Discounting Beyond Death:

an Exploration of Intergenerational Distribution Preferences

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Abstract

How do people value the welfare of future generations? This question is of special importance now that future generations' welfare is at stake because of expected climate change. This paper looks into people's preferences regarding intergenerational distribution of welfare. It replicates research on the discounting of life saving and uses a new question that aims to measure the valuation of future generations' standard of life. Data is obtained from an online questionnaire (N = 138) and shows values for the discount factors that indicate decreasing valuation of future welfare. Heterogeneity is observed in the distribution between one's descendants and between future generations in general. This could be explained by the effect on discounting of perceived social connectedness to future generations. The obtained discount factors possibly reflect decreasing connectedness to generations over time, until the point where such generations are considered strangers and no further discounting takes place. The effects of major life events such as grandparenthood also fit this explanatory framework. Changes in demographic factors could therefore translate to changes in intergenerational discounting. Exact predictions of such relationships should be confirmed by further research.

Keywords: intergenerational distribution, discounting, societal preferences, family ties

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1 Introduction

Discounting is an economic subject serving many applications. The economic theory of cost-benefit analysis for example implies that decisions with delayed effects should be judged based on their net present value. This value is not only dependent upon present and future costs and benefits, but also on the unobservable social discount factor, which reflects the valuation of something that is delayed with one year. Less explicit intergenerational discounting takes place continuously, because both private and public consumption have implications for the very long run. An example of such an implication is climate change as a result of the emission of greenhouse gases. Since the climate tends to behave as a public good, climate change becomes a public policy issue for which the intergenerational discount factor is an important policy parameter.

Lower levels of discounting, exemplified by higher discount factors, imply a higher willingness to make sacrifices now in order to sustain the level of welfare of future generations. Under the economic assumption that a benevolent social planner ideally uses policy parameters that reflect the values of citizens, it is crucial for governments to become familiar with the values of citizens regarding the topic of discounting. The Economist thus states that decisions on the use of resources will ultimately be based on moral assumptions about how much less one values their *descendants'* lives than their own (2018). The reference to descendants rather than to future generations in general seems to correspond with widely expressed societal sentiments about how we will leave the earth to our *children and grandchildren*. The relationship between intergenerational discounting and the family context will be one of the main topics of this thesis.

Climate change economists have presented a variety of methods to approach the intergenerational discount factor, resulting in a corresponding variety of values. The most well-known contradiction is between Nordhaus' descriptive factor that is determined by the market discount factor (2007) and Stern's much higher normative factor that is based on welfare economics' ethical framework of total utilitarianism (2006). Beckerman and Hepburn summarize that "there are a range of intermediate approaches" to the extremes of Nordhaus and Stern (2007, p. 206). They mention investigation of the use of stated preference surveys, behavioral experiments and methods to reveal the social preferences inherent in our social institutions as promising alternatives. It is a similar sort of intermediate approach that this thesis will use as well. A descriptive estimation of the discount factor, reflecting how society values consumption by individuals at different points in time (Arrow et al., 2014), has also been attempted by several studies on the discounting of life saving programs (Cairns, 1994; Cropper et al., 1994; Frederick, 2003; Johannesson & Johansson, 1997) that this thesis will discuss.

The purpose of this thesis is to focus on a specific form of discounting, namely the discounting of the *standard of life* of upcoming generations, although the discussion will sometimes refer to welfare for simplicity. The Economist (2018) uses "valuing your descendants' lives" and "valuing future generations' lives" interchangeably. So does the public conversation on climate change, in which people use both the phrase "conserving the earth for our children and grandchildren" and "conserving the earth for future generations." Equality of the two concepts does however not appear plausible right away: within-family intergenerational distribution preferences might be based on very different motives than general intergenerational distribution preferences, for example, kinship-related versus ethical motives. This thesis compares "private" distribution preferences for one's own descendants to "public" distribution preferences for upcoming generations in general, to find out whether separation of the two concepts leads to differences in discounting. Own data is collected to determine values for the two sorts of discounting based on a newly designed question. Questions based on previous discounting research on life saving are used to estimate discount factors in a different manner.

Moreover, this thesis will not only focus on the factors associated with the two different sorts of intergenerational discounting and life saving discounting, but also on the manner in which differences in respondents' background variables correlate with differences between their distribution preferences. Of special interest is the impact of age and family tree and the difference of their impact on discounting between generations that are near and those that are distant. Furthermore, do there exist differences between private and public determinants, i.e. are there determinants that manage to significantly explain the discounting preferences for the welfare of descendants but not of upcoming generations in general and/or are there determinants that have an opposite effect on the two sorts? Information about each respondent is collected in the questionnaire such that a regression can be performed on (background) variables that might be able to explain the discount factor.

As mentioned before, the intergenerational discount factor is a crucial determinant of models that calculate how much consumption to forego now in order to limit future climate change. As a result, societal approval of an intergenerational discount factor that resembles its normative counterpart of 1 would greatly contribute to preventing climate catastrophe. It would therefore be useful to obtain information which, if any, background variables serve to explain the height of one's intergenerational discount factor and whether private discounting preferences are different from public discounting preferences. The lack of empirical research still leaves many blanks in the understanding of intergenerational discounting. In general, any new information seems welcome in the field of intergenerational discounting that still knows little conclusions.

This thesis finds the expected result that for a certain value to distribute, discounting is higher among one's own descendants than generations in general. These and other results point at a relationship between the social connection to a future generation and the valuation of this generation. Grandparenthood for example strongly correlates to lower discounting of the standard of life of grandchildren relative to other generations. A demographic trend of parenthood and grandparenthood at a later age, which increases the number of years between any two generations, could thus lead to lower yearly discounting over the timespan of two generations. A similar result might be obtained for other timespans by other manners to increase social relationships with (potential) descendants or future generations. It turns out that memories of distant ancestors have no effect on the valuation of distant future generations.

"Desirable" societal behavior such as volunteering and low climate impact through plane flights and consumption of new clothes are most likely an outcome and not a cause of the lower levels of discounting that they are associated with. Finally, discount factors that correspond to intergenerational distribution of standard of life are slightly higher (indicating lower discounting) than for life saving, even though the life saving factors found in this thesis are already much higher than those of previous studies. Careful analysis of life saving discounting and its results leads to serious doubt about the extent that discounting of life saving accurately reflects intergenerational discounting.

2 Conceptual Framework

2.1 Literature Review

2.1.1 Life saving

Cropper, Aydede and Portney dominate research on long-term discounting derived empirically from measured individual choice. With various participant pools they repeated a 12-15 minute telephone survey in which respondents were asked whether they prefer a program that saves a fixed number of lives now over a program that saves a higher fixed number of lives in t years from now, where t varies from t = 5 until t = 100. A series of such questions were asked, in which the fixed number of lives presented in the question was adapted to the previously given answers of a respondent. The marginal rates of substitution for present versus future life saving, which Cropper et al. call *marginal rate of time preference*, were then turned into discount rates[1]. Their paper from 1994 combines results from the two participant pools used in previous research (1991; 1992). Converted values of Table 3 from that paper are presented in Table 1 below. The constant exponential annual discount factor clearly increases with the length of the horizon, which leads to large differences. The half-life is the year at which the number of lives saved needs to be 200 in order to be equivalent to saving 100 lives now. This time is 4.46 years for a discount factor of 0.856, but 18.38 years for factor 0.963.

Table 1: Median values of the yearly constant exponential discount factor

Horizon	t = 5	t = 10	t = 25	t = 50	t = 100
median	0.856	0.899	0.931	0.954	0.963

As is done in this thesis, Cropper et al. question what is, if any, the relationship between an individual's socioeconomic characteristics and the rate at which he or she is willing to trade off present for future life saving. They find that income and education have no effect on the discount factor. The negative effect of age, when included linearly, is only minor and its significance depends on the discounting model: the t-statistic corresponding to the coefficient is much larger for the hyperbolic than the linear model. Having children under 18 at home

[1] Discounting can be captured in discount rates and discount factors. Life saving research uses discount rates, but for this thesis the use of discount factors is much more suitable for interpretation and the research design. For internal consistency, the life saving discount rate $\lambda_t = X^{1/t} - 1$ is therefore replaced by the discount factor $\varphi_t = (\frac{1}{X})^{1/t} = \frac{1}{(1+\lambda_t)}$. where X stands for the substitution rate of lives now versus lives t years from now. This transformation can only be performed on median values. Appendix I provides a table of original discount rates including mean and sd.

significantly lowers the discount factor for horizons of 25 years or more, indicating an additional preference for immediate life saving. It however has no statistically significant effect for horizons of five or ten years. This confirms the hypothesis of the authors that responses are partly selfish and can be interpreted as a concern for one's own children until the moment they are able to take care of themselves.

Their general results are not always supported by outcomes of other studies of the same sort. Most other papers pose the critique that the manner in which the life saving question is framed leads to highly varying results. Johannesson and Johansson (1997) studied whether the framing of the binary question on life saving, more specifically the order of the program that saves lives now and the program that saves lives in the future, matters for people's program preferences. They find significance for a positive effect on the discount factor of presenting the future oriented program first ($\alpha = 0.10$). No control for such framing is included in the research of this thesis in order to prevent further complication of analysis and because the open-ended question that this thesis uses can be expected to suffer less from the framing effect than the binary question for which it was found originally. What is of interest is that Johannesson and Johansson find a 5.6% lower median discount factor (difference 0.052) than Cropper et al. (1994) for their questionnaire's overlapping time horizon of 25 years with the same order of the present and future program.[2]

Another study that challenges the question framing of Cropper et al. is Frederick (2003). He poses critique on the use of a binary question, arguing that many respondents do not merely apply their own, predetermined time preferences to the presented options, but make inferences about the appropriate (or expected) substitution rate from the options they are provided with. The preferences for present-oriented life saving programs thus do not adequately reflect respondents' ethical values. A matching question in which respondents are asked to equate two hypothetical life saving programs should overcome such effects. The matching question is open-ended, i.e. respondents are asked to think of a value of X number of lives saved t years from now that makes them indifferent between saving that number of lives in the future or saving a fixed number of lives now. For this question, Frederick found a discount factor of 0.988 (3.2 to 1 substitution rate) for a time horizon of 100 years, whereas the discount factor found by Cropper et al. (1994) for the same time horizon is 0.963 (45 to 1 substitution rate). In contrast, the substitution rates resulting from the original binary choice question are equal for

[2] They hypothesize that this could be due to, amongst other things, methodological differences between the studies and differing preferences between countries: Johannesson and Johansson use Swedish instead of American respondents.

both studies. Frederick however partly uses a student sample (243 out of 401 respondents) with a significantly lower marginal rate of substitution than the jury sample that provided the other 158 respondents. It is therefore difficult to hypothesize whether the substitution rates based on data collected for this thesis will resemble those found by Frederick or the preceding studies that used binary questions.

The field of intergenerational discounting is primarily dominated by analytical papers. The number of studies on long-term non-monetary discounting therefore remains limited. A final study to discuss here that also includes a questionnaire on life saving is Cairns (1994). Although still talking about the long run, the maximum number of years delay of the life saving “reward” in his study is only 19 years. The median discount factor found for this time horizon is 0.865. Interestingly, Cairns uses a matching question like Frederick. He provides respondents with several options of number of lives to “match”, but also leaves open the option for them to fill in their own desired value. Like Cropper et al., he examines whether individual characteristics influence the time preference. Unlike them, he finds that age only significantly explains the life saving discount factor when entered both quadratically and linearly at the same time. The coefficient corresponding to Age is positive and has a higher absolute value than Age Squared, which has a negative coefficient. This implies that the age-effect on the discount factor is shaped as an inverted U, increasing until age 49.7 and falling with further increases in age. The coefficients corresponding to the dummies for post-secondary education and having children under 10 years of age had the expected signs (positive and negative, respectively) but were not statistically significant. Smoking significantly decreases one’s discount factor. According to Cairn’s hypothesis “smokers may discount the future more heavily since they will be aware that they have a lower chance than non-smokers of living to enjoy that future.” This explanation of the found relationship seems to point at a very different sort of question than the sort of intergenerational discounting, irrespective of one’s own possible future, that this thesis is interested in.

