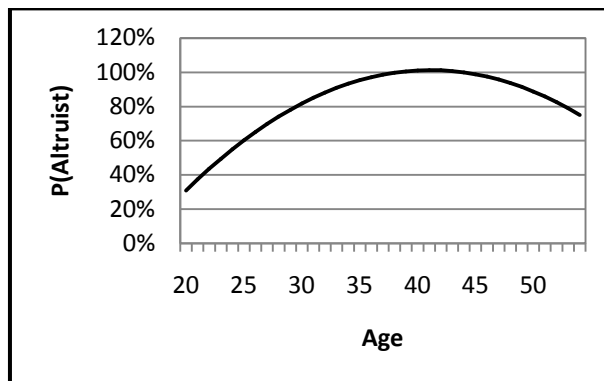


Table III, OLS Linear Probability Model regression 3. Probability of acting as an altruist according to Eckel's and Grossman's (1996) definition is the dependent variable. *Age*, *Age Squared*, and *Education* are the independent variables. *Education* is kept fixed. *Age* and *Age Squared* are measured in years.

FIGURE B9

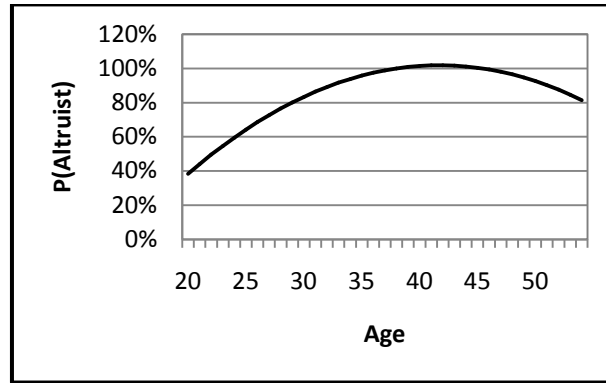


Table III, OLS Linear Probability Model regression 4. Probability of acting as an altruist according to Eckel's and Grossman's (1996) definition is the dependent variable. *Age*, *Age Squared*, *Education*, *Expected Income* and *Expected Income Squared* are the independent variables. *Education*, *Expected Income* and *Expected Income Squared* are kept fixed. *Age* and *Age Squared* are measured in years.

FIGURE B10

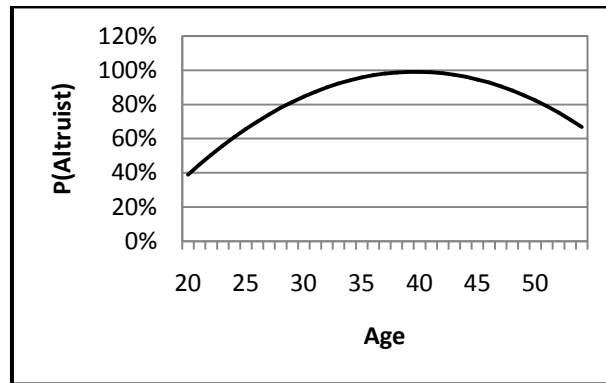


Table III, OLS Linear Probability Model regression 5. Probability of acting as an altruist according to Eckel's and Grossman's (1996) definition is the dependent variable. *Age*, *Age Squared*, *Education*, *Expected Income*, *Expected Income Squared* and *Psychotherapy Programme* are the independent variables. *Education*, *Expected Income*, *Expected Income Squared* and *Psychotherapy Programme* are kept fixed. *Age* and *Age Squared* are measured in years.

FIGURE B11

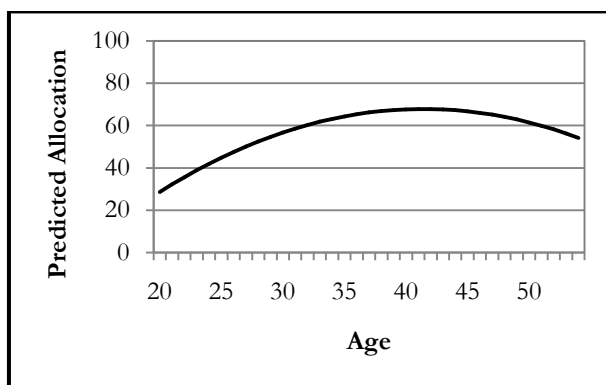


Table V, OLS regression 1. *Allocation* measured in SEK is the dependent variable. *Age*, *Age Squared*, *Education*, *Expected Income*, *Expected Income Squared* and *Personal Responsibility* are the independent variables. *Education*, *Expected Income*, *Expected Income Squared* and *Personal Responsibility* are kept fixed. *Age* and *Age Squared* are measured in years.

