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Empirical analysis of the decisions of German citizens for environmental protection distinguishing between reward and public award: Results from a survey among citizens in a small German city

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Abstract

The core questions of this paper are: What are the determinants for the provisions of some public goods like environmental protection work by citizens and how can this work be delegated to the citizens? On the basis of a survey's micro data, we show which motives are relevant to the choice between a public award with no monetary value and a symbolic payment of €10. For these purposes, we apply the binary choice models. The results reveal several significant impacts where the age as continuous variable shows a stable quadratic-like shape with firstly decreasing and then increasing vigilance for moneyless participation in environmental protection regarding the age of a person. The intrinsic motivation itself seems to be another crucial positive factor. For example, the higher planed hypothetic free time measured in hypothetic hours for environmental protection, the higher the probability that this individual indeed would do it. Moreover, the one's reputation may influence positively the honorary contribution to environmental protection. On the other hand, the probability for an active honorary environmental protection is smaller by young people in training and in absence of social situations. Interestingly, we found that the gender plays no significant role in this context. Hence, we can provide an elaboration of an incentive system for environmental commitment of Kassel's citizens which can be a base for further regional economic policy in this context.

Keywords: Self-motivated voluntary environmental protection, logit, award, reward.

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1. Introduction

In times of low budgets, municipalities have problems providing sufficient public goods. Moreover, at present German municipalities cannot finance all public goods by themselves. Therefore, it is necessary for the municipalities to delegate those provisions from public institutions to a certain extent to the citizens. Besides labour politics and economics, issues concerning the environment are one of the biggest themes people in Germany are interested in (cf. BMU 2010). Therefore, a healthy environment is a public concern and a lot of people enjoy having an intact nature around their hometowns. Consequently, it has to be determined how to motivate citizens for such environmental protection work. In this paper we describe the respective reasons for choosing a public award instead of €10 as gratification for participating in an environmental project by evaluating data of a survey done by the "Umwelt- und Gartenamt Kassel" in 2010. We do this by using econometric analysis, in particular logistic regressions (so-called logit-model). With these results, it is possible to make recommendations for municipalities, especially Kassel, on how to develop a gratification system for environmental commitment by the citizens. To our knowledge, this is the first paper dealing with this issue. Hence, the literature overview cannot be consequently given.

However, with respect to the question of this paper, it is necessary to illustrate the differences between awards and rewards. At the beginning it has to be clear that both of them are extrinsic incentives. As mentioned above, awards are public and in most cases rewards are not. Furthermore, accepting an award induces loyalty of the beneficiary to the donor, which establishes a particular relationship between both. Therefore, Frey and Neckermann (2008) argue that there exists a kind of contract, which is tacit, incomplete and difficult or even impossible to enforce. If the beneficiary does not accept or if he does not like the donating institution, awards do not work as incentives anymore. In the case of rewards, such contracts do not exist. It is rather a kind of a business contract, where one contractual partner pays the other for a particular effort. A further important distinction between awards and rewards is made according to the crowding theory, described in the following.

The crowding effect does not occur with the same intensity on both incentives. Frey and Neckermann (2008) state stronger crowding-out-effects in case of rewards. Those appear intrusive to the potential receiver. Awards, on the other hand, seem rather supportive. As shown, there are situations where paying for efforts does not work in the expected way. For

instance, in family relationships it is not expected that one pays a relative after an invitation for dinner at his or her place. The relative would probably feel insulted if he or she was paid since it is not according to the social norm. This is also relevant in situations where people work voluntarily, for example in environmental fields. If someone is intrinsically motivated to do something and suddenly she gets a money offer, her motivation might be crowded out and she stops doing it or decreases her effort. The first empirical finding about the crowding effect was published by Titmus (1970). He shows that the number of people who donate blood decreases after receiving a money offer for donating. Apparently, the offer crowds out their intrinsic motivation. For example Deci et al. (1999) analyzed 128 studies and presented evidence with respect to several activities.³ The reasons for such behavior are versatile. Firstly, Bolle and Otto (2010), for example, argue that people do not know about the value of their unpaid activity. They only can estimate its value. If they get paid for that activity, they will make comparisons to their own estimations. If the offered payment lies below their own estimated wages, intrinsic motivation is crowded out. They further state: "not paying is different from paying (almost) nothing" (Bolle and Otto 2010). That argument is also in line with Gneeze and Rustichini (2000). They show that there is a higher performance in an IQ-test experiment when the participants get no payment compared to when they get a low payment. Moreover high payment induces higher performance than low payment. Secondly, intrinsic motivation is also crowded out when people are ordered to act in a specific way. Frey's co-workers undertook an experiment where students play the Dictator Game (developed by Kahneman, Knetsch and Thaler 1986a and 1986b).⁴ If they have to give a minimum amount to their opponent, the disposers give significantly less than in the treatment without a minimum amount. Such situations seem like a constraint of the recipients' freedom of choice. Hence people may feel no longer responsible especially in situations in which they act altruistically (Frey 1997). Thirdly, Frey also argues that intrinsic motivation is partly or totally crowded out if the self-esteem of a person is negatively affected. This could happen when people want to express their interests in a specific activity by taking part in it. If they were suddenly paid for that activity it might lead to self-esteem being affected as mentioned above (Frey 1997). Fourthly, in situations where individuals feel controlled by external interventions it leads to the crowding out of intrinsic motivation, but if someone feels supported it leads to crowding in (Frey 1997). An example for the first situation is paying money for acting in a specific way, for the latter, a superior awards an employee at a NGO for