However insightful, the empirical research on life saving discounting provides inadequate basis to draw valid conclusions about intergenerational discounting of welfare. Saving a number of lives is of a very different order than the broad and much less concrete consequences of current consumption and investment on future welfare. This is why a new question that should capture intergenerational distribution preferences was created for this thesis, asking respondents to distribute standard of life over future generations. This is more relevant and less dramatic than saving lives. Still, the questionnaire also includes several life saving questions that combine elements from the empirical research described above.

2.1.2 Intergenerational distribution

It should be clear at this point that intergenerational discounting is absolutely distinct from the concept of consumer impatience that forms the basis of regular discounting within one's life-span, especially the simple form of monetary discounting. The following critique by Thomas Schelling supports this idea. "The alleged inborn preference for earlier rather than later consumption is exclusively concerned with the consumer's impatience with respect to his or her *own* consumption. (…) But greenhouse policy is not about saving for later consumption. It is about foregoing consumption in order that *somebody* else at a later time enjoys more consumption than would otherwise be available" (1995, p. 396). After this quotation, his paper continues with an introspective statement about impatience. Schelling claims that he would have no preference for an increment of consumption to accrue in the year 2150 to strangers not yet existing compared to such an increment accruing in the year 2100 also to strangers not yet existing. Directly after, he admits that this might be different for preferences on the short term:

> I can imagine reasons - some of them may even appeal to me - for preferring a boost to consumption in 2025 to the same boost of consumption in 2075, but it is hard to see that it has anything to do with impatience and the inborn preference for immediate over postponed consumption. In 2025, my oldest son will be the age I am today and his brothers a little younger; with a little luck they will be alive and healthy and my grandchildren will be the ages that my children are today, and my great-grandchildren (whom I do not yet know) will have most of their lives ahead of them. Seventy-five years later they will all be strangers to me. My genes may be as plentiful in the population at the later date but they will be spread thinner. I probably would prefer the benefits to accrue to my own grandchildren rather than to their grandchildren, but I must remind myself that my grandchildren's happiness may depend on their perceived prospects for their own grandchildren, and my 'time preference' becomes attenuated.
> (1995, p. 396)

If people took the latter reminder into account, then there would also be no preference for consumption between the year 2025 and 2075. However, as Schelling notes himself, this is not automatically part of one's reasoning and is not a result that this thesis expects to find.

Schelling uses the strength of a genetical connection to explain his potential time preference. Certain anthropologists have also defined kinship in American culture as biogenetic: "Because blood is a 'thing' and because it is subdivided with each reproductive step away from a given ancestor, the precise degree to which two persons share a common heredity can be calculated, and 'distance' can thus be stated in specific quantitative terms" (Schneider, 1968, p. 25). Appendix II pictures this biogenetic distance between oneself and various family members in a schema (Johnson, 2000). For descendants, genetic relatedness exponentially decreases with factor 0.5 per generation. Since low levels of relatedness however stretch over infinitely many generations, Schneider suggests that in American society, the level of relatedness that is still associated with kinship is a personal decision. This thesis could provide insight on such “cut-off points”. The constant focus on the futures of one’s children and grandchildren instead of one’s complete set of future offspring in the public conversation on climate change might give a first indication of such a point.

It could also be that “egoistic” kinship motives turn out to be overshadowed by ethical motives for a perfectly equal distribution. Hypotheses regarding this topic can be tested by the data collected for this research. The corresponding self-designed question asks for the distribution of 100 lottery tickets over five future generations. Each lottery ticket represents a percent chance on an equal or higher standard of life than one’s own.[3] The lottery ticket distribution over one’s descendants (private discounting) can be compared to the distribution over generations in general (public discounting).

2.2 Theoretical model

A theoretical model can be constructed using the question just described. Consider an individual in generation 0 who values the utility of the two generations following his own: generation 1 and 2.[4] His own utility $\mathrm{U_0}$ is then a function of the utility levels of generation 1 and generation 2. Assume that $\mathrm{U_1}$ does not enter $\mathrm{U_2}$ and vice versa. The expected utility of these two generations is however determined by the number of lottery tickets they receive, which indicates a chance on a high standard of life. For generation 1 the number of lottery tickets is L and for generation 2 it is $100 - \mathrm{L}$, where 100 indicates the total number of lottery tickets available:

$$\mathrm{U_0(L) = U_1(L) + \psi U_2(100 - L)}$$

This individual therefore maximizes his utility by allocating the 100 tickets such that the additional utility he would receive from giving an additional ticket to generation 1 is identical to the additional utility he would receive if he would give it to generation 2 instead. That is, we have the following first-order-condition that needs to hold in equilibrium:

$$\frac{\mathrm{dU_0(L)}}{\mathrm{dL}} = \frac{\mathrm{dU_1(L)}}{\mathrm{dL}} + \psi \frac{\mathrm{dU_2(100 - L)}}{\mathrm{dL}} = 0$$

[3] A much more detailed description of the question is presented in the methodology section of this thesis.
[4] These can be either descendants or generations in general.

From which it follows that:

$$\frac{dU_1(L)}{dL} = -\psi \frac{dU_2(100 - L)}{dL}$$

and:

$$\psi = -\frac{dU_1(L)/dL}{dU_2(100 - L)/dL}$$

Where ψ indicates the valuation of the utility of generation 2 as a factor of the utility of generation 1.

When the weight the individual puts on the utility of future generations is the same for both generations, then the value of ψ is 1. In that case, an unequal distribution of lottery tickets $(L \neq 50)$ can only be justified if the individual uses a different utility function for generation 2 than for generation 1: $U_1 \neq U_2$. Then it is possible that in equilibrium, $\frac{dU_1(L)}{dL} = -\frac{dU_2(100-L)}{dL}$ for a value of $L \neq 50$. This amounts to the individual believing that generation 1 will derive a different utility from a given standard of life than generation 2. This is a possible alternative explanation for our results, but it is not the focus of this thesis.

Instead, the assumption is made that generation 1 and generation 2 will equally enjoy chance on a high standard of life measured by lottery tickets: $U_1(L) = U_2(100 - L)$. In this case, an unequal distribution of lottery tickets points out that $\psi \neq 1$. If $\psi < 1$, the individual from generation 0 has a preference to distribute a majority of lottery tickets to generation 1. If instead $\psi > 1$, distributing a majority of lottery tickets to generation 2 is preferred. This is called "negative discounting".

This model can be extended for more than two future generations, but the intuition remains the same. The empirical data of this thesis, i.e. distribution preferences of each individual respondent, can now be captured in this general framework.

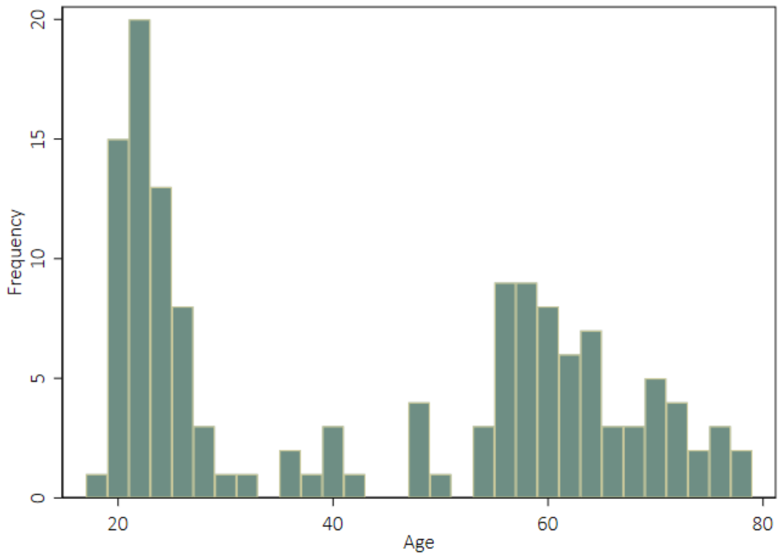
3 Methodology

Since there exists no suitable dataset to answer this thesis' research questions, own data was collected. This was done with the use of a questionnaire study, which allows for the possibility to research the relationship between a large number of variables.

3.1 Participants

Research participants are Dutch adults of ages 18 until 78 (*M* 43.0, *Mdn* 44.5). As can be observed in Figure 1, the sample however shows a clear peak for 20-year olds (*Mode* 22) and a relatively small number of participants between the ages 30 to 50. This has to do with the fact that the sample is a convenience rather than a random sample. The total number of respondents is 138, of which 65 are females and 73 are males. Their median income interval is €2000-2999 net per month. 63 respondents are parents, of whom 48 have children over 19 years of age, and 34 respondents are grandparents.

Figure 1: Histogram for respondent age



The 138 responses were collected during the period March 26 until April 15 2019. During this period an online questionnaire was distributed to acquaintances of the author through Facebook, e-mail and by individual requests. Respondents had the chance to win one out of three €20 VVV gift cards for three randomly selected respondents. This might have served as successful motivation for some people, especially students, to start and complete the questionnaire. Still, a stronger motivation for participation might have been the willingness to help the author. The relative difficulty of the questionnaire might have discouraged people without such willingness from completing or even starting the questionnaire. An important limitation of this research is therefore not only that the sample size is much smaller than that of professional research projects on the topic of long-term discounting, but also that the manner in which respondents were selected can lead to biased outcomes. Still, effort was made to obtain a sample of certain heterogeneity such that it is expected to be somewhat more representative of society than a simple student sample.

3.2 Questionnaire

An online questionnaire (appendix IV) was created with a total of 33 questions in Dutch. The questionnaire is divided into four sections: background variables (demographic); private and public intergenerational distribution; life saving; sketched situations; background variables (continued). This paragraph will discuss them in order.

Standard questions based on examples from the Qualtrics questionnaire program were used to measure the basic demographic variables gender, age, education and income[5]. The first section finished with questions on the number of brothers, sisters, children, grandchildren and great-grandchildren that each respondent has (had) and the number of parents, grandparents and great-grandparents they have memories of (not just on the basis of pictures).