FIGURE B12

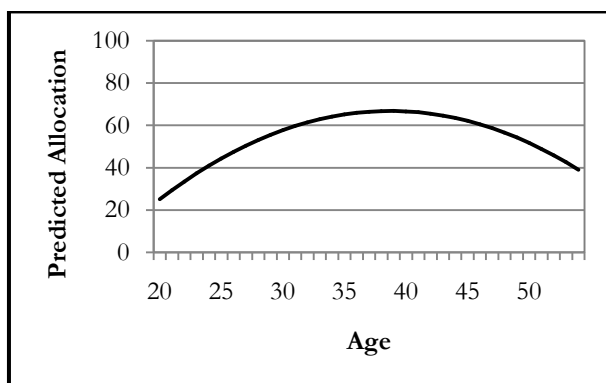


Table V, OLS regression 1. *Allocation* measured in SEK is the dependent variable. *Age*, *Age Squared*, *Education*, *Expected Income*, *Expected Income Squared*, *Personal Responsibility*, *Religiosity* and dummies for *Trust* are the independent variables. *Education*, *Expected Income*, *Expected Income Squared*, *Personal Responsibility*, *Religiosity* and *Trust* are kept fixed. *Age* and *Age Squared* are measured in years.

Appendix C

Part 1: Oral Introduction Translated to English

Hi and welcome everybody,

First, we would like to thank you all for taking time to contribute to our study. Our names are Niklas and Alexandra and we are presently writing our bachelor's thesis in economics at the Stockholm School of Economics. However, in order to do this, we need your help.

You are now about to take part in a short economic exercise. In this exercise, you will make decisions regarding real money. Thus you also will have the chance to be compensated with real money depending on your choices. However, due to funding reasons, we will only be able to compensate one third of you, which will be determined afterwards on a completely random basis.

During this exercise, it is important that you do not talk with each other. Moreover it is also important that you understand all instructions given. If there is anything you do not understand, please raise your hand and we will help you straight away.

To start with, you will take part in a simple economic exercise. After that, you will fill in a short questionnaire. We assure you that you will be completely anonymous towards every other participant in this exercise. You will also be matched with a person that is not present in this classroom. Towards this person, you are completely anonymous as well.

However, due to administrative reasons, we are going to need your address in order to be able to send you your money rendering from your decisions in the exercise. Anyhow, we assure you that the data only will be used in this study and not be further spread.

Part 2: Written Instructions Translated to English

You have randomly been matched with another person. You and this person are completely anonymous towards each other, both during and after this exercise. This person is not present in this room and acts only as a passive recipient in this exercise. Thus, this person cannot influence your decision.

You now have the opportunity to allocate 100 SEK of your own choice. We encourage you to make the decision to, from your obtained amount, give an amount of *your decision* to this anonymous person. This means that you can give everything ranging from 0-100 SEK to the anonymous person and keep the rest to yourself.

Note that there are no strategic elements in this exercise, the person to whom you are about to give money to is only a passive recipient. The drawing of lots of which choices will be realised is performed on a complete random basis.

Take your time, write down your choice and put this paper in the envelope in front of you and wait for everyone to be finished.

I chose to give _____ SEK

I chose to keep _____ SEK

(Please check that the sum of the above noted amounts are equal to 100 SEK)

Part 3: Questionnaire Translated to English

I am: ☐ Male
 ☐ Female

Year of birth: _____

Years of full time studies completed at university (or equivalent): _____

My current average monthly income is (SEK before taxes):

- ☐ 0 - 10 000
- ☐ 10 001 - 15 000
- ☐ 15 001 - 20 000
- ☐ 20 001 - 25 000
- ☐ 25 001 - 30 000
- ☐ 30 001 - 40 000
- ☐ 40 001 - 50 000
- ☐ 50 001 - 60 000
- ☐ More than 60 000

In 5 years I expect my average monthly income to be (SEK before taxes):

- ☐ 0 - 10 000
- ☐ 10 001 - 15 000
- ☐ 15 001 - 20 000
- ☐ 20 001 - 25 000
- ☐ 25 001 - 30 000
- ☐ 30 001 - 40 000
- ☐ 40 001 - 50 000
- ☐ 50 001 - 60 000
- ☐ More than 60 000

How often do you participate in religious contexts (e.g. go to church):

- ☐ Never
- ☐ Sometimes
- ☐ Regularly

Generally I think... (choose one alternative between 1-5):

	Totally Agree 1	2	3	4	Do not agree at all 5
... that people should take complete responsibility for themselves	☐	☐	☐	☐	☐
... that most people can be trusted	☐	☐	☐	☐	☐

I am currently enrolled in _____ programme (e.g. Stockholm University Psychology)

Address (only in order for us to send you money, will not be included in the study):

Name: _____

Street: _____

Postal Code: _____ City: _____

When you are done with the questionnaire, please fold it, put it in the envelope in front of you and hand it over to us!