⁴ For further information see Frey (1997).

his commitment. Generally, there are countervailing effects between the sum of money and the extent of crowding out. Thus, more money compensates for the crowding out of intrinsic motivation (cf. Frey 1997).⁵

Furthermore, Frey and Neckermann (2008) distinguish between two effects of the use of awards. The first ones are ex-post-effects. Such effects work as follows: If an individual gets an award for doing something important or special, other people may notice it and start to act in the same or in a similar way. Maybe it will be perceived as socially desirable to act in a certain way. Particularly with respect to public goods Neckermann and Frey (2008) show that there is a higher contribution rate from other people after noticing the bestowal of an award. In connection with the purpose of this paper, more people may begin to act in a more ecologically friendly way or get involved in an environmental issue after reading in the local newspaper that residents of Kassel received awards for environmental protection efforts. Further, even the winners increase their contributions to a public good after receiving the award. These results are presented in a study about incentive effects of awards with IBM employees in Switzerland by Neckermann and Frey (2008).

The second ones are ex-ante-effects. Those effects seem motivational, because people expect utility by receiving an award. For example, people feel good about themselves for getting an award, independent of publication or additional monetary rewards. Another point is that individuals may value the opinion of the conferring institution. Thus, they regard it as an honor to be awarded by a particular institution. The better the standing of the donating institution, the more utility the receiver of the award gets (Frey 2010). Furthermore, awards generate publicity effects. Many people will notice that somebody wins a particular award which generates utility in terms of reputation for the awarded person as well. Altogether, if people are able to anticipate the gain of utility after receiving an award, awards will work as incentives. According to the purpose of this paper these effects are central and define the profile of each person regarding her preferences to environmental protection.

We find that the age of individuals plays a crucial role for these preferences what can be leaded back to the human capital theory of Mincer (1974). This theory states, simply speaking, that earnings of each person over her lifetime rise to a peak at which they begin to decline. Hence, around this peak the free time is much more expensive than before and after

⁵ This is also one reason why it was decided to specify the amount of only €10 as monetary gratification for the self-activity in environmental protection. See next section.

that peak, indicating that individuals would prefer to work to earn more than to enjoy free time and thus to participate in voluntary environmental protection.

The paper proceeds as follows. Section 2 describes the survey and the dataset, including the dependent and all independent variables. Moreover, the economic working hypotheses and the expected signs of the independent variables are discussed. In section 3, we present the used methods and descriptive results as well as those of the logistic regression which is used to obtain those results. Section 4 discusses the results and gives some political recommendations. Section 5 concludes and outlines.

2. Dataset, variables and expected signs

2.1 Dataset

The data derive from a survey elevated by the "Umwelt- und Gartenamt Kassel" during October of 2010 on the occasion of the United Nations International Year of Biodiversity.⁶ The survey was carried out through interviews in the City of Kassel on the one hand and by a questionnaire that respondents filled out without an interviewer on the other hand. The interviews took place at public places and in front of supermarkets in every district of Kassel and on every day of the week from 8 am to 10 pm. Further, the respondents could fill in the questionnaires at Kassel's Museum of Natural History and the "Heilhaus Kassel". In addition they were sent to several senior high schools. The respondents were approached randomly and they could voluntarily agree to participate in this survey, therefore anyone who is walking around in Kassel, in senior high schools, at the Museum of Natural History or the "Heilhaus Kassel" could be a participant in the survey. The questionnaire consisted of socioeconomic questions like occupation, age, gender, etc. and of questions about the environment as well as about biodiversity. To sum up, there were 1515 useable questionnaires with a share of 61.5% carried out through interviews and 38.5% through fill-ins. The questionnaire consisted of 16 questions, nine of them open and seven closed.⁷ Additionally, data about the unemployment rate in 2009 of Kassel's districts and several other municipalities were purchased from the "Agentur für Arbeit Hessen" and used.⁸

⁶ For further information see <http://www.cbd.int/2010/welcome/>.