The second section contains the questionnaire's most important questions that were created for this thesis and that measure intergenerational distribution preferences. Respondents were asked to distribute standard of life rather than utility or broad consumption (including that of non-monetary goods and services), because those concepts might be difficult to understand for non-economists. The question thus overcomes critiques on the difficulty of theoretical constructs used in stated preference methods such as "pure time preference" and "benevolent social planner" (Arrow et al., 2014). The standard of life is defined in the questionnaire as a combination of multiple definitions found on the internet (Statistics Netherlands, 2014; Fontinelle, 2019) in the following manner: "The **standard of life** gives an indication of the level of human welfare on economic, social and cultural dimensions. Various indicators are used to measure the level of the standard of life. Think of material resources, the structure of society (housing, education and health care, etc.) and the (natural) environment, for example." The level of the standard of life that respondents could distribute is their own. This choice was made to avoid setting a certain value that might occur very low or very high to some respondents and therefore bias results. Furthermore, by distributing standard of life instead of (additional)

[5] Household income was formulated as a multiple choice question with six answer options, each indicating a €1000 net monthly income interval (the final one €5000+). The seventh answer option was "prefer not to say."

consumption, any expected growth rate of consumption or welfare does most likely not affect distribution choices. The standard of life does not end up on top of a certain standard that the future generation is already expected to have, but fully determines that standard. The question appeared in the questionnaire in the following form (differences between private/public discounting between brackets):

> This question is about how important you deem it that (**your potential own descendants/upcoming generations in general**) will have the same standard of life as you have or expect to have during the rest of your life.
>
> Imagine that each (of your descendants/generation) participates in their own "standard of life lottery". Each lottery has 100 participating lottery tickets and the different lotteries operate independently of one another. Each lottery will draw one winning lottery ticket. The price for the winning ticket in each lottery is the **same or a higher standard of** life than (your own/that of your own generation). Thus, for each (descendant/generation) every additional lottery ticket equals an extra percent change on winning this price.
>
> You can decide the number of lottery tickets that each (descendant/generation) will receive to participate in his or her own lottery. You have a total of 100 lottery tickets to divide over (your (potential) descendants/the five generations following yours). Assume that each (descendant/generation) will get one child at age 25 and that everyone's life expectancy at birth is 85 years.
>
> Example: *Assigning 100 lottery tickets to a descendant (generation) means that the winning lottery ticket will always be in the possession of this descendant (generation) and he/she will thus always have the same or a higher standard of life than yourself. Assigning 0 lottery tickets to a descendant (generation) means that the winning lottery ticket will in no occasion be in the possession of this descendant (generation) and he/she will thus always have a lower standard of life than yourself. Each number of lottery tickets in-between these two extremes will not provide complete security about the standard of life of the descendant (generation.) With 30 lottery tickets the descendant (generation) has 30% chance of the same or a higher standard of life than yours.*
>
> Indicate your desired distribution below:
> (Child/1 generation following yours): _______
> (Grandchild/2 generations following yours): _______
> (Great-grandchild/3 generations following yours): _______
> (Great-great-grandchild/4 generations following yours): _______
> (Great-great-great-grandchild/5 generations following yours): _______

The next section consisted of life saving questions that have been used to measure intergenerational discounting in previous research. The questions are introduced in the following manner:

In this question block you are asked to make trade-offs.

The government has to make trade-offs continuously. One of her tasks is to invest in preventing accidents and illnesses. Imagine that the government can decide to invest in programs that reduces health risks now and programs that reduce health risks in the future.

Unless there are programs to control these health risks, some will die this year as a result of accidents and illnesses, and some will in the future. There is only enough money to execute one of the two programs. Consider Program A and Program B below and then fill in the “blank” such that you would judge them to be equally good.

De following six questions differ from one another at the point how many years in the future Program B takes place.

In random order but on one page, the following question then appeared for T = 5, T = 10, T = 25, T = 25, T =50, T = 100, T = 200:

Program A saves 100 lives this year, but saves 0 lives **T years** from now.
Program B saves 0 lives this year, but saves X lives **T years** from now.

For which value of X do you consider program A and B to be equally good?

The seventh question measured respondents’ marginal rate of substitution without the specification of a time horizon.

Program A saves 100 lives this year, but saves 0 lives **X years** from now.
Program B saves 0 lives this year, but saves 200 lives **X years** from now.

For which value of X do you consider program A and B to be equally good?

This section of the questionnaire is based on the mentioned studies on life saving programs (Cropper et al., 1994; Johannesson & Johansson, 1997; Frederick, 2003). Any references to the environment and its pollution were deliberately excluded and several sentences were added or adapted to avoid possible misunderstanding of the question. The decision to work with an open-ended matching rather than (binary) choice question was made to simplify analysis later on. The marginal rate of substitution can easily be derived from the answer X, whereas the binary choice question limits the preciseness of the preference information and requires a complicated method of analysis. The critique posed by Frederick (2003) that the binary choice elicitation procedure encourages respondents to discount moreover advocates for the use of an open-ended matching-question. Its disadvantage on the other hand is that individuals find them more difficult to answer than binary choice questions (Mitchell & Carson, 1989). To accommodate for this, the questionnaire did not force respondents to answer these life saving questions as it did for the intergenerational distribution questions. On the next page of the questionnaire, respondents were welcomed to leave any comments or thoughts on these preceding questions. Furthermore they were asked whether, in making their choices, they had considered the effect programs would have on them or their families.[6]

After that, the new section "sketched situations" followed. Risk aversion was measured using a 5-point Likert scale (Likert, 1932). This scale was also used to measure opinions on government deficits and the height of the inheritance tax. A short context with some information on these two concepts was provided. Respondents' monetary marginal rate of time preference for a 10-year time horizon was obtained through another open-ended matching question.

The questionnaire finished with some final questions on participants' background and behavior. Respondents who indicated having children were asked for the age of their youngest child such that the research could optionally repeat a test for indirect selfish concerns just like Cropper et al. (1994). Other data that was collected in the final section of the questionnaire is on respondents' cigarette and new clothing consumption, the number of plane rides made over the past two years and the average monthly hours of volunteering.

3.3 Analysis method

3.3.1 Data and variables

Several data operations have been performed before hypothesis testing could start. Details about dropped variables and observations are given in Appendix III. Furthermore, the variables Grandchildren and Children were transformed to dummies. A dummy variable seems most meaningful, especially for the private distribution model, because respondents are asked to imagine only one descendant per generation. The number of descendants will most probably not increase the ability to picture a single descendant. In the case of public distribution it does not necessarily hold that a dummy is most meaningful, but independent variables were kept the same in order to compare regression models. The dummies also helped to resolve the problem of outlier values.

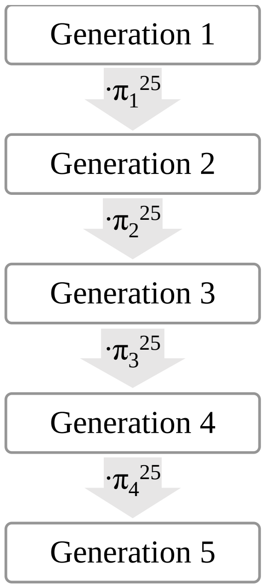
The number of grandparents and great-grandparents are not as suitable as dummy variables. It is hypothesized that a higher feeling of familiarity with future generations leads to lower discounting and that this feeling of familiarity might increase by relationships of similarly distant generations such as grandparents and great-grandparents. The number of these relationships is therefore still of importance. The dummy of Grandparents moreover takes on the value 1 for almost all respondents.

[6] Cropper et al. (1994) did the same in their research which enabled them to detect selfish concerns.

Discount factors can be calculated based on the outcomes of the private and public intergenerational distribution question. The number of lottery tickets distributed to generation g+1 as a share of the lottery tickets distributed to generation g,[7] captures the respondent's implicit valuation of the standard of life of a generation in terms of the standard of life of the previous generation, which is a form of discounting. To convert this to a yearly discount factor, the shares simply have to be raised to the power $\frac{1}{25}$, where 25 indicates the number of years between two generations according to the question that respondents faced.[8] Applying this calculation to the five answers on both the public and private lottery distribution preference questions results in a total of 8 discount factors: δ_i corresponding to the generation intervals between descendants and π_i corresponding to the generation intervals between future generations in general (i = 1, 2, 3, 4). Both of the factor sets have their own "time-invariant" discount factor δ and π, which is the average of the four factors that are each specific to a combination of two subsequent generations.

Figure 2 represents a visualization of intergenerational distribution that is based on (public) lottery ticket distribution. The value of a certain box corresponds to that of the box above multiplied with the yearly discount factor raised to the power *number of years between the two generations* (see arrows).

Figure 2: A model of intergenerational distribution



7 $\frac{\text{lottery tickets}_{g+1}}{\text{lottery tickets}_{g}}$

8 Results for 20 or 30 years between generations are discussed in section 5.2.4.

3.3.2 Statistical tests

The normal distribution of most variables was tested with the Skewness-Kurtosis test. The outcome of non-normality implies the use of median rather than mean comparison. The Wilcoxon Signed-Rank test was used to compare medians of two measures with one sample. The test considers the relative magnitude as well as the direction of differences between the two measures (Siegel, 1956).

To test hypotheses about regression coefficients, a multivariable regression with several of the discount factors δ and π as dependent variables was performed on the data using robust standard errors. A regression with a similar set of independent variables was ran for the dependent variable φ. Significance of the regression coefficients was determined using t-tests. Finally, correlations between the discount factors and the variables corresponding to the sketched situations were calculated and reported.

4 Hypotheses

4.1 Life saving

A first hypothesis about the outcomes of this research is that the life saving discount factor φ_t resembles the literature's factors from each corresponding time horizon. The discount factor is therefore also expected to, like those factors, show an increase for an increasing time horizon. Because the main interest of this thesis lies in the outcomes of the self-designed questions, only one additional hypothesis on life saving discounting will be stated here, covering the effect of age on one's discount factor.

Based on the results found by Cairns (1994), an inverted U-shape effect of age on the average discount factor of all time horizons can be expected. There however exist reasons to assume otherwise. Recently in the Netherlands there have been several climate activist group in the news who were, among other things, active in organizing climate protest marches. Two of such groups are Youth for Climate and Grandparents for Climate, who both emphasize their age group's special affinity with the topic climate change. On the website of Grandparents for Climate one of the involved grandparents is quoted (Beekman, 2018): "They sometimes say that ageing makes time go faster, but that also means that things from the distant past and the far future appear less distant. It is much easier: 2100 is nearby, only two generations away. Meanwhile young people are busy with their career, children, etc. For them 5 or 10 years is already far away." The effect of ageing on the perception of time has also been discussed by Draaisma (2001). One's personal yardstick plays an important role in judging future events: "Once having reached the age in which one has become familiar with the speeding up of time, ten years can seem short, while the same period still strikes a twenty-year-old as a small eternity" (p. 224). In combination with the increasing linear impact of age on the discount factor found by Cropper et al., a U-shape rather than Cairn's inverted U-shape would correspond to the age effect on the discount factor.

4.2 Private and public distribution

4.2.1 Median comparison

Assuming that the kinship effect is more likely to overpower any ethical motive for an equal distribution in the case of one's own descendants than in the case of generations in general, a first hypothesis about intergenerational distribution of standard of life is that respondents distribute a larger number of lottery tickets to their child and grandchild (generation

1 and 2) than they distribute to generation 1 and 2 in general. This implies that a higher portion of the 100 lottery tickets is given away at the start for the descendant question, which has to be compensated by lower discount factors, meaning higher discounting later on.

Based on the kinship argument, the closer one's tie to a descendant, the more one values this descendant's chance on an equal or higher standard of life than one's own. The standard of life of one's child is therefore expected to be considered of a significantly higher value than that of one's grandchild, whereas that of general generation 1 is not necessary expected to be considered of much higher value than that of general generation 2. The discount factor δ_1 is therefore expected to be lower than π_1. An argument could be made for people entering the same values for the two sorts of distribution, reasoning that the general generations' welfare says something about their descendant's welfare. Disregarding that argument for the most part, kinship effects are expected to have a small(er) effect on the lottery ticket distribution for generations in general.

An easy method to additionally test higher private than public discounting is to compare the average discount factors belonging to the private and the public distribution question. If weakening family ties have a stronger decreasing impact on lottery ticket distribution than does sole distance in time corresponding to future generations in general, then the private discount factor should be lower than the public discount factor. Since the total number of lottery tickets to distribute is fixed, this implies that a higher portion of the 100 lottery tickets has been given away at the start, which is in line with hypothesis 1. The number of tickets distributed to the five generations in general should have less of a decreasing trend.