Thank you for your time!

Part 1: Oral Introduction in the Original Language Swedish

Hej och välkomna,

Tack för att ni har tagit er tid att delta i denna studie. Vi heter Niklas och Alexandra och håller för närvarande på att skriva vår kandidatuppsats i nationalekonomi på Handelshögskolan, men för att kunna göra detta behöver vi er hjälp.

Ni kommer nu att delta i en kort ekonomisk övning. I denna övning kommer ni att fatta beslut kring riktiga pengar. Således kommer ni också att kunna få chansen att bli kompenserade med riktiga pengar beroende på era val. På grund av ekonomiska skäl kommer vi dock endast att kunna kompensera en tredjedel av er, vilket kommer att lottas om i efterhand.

Under denna övning är det viktigt att ni inte pratar med varandra. Det är också viktigt att ni känner att ni förstår de instruktioner som vi ger. Om ni inte förstår något räcker ni upp handen så kommer vi fram till er och svarar på era frågor.

Inledningsvis kommer ni att få göra en enkel ekonomisk övning. Efter det kommer ni att fylla i en kort enkät. Ni är helt anonyma gentemot varandra i denna övning. Ni kommer även att bli matchade gentemot en motpart vilket är en person som inte förekommer i den här salen. Även mot denna person är ni helt anonyma.

Av administrativa skäl kommer vi dock att behöva er adress eftersom de pengar som ni slutligen får i denna övning kommer att skickas till er i efterhand. Vi försäkrar er om att de uppgifter som ni lämnar inte kommer att spridas, utan endast användas i denna studie.

Part 2: Written Instructions in the Original Language Swedish

Du har slumpmässigt blivit ihopmatchad med en person. Du och personen är helt anonyma gentemot varandra, både under och efter denna övning. Personen förekommer inte i denna sal och agerar i denna övning endast som passiv mottagare och kan således inte påverka ditt val.

Du kommer nu att få möjlighet att disponera 100 kronor fritt. Vi uppmanar dig nu att göra valet att, från din tilldelade summa, ge ett *valfritt belopp* till denna anonyma person. Detta betyder att du kan ge allt mellan 0 – 100 kronor till den anonyma personen och behålla resten själv.

Notera att det inte finns några strategiska element i denna övning, den person som du ska ge pengar till är endast en passiv mottagare. Lottningen om vilka val som blir realiserade är helt slumpmässigt utförd.

Skriv ned ditt svarsalternativ i lugn och ro, lägg sedan detta blad i kuvertet framför dig och vänta på att alla blir klara.

Jag väljer att ge _____ kr

Jag väljer att behålla _____ kr

(Var god kontrollera att summan av de ovan angivna beloppen blir 100 kr.)

Part 3: Questionnaire in the Original Language Swedish

Jag är: ☐ Man
☐ Kvinna

Födelseår: _____

Antal år studerade vid universitet (eller motsvarande) på heltid: _____

Min nuvarande genomsnittliga månadsinkomst är (kr före skatt):

- ☐ 0 - 10 000
- ☐ 10 001 - 15 000
- ☐ 15 001 - 20 000
- ☐ 20 001 - 25 000
- ☐ 25 001 - 30 000
- ☐ 30 001 - 40 000
- ☐ 40 001 - 50 000
- ☐ 50 001 - 60 000
- ☐ Mer än 60 000

Om 5 år förväntar jag att min månadslön är (kr före skatt):

- ☐ 0 - 10 000
- ☐ 10 001 - 15 000
- ☐ 15 001 - 20 000
- ☐ 20 001 - 25 000
- ☐ 25 001 - 30 000
- ☐ 30 001 - 40 000
- ☐ 40 001 - 50 000
- ☐ 50 001 - 60 000
- ☐ Mer än 60 000

Hur ofta deltar du i religiösa sammanhang (exempelvis gå i kyrkan):

- ☐ Inte alls
- ☐ Ibland
- ☐ Regelbundet

Generellt sett... (välj ett alternativ mellan 1-5):

	Instämmer helt				Instämmer inte alls	
	1	2	3	4	5	
... anser jag att människor bör ta fullt ansvar för sig själva	☐	☐	☐	☐	☐	
... tycker jag att man kan lita på de flesta människor	☐	☐	☐	☐	☐	

Jag studerar för närvarande vid _____ (institution)

Adressuppgifter (för mottagande av pengar, kommer ej att inkluderas i studien)

Namn: _____

Adress: _____

Postnr: _____ Postort: _____

När du är färdig med enkäten kan du vika ihop den, lägga den i kuvertet och lämna kuvertet till oss!

Tack för din tid!