⁷ A copy of the questionnaire is attached to the appendix (figure 5).

⁸ The "Agentur für Arbeit Hessen" is the Employment Agency of the German state Hessen.

The type of interview utilized is a loosened style of a neutral interview.⁹ Its purpose was to create a positive communicational atmosphere. The interviewer also showed interest in the interviewee and her answers. To that effect the motivation of the interviewees was maintained during the interview (cf. Attesländer 2003). An interview lasted about five minutes on average.

2.2 Economic Hypotheses, variables and expected coefficient signs

In the past decade, we are witnesses of environmental changes and debates in media. Climate change with all its consequences for the environment is a fact which can be neither denied nor ignored. Therefore, we are making assumption that environmental protection is in everyone's interest.

Assumption 1: Everybody wants healthy and protected environment without any negative effects.

Under this assumption, we are wondering what circumstances affect individuals to contribute in environmental protection without any payments or are they doing this as good will. This is very interesting question because the governments with budget deficit can solve this issue faster and more efficient by involving and empowering its citizens. We are interested to find out what circumstances are important for individuals to decide whether to contribute to environment protection. In this context, we would like to create the hypotheses below and to test and analyse them.

Hence, the dependent variable y is a binary-variable called *award_yes*. It takes on the value 1 if the respondent chooses the public award as gratification for hypothetical environmental commitment and the value 0 if she chooses €10. 55% of the respondents choose the public award and thus 45% the €10 (cf. table 2). We offer them only €10 as payment because it shall be a symbolic payment because the participants emulate leisure to do environmental commitment. Further, the payment is that small because it should not be understood as an

⁹ At neutral interviews, the interviewers do not communicate their opinions or judgments about the interviewees and their answers. Further the interviewers do the interviews unemotionally.

alternative occupation for the participants, and thus should be a proxy-variable for costs of free time.¹⁰ The hypotheses as well as the independent and control variables are shown below:

Hypothesis I: *The probability to choose the public award increases for intrinsically motivated individuals to work for the environment compared to individuals who are not intrinsically motivated.*

This hypothesis will be tested by the following variables: The dummy-variable *environmental_ngo* takes on the value 1 if the respondent is member of an environmental NGO, otherwise it takes on the value 0. People who already participate in such institutions are usually intrinsically motivated and work without payment. The dummy-variable *hours_med* is constructed as follows: The interviewees were asked to state their monthly hours of voluntary work at a hypothetical environmental project. *Hours_med* is 1 if the stated quantity is above the median of two, otherwise it is 0.¹¹ It is also an indicator for intrinsic motivation to work for the environment, because those people would not get gratifications for their commitment. The dummy-variable *mon_birds_yes* takes on the value 1, if the recipient states to monitor birds voluntarily, otherwise it takes on the value 0. It is perhaps an indicator of intrinsic motivation in the same way as *hous_med* with the exception that they would participate in the specific project of bird count. These three variables are direct indicators for intrinsic motivation to work for the environment. Indirect indicators are described in the following:

Biod_yes is a dichotomous variable and takes on the value 1 if the respondent has already heard something about biodiversity, otherwise it takes on the value 0. The discrete variable *mentioned_birds* shows the number of different species of birds which the respondent is able to name, which lies between 0 and 16. The latter two variables are indicators of environmental knowledge. Furthermore Franzen (1994) shows that people with above-average environmental knowledge donate more money to environmental organizations than people without this knowledge. This shows that people who are well informed about the environment might be more interested in these issues and have stronger preferences for it. It can be assumed that preferences for the environment correlate positively with intrinsic

¹⁰ Otherwise one would see it as an additional income and thus the motivation behind that would be some other one.

¹¹ I chose the median because some respondents stated that they would participate monthly for 30 minutes or less in environmental projects. Those answers do not seem realistic and they arose apparently due to a social norm. Hence, I assume that these participants who stated below 30 minutes maybe do not want to be judged by the interviewers, if they would state zero hours to work voluntarily for the environment.

motivation to work for the environment. The dichotomous variable *notice_birds* takes on the value 1 if the respondents notice birds actively in their daily routines, otherwise it takes on the value 0. Those people have apparently a higher interest in birds and perhaps even for the environment altogether and therefore higher preferences. *Gender* is constructed as a dichotomous variable and it is 1 if the respondent is female, otherwise it is 0. Several authors show that women are more concerned about the environment and act in a more environment-friendly way than men (Mohai 1992; Diamantopoulos 2003; Czap and Czap 2010; Zelezny, Chua and Aldrich 2000). One can assume that those attitudes and behaviors correlate in a positive way with intrinsic motivation to work for the environment. At the four latter indicators the intrinsic motivation stems from knowledge, preferences and concern about the environment. They are as mentioned above indirect indicators. Therefore, we assume a lower strength of impact on the dependent variable $y=I$ than from the three direct indicators described at the beginning of this subsection (*environmental_ngo*, *hours_med* and *mon_birds_yes*).