Schelling (1995) posed the idea that no preferences exist for distributions of consumption between two distant strangers. One could argue that in a sense, one's great-great-grandchild will be as much of a distant stranger as one's great-great-great-grandchild. This would be in line with Schneider's calculations on genetic connection in Appendix II, which show that the absolute difference in connection is decreasing when generations become more distant. Thus, the difference between one's great-grandchild and great-great-grandchild might already feel much smaller than that between one's grandchild and great-grandchild.[9] The discount factor δ_1 is therefore expected to be significantly larger than δ_2. The final factors δ_3 and δ_4 between the descendants great-grandchild, great-great-grandchild and great-great-great-grandchild are expected to show no significant differences.

[9] According to information about life expectancy and age of becoming a parent provided in the question, respondents are expected to pass away after the first 10 years of their great-grandchild's life.

4.2.2 Regression and correlation

Discount factors based on the lottery ticket distribution question can be regressed on several possible determinants, just like life saving discount factors. Differences are expected for regression coefficients between private and public discounting factors, but also between factors corresponding to different combinations of generations. The general idea is that the more a future generation is perceived as a stranger, or put differently, the less one feels connected to a future generation, the more their welfare is discounted. A person who has grandchildren probably considers their grandchild (generation 2 in the private distribution model) to be less of a stranger than someone with zero grandchildren considers his or her potential grandchild. δ_1 should in that case be higher for grandparents than for non-grandparents.

Perhaps the perception of relational ties with future generations is not only impacted by the lower part of one's family tree, but also by the memories one has of the upper part of his or her family tree. A video of UNICEF (2019) states that children "need rooting to become aware they are part of a life movement that started before and will continue after them." Along the same line of reasoning, a person who has memories of more ancestors of a specific generation above them might feel a stronger social connection to generations below them that are at least as distant. Thus, if someone has known those family members further up in the family tree, that person might feel a larger connection to generations further away and similarly take that into account when dividing the 100 lottery tickets among one's descendants. This explorative hypothesis is most likely to hold for private discounting. The variable Grandparents would in that case have a significant positive effect on δ_1, whereas the variable Great-grandparents would on δ_2.

Lastly, two proxies for climate impact might be able to point out a link between this impact and intergenerational distribution. Short-sightedness in intergenerational distribution would imply a relatively high number of lottery tickets for generation 1 and a low discount factor π. New clothes are accessible at low prices, especially when the production process is not environmentally sustainable. Just as is the case for plane flights, a higher value of this variable therefore implies a high climate impact and is therefore hypothesized to lower the average public discount factor π.

To conclude, the large number of variables that have been measured in the questionnaire allow for the possibility to formulate a large number of hypotheses as well. As the literature review has shown, there are only limited number of previous empirical results on which expectations can be based. In order to avoid a very large number of explorative hypotheses, this thesis has limited itself to a small selection of hypotheses based on the most apparent signals.

5 Data and analysis

5.1 Life saving

5.1.1 Descriptive statistics

Table 2 summarizes the annual life saving discount factors for the various time horizons. The null of a normal distribution is rejected on the basis of the Skewness-Kurtosis test ($p < 0.05$) for all factors except the ones corresponding to t = 10 ($p = 0.346$) and t = 25 ($p = 0.093$). Median discount factors show an increasing trend for longer time horizons, with the exception of t = 10. The range between factors of different horizons is, with a mere 0.023, smaller than ranges found in previous life saving research.

Table 2: Summary statistics of the constant exponential discount factor

Horizon	t = 5	t = 10	t = 25	t = 50	t = 100	t = 200	Average[a]
median	0.9642	0.9603	0.9727	0.9818	0.9862	0.9886	0.9724
mean	0.9260	0.9390	0.9565	0.9682	0.9788	0.9860	0.9593
sd	0.2324	0.1550	0.0796	0.0468	0.0310	0.0186	0.0847

a: the mean of the discount factors corresponding to the six time horizons

5.1.2 Median comparisons

The life saving discount factors presented in Table 2 show higher mean and median factors than those of Cropper et al. (1994) for all time horizons. Medians found by Johannesson and Johansson (1997) and Cairns (1994) were lower than theirs and thus even less alike the ones found in this thesis. The Wilcoxon Signed-Rank test for the equality of medians is able to reject the null of equal medians for all time horizons ($p \leq 0.021$). Frederick's life saving discount factor corresponding to a time horizon of 100 years was 0.988, very similar to the discount factor that this thesis found for the 200-year time horizon. Whereas the null of equal medians is rejected for a time horizon of 100 years ($p = 0.012$), it is not for the 200 year horizon ($p = 0.804$).

5.1.3 Regressions

Apart from the factor itself, determinants of the factors can also be reviewed. Rather than discussing regressions for the discount factors corresponding to all time horizons separately, the analysis will limit itself to the regression of the dependent variable Average discount factor of all time horizons φ (Table 3). The other regressions models were all insignificant.

Similar to Cropper et al. is that it does not appear as if discount factors were impacted by direct selfish concerns. They found that respondents who answered at the end of the questionnaire that they considered the effect that programs would have on themselves and their relatives do not have a significantly higher preference for present-oriented programs. In the questionnaire for this thesis a similar question was asked. Insignificant median differences for the three groups of answers ($p = 0.514$) along with low correlation between such consideration and the Average life saving discount factor (*Pearson's correlation* $r = -0.01$) leads to the same conclusion. A second manner in which they measured selfish concerns was indirectly: people with young children have lower long-term discount factors, indicating that people care about their children when they are young. Due to a low number of respondents with young children, this finding could not be tested with data collected for this thesis.

Table 3: Regression for the average life saving discount factor of all time horizons φ

	φ	*p*
Male	0.0282$^{\sim}$	(0.096)
Age	-0.0098*	(0.024)
Age squared	0.0001**	(0.007)
Income	-0.0078	(0.349)
Siblings	0.0043	(0.357)
Children[a]	-0.0107	(0.753)
Grandchildren[a]	-0.0528	(0.173)
Grandparents known	-0.0027	(0.798)
Great-grandparents known	0.0021	(0.831)
Volunteering hours[b]	0.0005	(0.141)
New clothes[b]	0.0028	(0.293)
Flights[c]	0.0021*	(0.013)
Constant	1.1153**	(0.000)
N	111	
R^2	0.218	

Two-tailed *p*-values in parentheses
$^{\sim}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

a: the variables Children and Grandchildren are dummies for having at least one family member in this category
b: the variables Volunteering hours and New clothes are measured per month
c: the variable Flights measures the number of plane flights over the past two years

The table shows significance of the coefficients corresponding to gender, age and plane flights. The significant positive effect of being a male on the discount factor is a surprising result that has not been found before and for which no immediate explanation can be given.

The positive sign of Flights indicates that the number of plane flights over the past two years positively correlates with the discount factor. This is a little counterintuitive since a higher consumption level of these goods corresponds to a higher climate impact, which does not seem to indicate a high valuation of the (far) future as measured with the discount factor. Obviously, no link between the valuation of the future and active contribution to "saving" the future is apparent, but the positive sign of this coefficient is still worth pointing out.

The question raised in the Literature Review section was whether the linear and quadratic addition of Age to the regression model would point out a U-shape effect of age on the discount factor or an inverted U-shape effect. The negative coefficient for Age and the positive coefficient for Age Squared imply a U-shape: the discount factor decreases with age until a certain point, after which it starts increasing. The minimum discount factor is at 49 years of age. No previous research on life saving has found this result, which also raises the question whether the result is inherent to the specific sample. The age distribution as shown in the histogram of Figure 1 is not representative of society: the limited amount of observations for middle-aged people could possibly bias any effect of age. Still, it would be very interesting to further investigate this relationship, because there are good reasons for it to hold.

Most life saving papers conclude with a comparison of their found life saving discount factors to monetary discount factors. Some results are that the discount factor for saving lives is higher than (Cairns, 1994) or equal to (Cropper, Aydede & Portney, 1994) the discount factor for financial benefits. These results are partially supported by data used for this thesis. Since the monetary constant exponential discount factor is based on a question that uses a 10-year time horizon, this factor is compared to the constant exponential discount factor that is also associated with a 10-year time horizon. The monetary discount factor has a median of 0.943 whereas the life saving discount factor has a median of 0.960. Inequality of medians cannot be rejected ($p = 0.158$). Correlation between the two discount factor is however low ($r = 0.18$), but other studies present no coefficients to compare this correlation with.

5.1.4 Qualitative data

Besides the substitution rates that respondents were asked to fill in, they also had the chance to express their comments or concerns in words on the next page. 38 people made use of this opportunity and some of their comments are worth sharing. Although the comments do not provide much more information, it is very insightful to have people's actual reasoning confirmed and see that differences between their reasoning also lead to differences in their discount factors.

A number of people wrote that they believe lives saved now are worth just as much as lives saved in the future. However, the final question basically asks respondents which time horizon corresponds to the point where a life saved now is worth twice as much as a life saved later. This group of respondents thus rightly pointed out that they were unable to answer that question: the time horizon would be positively infinite for them. The question might have led to some sort of framing after all, implying that life saving loses its value when delayed.

Some others admit that they have drawn the line for a comparable value of lives saved now versus lives saved later at about 50 years, because predictions about longer time horizons are too uncertain. Others make their preferences even more concrete by saying that "the number of future lives saved should be at least (1.5 times) as much as lives saved in the present" or "each additional year that a project is delayed requires a growth of its value of 7 percent: if a project can cure 100 people this year, another project should cure 107 people next year to be equally good." The rationale of these respondents was indeed perfectly captured in their substitution rates and discount factors.

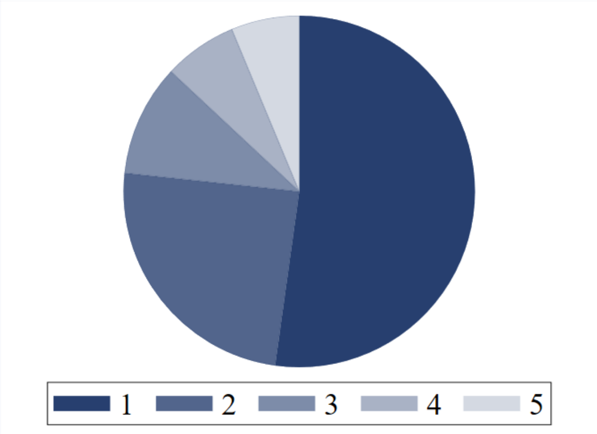
5.2 Private and public distribution

5.2.1 Descriptive statistics

For the variables "number of lottery tickets distributed to generation g" (g = 1 to 5), the null of a normal distribution is also rejected by the Skewness-Kurtosis test ($p < 0.05$) for all generations. Because median values do not add up to 100 lottery tickets, the pie charts of figure 3 still use mean values to illustrate the distribution of the total number of tickets. The pie chart of private distribution shows that a larger share of the 100 tickets is given to generation 1 and to generation 1 and 2 combined than in the case of public distribution. It is striking that the number of tickets distributed to generation 4 seems to equal the number of tickets distributed to generation 5 for both private and public distribution, although this number is higher for public distribution. Median distribution values are captured in figure 4. The line graph clearly shows a wider range of median lottery tickets distributed to descendants than to generations in general, with the final two median values of the former even equaling zero. A main difference between the two sorts of distribution is the discounting between generation 2 and 3. The discount factor appears to be much lower for private than for public distribution: $\delta_2 < \pi_2$.

Figures 3a and 3b: Pie charts of mean lottery ticket distribution among the 5 generations

a. Private distribution



b. Public distribution

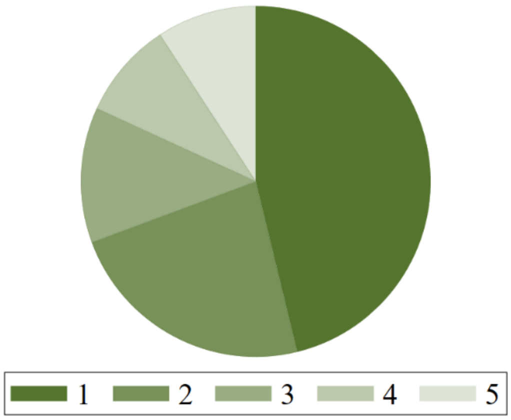
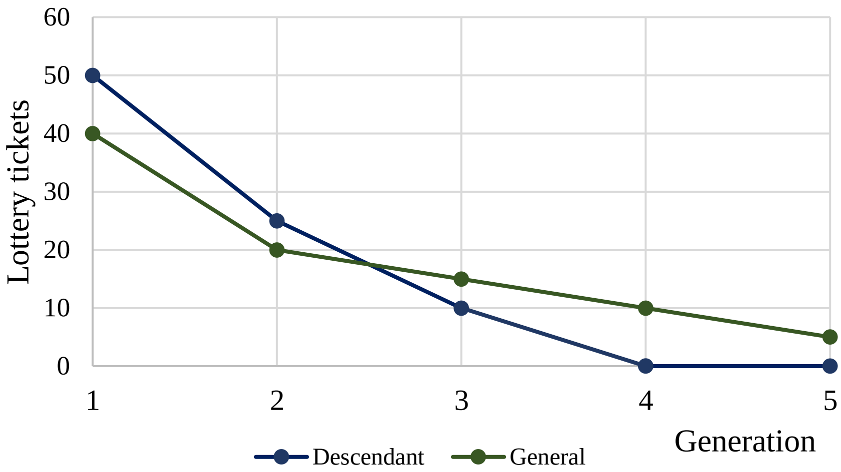


Figure 4: Median values of lottery tickets distributed



Summary statistics of the discount factors are presented below in tables 4 and 5. A non-normal distribution can, on the basis of the Skewness-Kurtosis test, also be assumed for all discount factors ($p < 0.05$). No factors could be calculated for a combination of generations g+1 and g if the number of lottery tickets distributed to generation g is zero. The lower variable count of the δ_i's than π_i's indicates that this turns out to be the case more often for private than public discounting.

Table 4: Summary statistics of the private discount factors

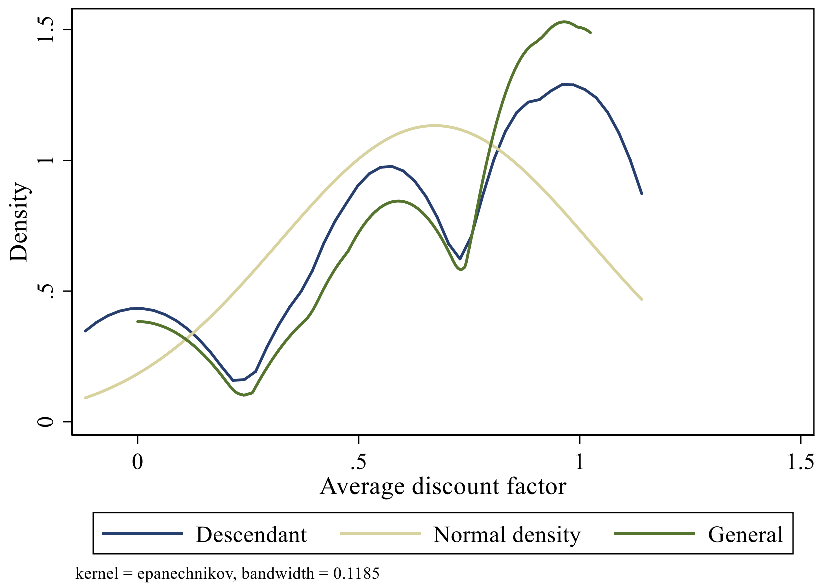
	δ_1	δ_2	δ_3	δ_4	δ
median	0.9839	0.9727	0.9862	1	0.6576
mean	0.8382	0.7214	0.7705	0.9217	0.6717
sd	0.3513	0.4354	0.4131	0.2640	0.3521
N	135	117	86	67	137

Table 5: Summary statistics of the public discount factors

	π_1	π_2	π_3	π_4	π
median	0.9886	0.9839	1	1	0.9762
mean	0.8626	0.7964	0.8253	0.8859	0.7226
sd	0.3291	0.3918	0.3714	0.3183	0.3438
N	135	119	96	80	136

Figure 5 shows the sample's distribution of average discount factors, which also visually confirms that they do not approach a normal distribution. Peaks for both private and public distribution lie around the factors 0, 0.5 and 1. The first two peaks merely reflect the point at which a respondent distributes zero tickets to a generation, because the average discount factor is calculated as the mean of the factors for which there are observations.[10] Only for those respondents who did not distribute zero points to any generation, the average discount factor approaches 1, which is close to the median for public discounting of generations in general. The high median π reflects that a majority of respondents distributed tickets to all generations.

Figure 5: Distribution of average "time-invariant" discount factors



5.2.2 Median comparisons

The pie charts of figure 3 and line graph of figure 4 seem to indicate that a higher number of lottery tickets was given away to the first two generations of descendants than the first two

[10] Thus, if a person only distributes lottery tickets to the first two generations, his or her average discount factor will most likely lie around 0.5, because the second factor equals 0 and it is assumed the first one approaches 1.

generations in general. This would correspond to the first hypothesis about lottery ticket distribution and is confirmed by the formal test for equality of medians (p = 0.000). The absolute and relative difference between tickets distributed to only generation 1 for public and private discounting was even larger than that difference for generations 1 and 2 combined.

Figure 4 also seems to be in accordance with the hypothesis that the median overall private discount factor $\delta = 0.66$ is lower than the median public discount factor $\pi = 0.98$. The test result from Table 6 shows that δ is indeed significantly lower than π. In fact, this holds for all δ_i and π_i except for i = 4. Although this includes the confirmation of the hypothesis $\delta_1 < \pi_1$, it also shows that higher private than public discounting is present but not limited to the earlier generations where close descendant ties still distinguish the two sorts of distribution. The pattern does not hold anymore for δ_4 and π_4, both with a median value of 1. A factor 1 indicates a halt to discounting after 4 generations (≈ 100 years). Such a halt could have been confirmed if the life saving substitution rates corresponding to the 100- and 200-year time horizon would be the same. However, the Null of equal median number of lives saved for the two time horizons was rejected (p = 0.000). A stronger sign for a halt to discounting after 4 generations of 25 years could have been pointed out by the continuation of this pattern for at least one more generation. The self-designed question should have included a sixth generation to distribute lottery tickets to in order to research the potential halt in this manner.

Finally, this thesis posed the idea that the difference between one's great-grandchild and great-great-grandchild might already feel much smaller than the difference between one's grandchild and great-grandchild. This hypothesis is also supported by the data. A high difference in ticket distribution between one's grandchild and great-grandchild would have been indicated by a low value of δ_2. It turns out that this generational jump is indeed most impactful: the standard of life of the great-grandchild generation faces higher discounting (of the standard of life of the preceding generation) than did the grandchild generation: δ_2 is significantly smaller than δ_1. The discount factors δ_3 and δ_4 that follow are significantly higher than δ_2 and are increasing, but their median values do not significantly differ from each other. These results indicate that the level of (constant exponential) discounting is therefore the highest between one's grandchild and great-grandchild. However, a similar pattern holds for public discounting as indicated by the factors π_i. This casts doubt on the descendant-specific explanation of this pattern that was presented in the Literature Review section. The comparison of median factors within the private and public discounting frameworks is done in the second line of Table 6. The only difference between the two sorts of discounting is the much lower p-value for $\pi_3 = \pi_4$ (but still insignificant) than for $\delta_3 = \delta_4$. Table 4 shows that both medians π_3 and

π_4 are 1, which indicates a halt to discounting already at an earlier stage than in the case of private distribution.

Table 6: Median comparison[a] of the discount factors

H_0[b]	$\delta_1 = \pi_1$	$\delta_2 = \pi_2$	$\delta_3 = \pi_3$	$\delta_4 = \pi_4$	$\delta = \pi$	
p[d]	0.0050	0.0004	0.0025	0.9447	0.0000	
H_0[c]	$\delta_1 = \delta_2$	$\delta_2 = \delta_3$	$\delta_3 = \delta_4$	$\pi_1 = \pi_2$	$\pi_2 = \pi_3$	$\pi_3 = \pi_4$
p[d]	0.0000	0.0134	0.9085	0.0000	0.0021	0.1180

a: Using the Wilcoxon Signed-Rank test
b: All tests in this row find that the first term is smaller than the second
c: All tests in this row find that the second term is smaller than the first, except for $\delta_3 = \delta_4$
d: Two-tailed

5.2.3 Regressions

As can be seen in figure 4, the median number of lots distributed to generation 1 is 50 for descendants and 40 for generations in general. Table 7 below shows the factors affecting these two numbers of lottery tickets. When interpreting this table, it should be noted that all lots given to generation 1 are at the cost of tickets given to one of the later generations. A high value at this point therefore indicates the need of higher discounting (lower discount factors) later on.

The first surprising result of the regression is the effect of gender on the number of lottery tickets distributed to generation 1. Table 3 with life saving discount factors shows how males have a higher discount factor and thus discount less than females. A higher initial lottery ticket distribution by males, leading to higher discounting later on, is the exact opposite result.

The second surprising result is the significance of the positive beta coefficient corresponding to income. With each additional €1000 monthly household income (until €5000), the number of lottery tickets distributed to generation 1 increases with about 6 (private distribution) and 5 (public distribution). In past research, higher income was mainly found to increase monetary discount factors but have no effect on non-monetary discounting (Cropper et al., 1994). Only a weak correlation between income and the monetary discount factor can be observed here ($r = -0.15$) along with an even weaker correlation between the monetary discount rate and the number of tickets for generation 1 (both private and public).

The coefficient for the dummy Children is, unlike hypothesized, negative and insignificant for the private distribution model. Unexpectedly, it is positive and has a very high value for public distribution. In contrast, the effect of grandparenthood is similar for private and public distribution, although again insignificant. The coefficient for Great-grandparents in the public distribution model indicates that each additional great-grandparent known increases the number of lots distributed to the first generation with 9.6 on average. This is contrary to the idea that one's family tree reflects one's distribution decisions. According to that idea, having known great-grandparents would make a person care about future generations just as distant, rather than being short-sighted and distributing the lottery tickets to generation 1 instead. The signs for Volunteering hours, New clothes and Flights are according to expectations.

Table 7: Regression of number of lottery tickets distributed to generation 1

	Private distribution	*p*	Public distribution	*p*
Male	9.0604$^{\sim}$	(0.089)	11.5836*	(0.032)
Age	0.2309	(0.874)	-1.1478	(0.356)
Age squared	-0.0017	(0.896)	0.0118	(0.321)
Income	5.8471*	(0.015)	4.8605$^{\sim}$	(0.050)
Siblings	1.4229	(0.149)	0.8207	(0.477)
Children[a]	-3.6299	(0.785)	14.5713	(0.223)
Grandchildren[a]	-11.9764	(0.175)	-11.7316	(0.238)
Grandparents known	-1.9406	(0.374)	-3.2198	(0.126)
Great-grandparents known	2.2688	(0.541)	9.6071*	(0.012)
Volunteering hours[b]	-0.0846	(0.404)	-0.1480$^{\sim}$	(0.059)
New clothes[b]	1.4579*	(0.047)	1.3095	(0.103)
Flights[c]	0.6671*	(0.037)	0.8338*	(0.016)
Constant	25.0987	(0.329)	44.9338*	(0.029)
N	122		122	
R^2	0.285		0.335	

Two-tailed p-values in parentheses
$^{\sim}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

a: the variables Children and Grandchildren are dummies for having at least one family member in this category
b: the variables Volunteering hours and New clothes are measured per month
c: the variable Flights measures the number of plane flights over the past two years

Table 8 on page 30 presents another total of 5 regressions: 3 for private discount factors and 2 for public discount factors as dependent variables. All regression models for the other discount factors turned out to be insignificant as a whole. Right-hand sides of the regression equations are unchanged. The following paragraphs will point out the most remarkable result and review the hypotheses formulated in the Literature Review section. A first remark is that only a minority of independent variables turns out to significantly explain the dependent variables.

For both the private and public discounting models, the gender effect as seen for the ticket distribution to generation 1 is found a few more times. The gender effect is especially apparent for δ_2. For that case, the discount factor of males is on average 0.22 lower than for females. The number of siblings shows a significant negative effect on δ_2, for which no immediate explanation can be given as well.

Several hypotheses were formulated about the effect on the discount factors of having grandchildren. Significance of $\beta_{Grandchildren} > 0$ for δ_1 is the first to be tested. Table 8 shows that this hypothesis is confirmed by the data and that the beta-coefficient even has a very high value of around 0.35. This means that, for the years between their child and grandchild, a person who has grandchildren discounts much less. No such effect is found for the factor δ_2 that indicates the same relationship, but then for the years between one's grandchild and great-grandchild. In contrast, the beta-coefficient has a negative sign and even larger absolute value (but is insignificant). This does not necessarily indicate that grandparents care less about their great-grandchildren than do non-grandparents, but rather that they have given away a higher number of lottery tickets to their grandchildren in comparison and therefore have to decrease that number with a higher percentage. In accordance with the hypothesis, this grandchildren effect is not significant in the case of public discounting.

A second major bundle of hypotheses formulated in the Literature Review section was about the impact of the family tree. The number of grandparents that one has known does not significantly explain either the private or the public discount factors, although this variable was expected to positively correlate with the discount factor δ_1. A similar conclusion can be drawn about great-grandparents and the expected positive relationship with δ_2. The expected negative effect on π is significant for Flights, but not for New clothes. Both variables have a negative impact on the discount factor for all cases, which is different from results of the regression corresponding to life saving. Volunteering, which is instead associated with positive rather than negative externalities, and therefore perhaps low discounting, does indeed have a positive sign and is significant for some of the models.

Finally, income shows a negative effect on the discount factor in all cases, indicating higher discounting. Significance however only holds for δ_2. A higher income therefore points to “short-sightedness”, corresponding to the positive relationship between income and number of lottery tickets distributed to generation 1.

Table 8: Regression models for private and public discount factors

Dependent variable	δ_1	δ_2	δ	π_1	π
Male	-0.0840	-0.2153*	-0.1132	-0.0920	-0.1188$^{\sim}$
	(0.185)	(0.027)	(0.101)	(0.150)	(0.084)
Age	-0.0102	0.0050	-0.0075	0.0135	0.0039
	(0.550)	(0.829)	(0.660)	(0.438)	(0.812)
Age Squared	0.0000	0.0000	0.0000	-0.0002	-0.0001
	(0.950)	(0.868)	(0.878)	(0.264)	(0.672)
Income	-0.0193	-0.1257**	-0.0499	-0.0307	-0.0483
	(0.558)	(0.003)	(0.103)	(0.341)	(0.130)
Siblings	-0.0058	-0.0561*	-0.0218	-0.0050	-0.0137
	(0.725)	(0.041)	(0.112)	(0.752)	(0.356)
Children[a]	0.0763	0.0535	0.0645	-0.0907	-0.0802
	(0.668)	(0.763)	(0.681)	(0.538)	(0.602)
Grandchildren[a]	0.3511*	-0.2196	0.1535	0.1937	0.0605
	(0.027)	(0.280)	(0.236)	(0.239)	(0.641)
Grandparents known	-0.0042	0.0409	0.0070	0.0083	0.0179
	(0.877)	(0.391)	(0.786)	(0.772)	(0.486)
Great-grandparents known	0.0434	-0.0619	-0.0091	-0.0507	-0.0676
	(0.243)	(0.272)	(0.829)	(0.307)	(0.156)
Volunteering hours[b]	0.0014$^{\sim}$	-0.0011	0.0011	0.0021*	0.0018$^{\sim}$
	(0.052)	(0.638)	(0.384)	(0.028)	(0.057)
New clothes[b]	-0.0252	-0.0031	-0.0215	-0.0230	-0.0151
	(0.105)	(0.799)	(0.119)	(0.114)	(0.274)
Flights[c]	-0.0099*	-0.0016	-0.0074	-0.0124**	-0.0107*
	(0.044)	(0.879)	(0.110)	(0.010)	(0.017)
Constant	1.3172**	0.9912**	1.1715**	0.9290**	0.9885**
	(0.000)	(0.008)	(0.000)	(0.000)	(0.000)
N	120	102	122	120	121
R^2	0.286	0.292	0.288	0.251	0.297

Two-tailed *p*-values in parentheses
$^{\sim}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

a: the variables Children and Grandchildren are dummies for having at least one family member in this category
b: the variables Volunteering hours and New clothes are measured per month
c: the variable Flights measures the number of plane flights over the past two years

5.2.4 Robustness

Table 9 and 10 provide additional discount factors based on a different number of years between two generations. Since respondents were informed the number of years was 25 and might have adjusted their distributions accordingly, the results based on a different generational gap should not be generalized. Still, they give an indication of how robust the initially calculated factors are. For all factors except δ_2, the differences for t = 20 and t = 30 are less than 0.01. Regressing the new factors leads to almost exactly the same coefficients and significance levels as in Table 8. It thus appears that the discount factor is rather robust. However, a difference of 0.01 should still be regarded important if the factors would be used for (policy) implementations. To illustrate, the half-life corresponding to $\pi = 0.97$ is 23 years whereas it is 34 years for $\pi = 0.98$.

Table 9: Private discount factor medians by year between two generations

	δ_1	δ_2	δ_3	δ_4	δ
t = 20	0.9799	0.9659	0.9828	1	0.6553
t = 25	0.9839	0.9727	0.9862	1	0.6576
t = 30	0.9866	0.9772	0.9885	1	0.6591

Table 10: Public discount factor medians by year between two generations

	π_1	π_2	π_3	π_4	π
t = 20	0.9857	0.9799	1	1	0.9703
t = 25	0.9886	0.9839	1	1	0.9762
t = 30	0.9905	0.9866	1	1	0.9801

5.2.5 Correlations

Some final statistics to analyze are the correlations between the various forms of discounting and the respondents answers on questions from the “sketched situations” section. Those questions measured risk-aversity, the monetary discount factor for a 10-year time horizon, opinion on increasing government debt to finance current consumption and opinion on the height of the Dutch inheritance taxes. The latter two both have an aspect of intergenerational distribution to them, but showed low anticorrelations (minimum $r = -0.22$) with the average public discount factor. Corresponding to intuition is that a higher appreciation of government deficits leads to a lower discount factor, both of which express a high valuation of the present. Besides, those respondents who consider the inheritance tax to be too high relative to other respondents are also the ones with lower discount factors. Correlation between the several discounting statistics and risk-aversity and the monetary discount factor was much lower.

5.3 Summary

This section of the thesis has presented a large number of results. Before proceeding to the conclusion, the main results will be summarized, starting with those of the life saving discount factor.

Contrary to major studies executed decades ago, data from this thesis shows relatively high life saving discount factors with minimum median 0.96 and maximum median 0.99 depending on the time horizon. This indicates a much higher valuation for saving lives in the (far) future. A similarity between previous studies and this thesis is the increase in the median discount factor for longer time horizons, although the range between minimum and maximum factors found is much lower. Age was the significant explanatory variable of most importance and showed a U-shape relationship with the discount factor, consistent with the hypothesis that people who are in the middle of organizing their lives in terms of family and career have lower discount factors than young people or older people who have passed that phase. This contradicts the age-effects on the life saving discount factor found by previous studies.

For the self-designed question, the expected trend of higher private than public discounting was confirmed by lower median discount factors up until generation 4. Little discounting from generation 4 to 5 could be observed for both the private and public distribution model. Further research should point out whether this first sign of a halt to discounting after a number of generations might serve as support for non-constant exponential intergenerational discounting. Discount factors seem to reflects decreasing social connections with generations over time until the point where such generations are strangers and no further discounting takes place. Assuming that generations in general are perceived as more distant than descendants, the median 1 for π_3 proves that no further decrease in social connectedness to future generations takes place for the public model after 3 generations. For the private model this is only the case after 4 generations. For both models it holds that highest discounting takes place from generation 2 to generation 3, which is apparently a point where a feeling of social connectedness fades.

The regressions of private and public discount factors showed some surprising effects, especially for δ_2. Many other results were however conform hypotheses. For example, the "grandparenthood effect" is specific to private intergenerational distribution and implies that the effect of having a grandchild increases perceived connection to one's grandchild, which leads to lower discounting of the standard of life for the period between one's child and grandchild. Finally, a negative impact on the climate through consumption of new clothing and plane flights points out higher discounting whereas volunteering is related to lower discounting.

6 Conclusion

6.1 Findings

This thesis has used an extensive questionnaire with 138 responses to convert stated preferences into life saving discount factors and discount factors based on intergenerational distribution of standard of life and regress those factors on several variables capturing differences between respondents.

6.1.1 Private and public distribution

In general, the outcomes of this thesis are consistent with the idea that the social connectedness to a generation is indicative of the valuation of that generation's welfare. Such an effect could be comparable to the effect of psychological connectedness with one's future self that is found to influence personal discount factors (Bartels & Rips, 2010). In this research, the effect of social connectedness on discounting is supported by the idea that a direct genetical connection to descendants provides a stronger social connection than the indirect version of this connection to generations in general: respondents place a higher relative value on the first two generations of their descendants than the upcoming two future generations in general. In contrast, the difference between perceived social connection to the final two or three generations is likely to be only minor. In combination with the fixed total number of lottery tickets that respondents were able to distribute, this phenomenon explains the more uneven private than public distribution of lottery tickets. Both distributions show a clear decreasing trend and discount factors still lie within a narrow range. As shown with half-life numbers, differences in the exact height of a discount factor can however lead to very different outcomes.

Furthermore, being a grandparent enhances the ability to picture generation 2 of one's grandchildren even more, which leads to lower discounting of their welfare, probably because there is a higher perception of social connectedness. Among the respondents were no great-grandparents, but it would be interesting to test a similar relationship for that family tie in follow-up research. The effect of known number of grandparents and great-grandparents however showed that relational ties with ancestors had no significant impact on distribution and discounting choices. The experience with family members of distant generations apparently only effectively increases the social connection to future generations of similar distance if those family members are or were descendants rather than ancestors.

The discounting of welfare (based on median discount factors) halts after 4 generations in the case of private discounting and after 3 generations in the case of public discounting.

Intuitively this makes sense: the social connection to one's great-grandchild, generation 3, might still feel different than the connection to one's grandchild, whereas such differences feel smaller if the generations are simply labeled "generation 2" and "generation 3". Further confirmation of this finding might point out that if some generation is considered a full stranger or cannot be pictured any better than the next generation, the amount of welfare allocated to that generation will not be further lowered anymore for a next generation that is even more distant in terms of time.

The impact of changes in demographic factors on discount factors is not completely clear, because various effects appear to contradict each other. For instance, on the one hand an increase in the number of years between any two generations leads to lower discounting on the short term, because the high valuation of grandparents of the welfare of their grandchildren is extended over more years. On the other hand, the halt to discounting might also be postponed, leading to a lower valuation of the far future. There are many other extrapolations of the results of this thesis that are similarly uncertain.

6.1.2 Life saving

Life saving discount factors showed a similar increasing trend for lengthier time horizons as observed in previous studies on life saving preferences (Cropper et al., 1994; Johannesson & Johannsson, 1997). The height of the factor was however much higher, approaching the factor of Frederick (2003). The idea that the perceived social connection to the generation receiving possible benefits will lead to lower discounting for that generation is hard to test with the sort of question asked here. A halt to discounting after 100 years, similar as the halt to discounting after 4 generations from the lottery ticket distribution question, could not be observed.

Testing intergenerational distribution preferences by means of life saving discount factors remains somehow dubious. Delaying life saving is not about foregoing consumption now in order to increase (non-material) consumption later. If researchers are lucky, this discount factor shows people's ethical rather than practical concerns regarding intergenerational time preference of saving lives. This ethical preference might however not be the factor on which they want to base public policy regarding intergenerational distribution of welfare in general. One respondent for example stated that her life saving discount factor did not imply a lower level of welfare for descendants, as "they can profit from previous generations." If governments are actually after a social intergenerational discount factor that applies to welfare in general, a version of the public lottery ticket distribution question is perhaps more suitable than the discounting of life saving.

6.2 Limitations

Awareness exists of the fact that the methodology used for this thesis has several limitations. The question on intergenerational distribution requires people to think about their valuation of the world after their death. This must be a very difficult question to even understand in the first place, let alone to answer. One of the respondents nicely captured this by commenting that some sort of “fog” enters his imagination capacity of thinking about that future soon after his expected year of death. In reality, people however continuously impact that future by their consumption decisions.

Tradeoff between own and future welfare was not perfectly mirrored in the question on lottery ticket distribution, which did not require respondents to include themselves in the distribution decisions. In the extreme case where the valuation of a future beyond one’s death is zero, intergenerational discounting preferences beyond one’s death are not even relevant. This limitation is however also applicable to life saving questions, where lives saved are most likely those of distant strangers and do not have anything to with foregoing own consumption of either healthcare or material goods. In the case of lottery ticket distribution, these very short-sighted people might distribute all of their 100 tickets to generation 1. In that case their high discounting preferences are still revealed.

A more impactful limitation has been the use of a convenience sample rather than a randomized sample. This might have especially limited the outcomes of the regression models that would have moreover profited from both a higher sample size and a more heterogenous sample. The perceived difficulty of the questionnaire increased the difficulty of finding respondents. From the 138 respondents there were still many who, based on their illogical answers, misinterpreted the life saving and monetary discounting questions. All in all, further simplification of the questionnaire would be necessary before it can be used another time and reach a more representative sample of society.

Similarly, follow-up research would profit from a new set of analysis procedures that might make interpretation of results somewhat more straightforward. Although it would disregard variation between discount factors corresponding to different combinations of generations, a single time-invariant discount factor would be a great addition to other statistics. The fit of other discount functions than a constant exponential function, such as a quadratic or linear function should in that case also be tested. Especially with the apparent halt to discounting after 3 or 4 generations, it seems suitable to use a different sort of function than the default of constant exponential discounting used in the neoclassical theory of project evaluation (Arrow & Kurz, 1970).

6.3 Implications

6.3.1 Further research

Many suggestions for further research have already been mentioned throughout this conclusion. The most important next step is optimization of the intergenerational distribution question. The question should be further simplified to stimulate response rates and additional generations could be added to investigate the halt to discounting. Finally, it needs to be presented to a larger and randomized sample, for instance the LISS panel (Longitudinal Internet Studies for the Social sciences). This is a representative sample of true probability of Dutch households drawn from the population register (Scherpenzeel and Das, 2010).

Psychological insights with regards to perception of time in general and their influence on discount factors are also worth further investigation. The U-shape effect of age on the life saving discount factor seems to link intergenerational discounting with different perceptions of time and the distant future for different ages (Draaisma, 2001). Similar reasoning was expressed by activist group Grandparents for Climate. Further research on this effect and the age at which discounting "peaks" would be interesting, even though in this thesis the effect could only be observed for life saving and not for private and public discounting.

The effect of grandparenthood was very significant for discount factors around the generation of grandchildren. This effect was measured in this thesis using a dummy for having (had) grandchildren. The impact of the number of grandchildren that someone has, or the qualitative social connection with one's grandchildren could possibly lead to other conclusions regarding the effect of being a grandparent on discount factors.

6.3.2 Policies

Obviously, the numbers that this thesis has found merely display preferences regarding intergenerational distribution and not the acting upon such preferences. The relatively small effects of proxies for climate impact on discount factors that this thesis has found, as well as previous research that has shown similar or higher levels of carbon emissions for those people with a higher level of environmental concern (Moser & Kleinhückelkotten, 2017) indicate a gap between preferences and outcomes. It shows the need of governments to act upon implicit valuation of the future as measured by societal intergenerational discount factors. An example is implementing model outcomes based on the factors, for instance a carbon tax (Pindyck, 2013; Poelhekke, 2017).

The irreversibility of certain consequences of current actions makes the intergenerational discount factor an immensely important topic. Deciding on the right discount factor “requires more than just number crunching. It requires a fundamental decision about how much we care about future generations” (Partnoy, 2012, p. 240). Slowly but certainly more researchers, journalists and politicians seem to become aware of this importance. Because of the involved irreversibility it is crucial that citizens will take over this awareness and continue, or start, to think about discounting beyond death.

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Appendices

I Summary statistics of the constant exponential discount rate (Cropper et al., 1994)

Horizon	t = 5	t = 10	t = 25	t = 50	t = 100
median	0.168	0.112	0.074	0.048	0.038
mean	0.274	0.179	0.086	0.068	0.034
sd	0.314	0.183	0.083	0.092	0.026

II Mapping of kinship (Johnson, 2000, Figure 1-B)

A. Canon Law Model

Distance from EGO: Degree of Relationship

Generation	0	1	2	3
2			Grandparents	Great aunts and great uncles
1		Parents	Aunts and uncles	
0	EGO	Siblings	First cousins	Second cousins
−1		Children	Nieces and nephews	
−2			Grandchildren	Grandnieces and grandnephews

B. Genetic Model

Distance from EGO: Fraction of Chromosomes Shared

Generation	1	1/2	1/4	1/8
2			Grandparents	Great aunts and great uncles
1		Parents	Aunts and uncles	
0	EGO	Siblings		First cousins
−1		Children	Nieces and nephews	
−2			Grandchildren	Grandnieces and grandnephews

C. Civil Code Model

Distance from EGO: Degree of Relationship

Generation	0	1	2	3	4
2			Grandparents		Great aunts and great uncles
1		Parents		Aunts and uncles	
0	EGO		Siblings		First cousins
−1		Children		Nieces and nephews	
−2			Grandchildren		Grandnieces and grandnephews

III Data operations

All values corresponding to either "no opinion" or "prefer not to say" were changed to blanks. Yes/no answers instead of the expected numerical answers on questions asking the number of various family members were also changed to either blanks (for "yes") or zero (for "no"). Severe outlier values that seemed to point out misunderstanding of questions corresponding to independent variables such as "number of new clothes per month" were deleted as well. Unfortunately all of this resulted in the fact that less responses could be used for the regression tests (but fortunately still for the median comparisons). Something similar was done for some answers on the life saving question after indicating misunderstanding based on values (prefer to save 0 lives in 50 years rather than 100 now) or on comments left after the life saving question section.

The variable Education with values 1-12 was in first instance transformed to the three dummy variables Low Education, Middle Education and High Education, in accordance with the classification that belongs to the standard question. However, the specific sample with many near-graduates did not accurately reflect education level as it was meant to be measured. All of these bachelor students in their final year could only fill in VWO as their highest level of education, which classifies as Middle Education. However, a near-graduation status of university seems incomparable with other degrees of that sort such as mbo. Moreover, only 2 or 3 respondents fell within the category Low Education. All in all, it seemed better to leave Education out.

In a similar manner, the independent variable Smoker was dropped due to a very small percentage of smokers (of which some also only light smokers). It was originally included to check whether the same significant negative relationship between cigarette consumption and the life saving discount factor was found as by Cairns (1994).

Lastly, Parents was excluded from the regression completely. Many people filled in a value that was higher than two, which probably referred to their stepparents as well. However, the idea of this question was not to compare the impact of having stepparents on discount factors. It was merely meant as a control and for completeness, but no effect was expected. Due to the expected misinterpretation, it was decided to simply exclude the variable.

IV Questionnaire

Welkom bij deze vragenlijst voor mijn bachelorscriptieonderzoek aan de Rijksuniversiteit Groningen. Dit onderzoek zal gaan over afwegingen tussen het heden en verschillende toekomstige periodes.

Het invullen van de vragenlijst zal ongeveer 20 minuten duren. Uw deelname aan dit onderzoek is op vrijwillige basis. Uit alle compleet ingevulde vragenlijsten zullen drie respondenten willekeurig worden geselecteerd die een VVV cadeaukaart ter waarde van €20,- ontvangen.

Als deelnemer kunt u ervan verzekerd zijn dat uw antwoorden volledig vertrouwelijk en anoniem zullen blijven. U heeft het recht op elk moment te stoppen met uw deelname aan dit onderzoek, om wat voor reden dan ook.

Deze vragenlijst kan ingevuld worden op zowel computer of laptop als mobiele apparaten, hoewel u wordt aangeraden een computer of laptop te gebruiken. Sommige onderdelen kunnen wellicht minder goed vertoond worden op mobiele apparaten.

Mocht u contact op willen nemen met de onderzoeker, mail dan naar L.Voorintholt@student.rug.nl of bel 0611603709.
Door hieronder akkoord te gaan met verdere deelname, erkent u dat u:

- vrijwillige toestemming geeft om aan dit onderzoek deel te nemen
- vrijwillige toestemming geeft voor het gebruiken van uw gegevens voor de doeleinden die in de onderzoeksinformatie vermeld staan
- minimaal 18 jaar bent
- ervan op de hoogte bent dat u op elk moment mag stoppen met uw deelname aan dit onderzoek

(Q0) [Akkoord/Niet akkoord]

De vragenlijst zal bestaan uit vier delen. De vragenlijst heeft de optie om vooruit en terug te bladeren. Uw antwoorden zullen hierbij bewaard blijven. Wanneer u besluit om de vragenlijst niet in één keer af te maken, kunt u op een volgend moment weer verder gaan met de vraag waar u de laatste keer bent gestopt.

Let alstublieft op dat elke keer wanneer u om een aantal gevraagd wordt, dit aantal in cijfers en niet in letters dient ingevuld te worden. Gelieve geen gebruik te maken van punten, komma's of spaties voor het scheiden van <u>grote getallen</u> (voorbeeld: vul in 10000 in plaats van 10.000 of tienduizend).

BLOK 1: De vragenlijst begint met een enkele vragen over uzelf.

(Q1) Wat is uw geslacht? [Man/Vrouw/Anders]
(Q2) Wat is uw geboortejaar?
(Q3) Wat is uw hoogst genoten opleiding (afgerond)?

- Geen onderwijs, basisonderwijs of lagere school
- Lbo, vso (lbo, leao, lhno, lts, vbo, huishoudschool, ambachtsschool)
- Vmbo, lwoo (theoretische leerweg)
- Mavo (ulo, mulo)
- Mbo 1
- Havo (mms)
- Vwo, gymnasium, atheneum (hbs, lyceum)

- Mbo 2-4 (mts, meao, middenstandsdiploma, pdb, mba)
- Hbo (hts, heao, kweekschool, associate degree)
- Universitaire opleiding (bachelor, master, postdoc en promotieonderzoek)
- Anders, namelijk: …

(Q4) Hoe hoog is het totaal **netto inkomen** van uw huishouden (van u en uw eventuele partner) **per maand**? Als u het niet zeker weet, geef dan uw beste schatting.

- Minder dan €1.000 netto per maand
- €1.000-1.999 netto per maand
- €2.000-2.999 netto per maand
- €3.000-3.999 netto per maand
- €4.000-4.999 netto per maand
- €5.000 netto of meer per maand
- Zeg ik liever niet

(Q5) Wat is uw nationaliteit? [Nederlands; Anders, namelijk: …]
(Q6) Welk aantal van de volgende familieleden heeft u (gehad)? [Broers; Zussen; Kinderen; Kleinkinderen; Achterkleinkinderen]
(Q7) Aan welk aantal van de volgende familieleden heeft u eigen herinneringen (niet op basis van foto's)? [Overgrootouders; Grootouders; Ouders]

BLOK 2: De volgende twee vragen hebben te maken met uw levensstandaard. Door middel van onderstaande uitleg kunt u een beter idee krijgen wat dit begrip inhoudt.

De **levensstandaard** geeft een indicatie van het menselijk welvaartsniveau op economisch, sociaal en cultureel vlak. Om de hoogte van de levensstandaard te meten worden diverse indicatoren gebruikt. Denk bijvoorbeeld aan materiële middelen, de inrichting van de samenleving (huisvesting, educatie en gezondheidszorg etc.) en omgeving en milieu.

(Q8) Deze vraag gaat na hoe belangrijk u het vindt dat uw eventuele **eigen nakomelingen** dezelfde levensstandaard zullen hebben als uzelf heeft en verwacht te hebben in de rest van uw leven.

Stelt u zich voor dat ieder van uw nakomelingen meedoet aan zijn of haar eigen 'levensstandaard loterij'. Er spelen 100 loten mee met elke loterij en de verschillende loterijen zijn onafhankelijk van elkaar. In elke loterij wordt één winnend lot getrokken. De prijs voor het winnende lot in elke loterij is **dezelfde of een hogere levensstandaard** dan die van uzelf. Voor iedere nakomeling staat elk extra lot dus gelijk aan een extra procent kans op deze prijs.

U kunt beslissen met hoeveel loten iedere nakomeling meespeelt met zijn of haar eigen loterij. U heeft in totaal 100 loten om te verdelen over uw (eventuele) nakomelingen. Ga er hierbij vanuit dat iedere nakomeling op ongeveer 25-jarige leeftijd één kind krijgt en dat ieders levensverwachting bij geboorte 85 jaar is.

Voorbeeld: *100 loten toewijzen aan een nakomeling betekent dat het winnende lot altijd in het bezit van deze nakomeling zal zijn en deze daarom sowieso dezelfde of een hogere levensstandaard zal hebben dan uzelf. 0 loten toewijzen aan een nakomeling betekent dat het winnend lot in geen geval in het bezit van deze nakomeling zal zijn en deze daarom sowieso een lagere levensstandaard zal hebben dan uzelf. Elk aantal loten tussen deze twee uitersten in biedt geen volkomen zekerheid over de levensstandaard van de nakomeling. Met 30 loten heeft een nakomeling bijvoorbeeld 30% kans op dezelfde of een hogere levensstandaard dan de uwe.*

Geef hieronder uw gewenste verdeling aan.

Kind (generatie 1) : _______
Kleinkind (generatie 2) : _______
Achterkleinkind (generatie 3) : _______
Achterachterkleinkind (generatie 4) : _______
Achterachterachterkleinkind (generatie 5) : _______

(Q9) Deze vraag gaat na hoe belangrijk u het vindt dat **komende generaties in het algemeen** dezelfde levensstandaard zullen hebben als uw eigen generatie heeft of verwacht te hebben.

Stelt u zich voor dat iedere generatie meedoet aan een eigen 'levensstandaard loterij'. Er spelen 100 loten mee met elke loterij en de verschillende loterijen zijn onafhankelijk van elkaar. In elke loterij wordt één winnend lot getrokken. De prijs voor het winnende lot in elke loterij is **dezelfde of een hogere levensstandaard** dan die van uw eigen generatie. Voor iedere generatie staat ieder extra lot staat dus gelijk aan een extra procent kans op deze prijs.

U kunt beslissen met hoeveel loten iedere generatie meespeelt met haar eigen loterij. U heeft in totaal 100 loten om te verdelen over de vijf generaties na u. Ga er hierbij vanuit dat ieder lid van een generatie op ongeveer 25-jarige leeftijd één kind krijgt en dat ieders levensverwachting bij geboorte 85 jaar is.

Voorbeeld: *100 loten toewijzen aan een generatie betekent dat het winnende lot altijd in het bezit van deze nakomeling zal zijn en de generatie daarom sowieso dezelfde of een hogere levensstandaard zal hebben dan uw eigen. 0 loten toewijzen aan een generatie betekent dat het winnend lot in geen geval in het bezit van deze generatie zal zijn en de generatie daarom sowieso een lagere levensstandaard zal hebben dan uw eigen generatie. Elk aantal loten tussen deze twee uitersten biedt geen volkomen zekerheid over de levensstandaard van de generatie. Met 30 loten heeft een generatie bijvoorbeeld 30% kans op dezelfde of een hogere levensstandaard dan uw eigen generatie.*

Geef hieronder uw gewenste verdeling aan.
1 generatie na u : _______
2 generaties na u : _______
3 generaties na u : _______
4 generaties na u : _______
5 generaties na u : _______

BLOK 3: In dit vragenblok wordt u gevraagd afwegingen te maken.

De overheid moet voortdurend afwegingen maken. Eén van haar taken is investeren in het voorkomen van ongelukken en ziekten. Stelt u zich voor dat de overheid kan besluiten te investeren in een overheidsprogramma dat gezondheidsrisico's vermindert op dit moment en een overheidsprogramma dat gezondheidsrisico's vermindert in de toekomst.

Zonder een overheidsprogramma om deze gezondheidsrisico's te verminderen, zullen sommigen dit jaar sterven als het gevolg van ongelukken en ziekten, en sommigen in de toekomst.

Ga er vanuit dat er een keuze gemaakt moet worden tussen twee programma's van dezelfde prijs. Eén programma redt levens op dit moment en het andere programma redt levens in de toekomst. Er is echter slechts genoeg geld om één van de twee programma's uit te voeren. Bekijk Programma A en Programma B hieronder en vul vervolgens het open veld X in op zo'n manier dat u Programma A en Programma B als even goed beschouwt.

De komende zes vragen verschillen onderling op het punt hoeveel jaar in de toekomst programma B plaatsvindt.[11]

Programma A redt dit jaar 100 levens, maar redt 0 levens over **5 jaar**.
Programma B redt dit jaar 0 levens, maar redt X levens over **5 jaar**.
(Q10) Wat moet volgens u de waarde van X zijn zodat programma A en B even goed zijn?

Programma A redt dit jaar 100 levens, maar redt 0 levens over **10 jaar**.
Programma B redt dit jaar 0 levens, maar redt X levens over **10 jaar**.
(Q11) Wat moet volgens u de waarde van X zijn zodat programma A en B even goed zijn?

Programma A redt dit jaar 100 levens, maar redt 0 levens over **25 jaar**.
Programma B redt dit jaar 0 levens, maar redt X levens over **25 jaar**.
(Q12) Wat moet volgens u de waarde van X zijn zodat programma A en B even goed zijn?

Programma A redt dit jaar 100 levens, maar redt 0 levens over **50 jaar**.
Programma B redt dit jaar 0 levens, maar redt X levens over **50 jaar**.
(Q13) Wat moet volgens u de waarde van X zijn zodat programma A en B even goed zijn?

Programma A redt dit jaar 100 levens, maar redt 0 levens over **100 jaar**.
Programma B redt dit jaar 0 levens, maar redt X levens over **100 jaar**.
(Q14) Wat moet volgens u de waarde van X zijn zodat programma A en B even goed zijn?

Programma A redt dit jaar 100 levens, maar redt 0 levens over **200 jaar**.
Programma B redt dit jaar 0 levens, maar redt X levens over **200 jaar**.
(Q15) Wat moet volgens u de waarde van X zijn zodat programma A en B even goed zijn?

De laatste vraag in deze serie vraagt u naar een aantal jaar in plaats van naar een aantal levens.

Programma A redt dit jaar 100 levens, maar redt 0 levens over **X jaar**.
Programma B redt dit jaar 0 levens, maar redt **200 levens** over **X jaar**.
(Q16) Wat moet volgens u de waarde van X zijn zodat programma A en B even goed zijn?

(Q17) U kunt hier eventueel een toelichting plaatsen bij uw antwoorden op voorgaande vragen.
(Q18) Heeft u bij het beantwoorden van de afgelopen 7 vragen het effect van deze overheidsprogramma's op uzelf of uw familie in beschouwing genomen? [Ja, heel erg; Ja, enigszins; Nee, helemaal niet]

BLOK 4: In dit gedeelte van de vragenlijst worden enkele situaties geschetst die eindigen met een vraag om te beantwoorden.

Optie A: U ontvangt €250
Optie B: U maakt 30% kans op het ontvangen van €1000
(Q19) Ik vind optie B **...** dan optie A.

- Veel slechter
- Slechter
- Even goed
- Beter
- Veel beter

[11] Randomized order

- Weet ik niet

Optie A: U ontvangt vandaag €10.000
Optie B: U ontvangt €X over 10 jaar
Ga er vanuit dat een euro vandaag evenveel waarde heeft als een euro over 10 jaar.
(Q19) Wat moet volgens u de waarde van X zijn zodat optie A en B even goed zijn?

Wanneer belastingopbrengsten en overige overheidsinkomsten in een jaar lager zijn dan de overheidsuitgaven, heeft dit een begrotingstekort als gevolg. In plaats van de belastingen te verhogen of de inkomsten te verlagen kan een overheid ook kiezen om een schuld op te bouwen. Door geld te lenen om deze schuld te financieren, komen er extra rentekosten over het tekortbedrag heen. De rente en het schuldbedrag zullen op een moment in de (verre) toekomst moeten worden afgelost.
(Q20) Wat is uw mening over begrotingstekorten die leiden tot extra overheidsschuld?

- Heel slecht
- Slecht
- Niet goed en niet slecht
- Goed
- Heel goed
- Geen mening

In Nederland is de erfbelasting progressief en afhankelijk van de relatie met de erfgenaam. Zo hoeven partners pas erfbelasting af te dragen bij een erfenis hoger dan €650.000, terwijl kinderen dit al doen bij een erfenis van €20.000. Tarieven voor partner en kinderen als ontvangers zijn 10% bij erfenissen tot €124.727 en daarboven 20%. Voor kleinkinderen en afstammelingen in rechte lijn als ontvangers zijn de percentages 18% en 36% respectievelijk.
(Q21) Wat vindt u van de Nederlandse belasting op erfenissen?

- Veel te laag
- Te laag
- Precies goed
- Te hoog
- Veel te hoog

BLOK 5: Tot slot:

(Q22) Indien u één of meerdere kinderen heeft: Wat is de leeftijd van uw jongste kind? [0-4 jaar; 5-9 jaar; 10-14 jaar; 15-19 jaar; 20+ jaar]
(Q23) Rookt u sigaretten? [Ja, 6 of meer per dag; Ja, 5 of minder per dag; Nee, ik rook niet]
(Q24) Hoeveel nieuw geproduceerde kledingstukken heeft u het afgelopen jaar gemiddeld gekocht **per maand**? Geef een schatting.
(Q25) Hoeveel uur **per maand** werkt u als vrijwilliger (bijvoorbeeld bij een educatieve, politieke, culturele of religieuze associatie of vereniging)? Geef een schatting.
(Q26) Hoeveel vliegreizen heeft u de **afgelopen twee jaar** gemaakt? Geef een schatting. *Een retour telt als twee vliegreizen. Een reis met directe overstap(pen) telt als één vliegreis.*