Altogether, intrinsically motivated people will perceive getting the public award as supportive, therefore it leads to crowding in. Moreover receiving €10 leads to crowding out of intrinsic motivation to work for the environment. Therefore, we expect a positive sign of the coefficients of these seven independent variables. However, we cannot predict which argument is to which magnitude responsible for the crowding out (cf. section 1).

Hypothesis II: *The probability to choose the public award as gratification for environmental commitment is higher by specific groups of individuals with appearing high income.*

Wealthy is an indicator for high income and constructed as follows: This dichotomous variable takes on the value 1 if the respondent lives in a district of Kassel or a municipality with an unemployment rate below Hessen's average of 7.7% in 2009, otherwise it takes on the value 0. It is assumed that residents of these districts are in average more affluent than residents living in the other districts or municipalities. The dichotomous variable *univ_degree* indicates by being 1 that a respondent has a university degree, otherwise it is 0. Collier (2005) shows a positive correlation between university degrees and income. Therefore it is an indicator for high income as well. Based on the standard neoclassical theory and the assumption of diminishing marginal utility, people with high income have a lower marginal

utility of €10 than people without high income. Several empirical surveys show a positive correlation of individuals' income and environmental concern as well as willingness to pay for the environment (cf. Franzen and Meyer 2010; Marquart-Pyatt 2012). By implication we assume that those individuals prefer the public award because not receiving the €10 and paying more for the environment is the same from an economic point of view. Hence, we expect a positive impact on the dependent variable y from both these indicators of high income.

Moreover, it can be argued that according to Maslow (2008), people with high income have satisfied their physiological needs, like sufficient food supplies. However in Germany almost all people have access to sufficient food supplies, but not everyone can get the kind of food which they like the most or which is produced according to their preferences, for instance ecologically. Only people with certain levels of income have such possibilities. Furthermore, safety can be satisfied more easily by people with high income. They have more monetary possibilities to choose the neighborhood in which they want to live in and a crucial factor of choice is the safety of the neighborhood. People with high income also have a higher degree of security regarding guaranteed employment. As a result those people have already satisfied the lower needs in Maslow's hierarchy of needs and they aspire to the higher ones like esteem and self-actualization. From a critical point of view needs must not necessarily be satisfied in the exact order of Maslow's hierarchy of needs. For instance, some people do not want to satisfy their need for food completely, they prefer to act in an environmentally friendly way and rather accept than having not enough to eat.¹² Nevertheless we also assume a positive sign of the *wealthy's* and the *univ_degree's* coefficient, because receiving a public award suits the higher needs more than receiving €10.¹³

Hypothesis III: *The probability to choose the public award is lower by individuals with low income.*

The dichotomous variable *retiree* is 1 if the respondent is in retirement, otherwise it is 0. *In_training* will be 1 if the respondent is a pupil, a student or a trainee, otherwise it will be 0. There are predominantly young people between 15-26 years with low income. Further,

¹² This paragraph is according to Maslow (2008).

¹³ We point out here that this hypothesis is based on different argumentation than the hypothesis VII later on. In that hypothesis VII, we consider the utility function based on maximizing income so that the free time has a vice versa utility value. That is, the higher income the more expensive free time, and vice versa.

unemployed is 1 if the respondent is unemployed, otherwise it is 0. With respect to the neoclassical assumptions of diminishing marginal utility, mentioned above, all of them have less income by trend than the comparison group. Consequently they get a higher marginal utility by €10. Thus, we expect a negative sign of the coefficients of these three variables.

Hypothesis IV(a): *The probability to choose the public award increases if the respondent is a mother.*

Hypothesis IV(b): *The probability to choose the public award decreases if the respondent is a father.*

The dichotomous-variable *mother/father* takes on the value 1 if the respondent is a mother/father, otherwise it takes on the value 0. According to George and Southwell (1986), parents take on the roles they have experienced with their own parents. Hence men act more like their fathers and women like their mothers. Men are more concerned about economic issues affecting the family and women are concerned about the well-being of their families in an educational and care-taking sense. According to these role models each parent acts in a commendable way. Hence for mothers it is the right option to work without getting money for the environment (public award) and fathers decide for the option which has the higher economic utility (€10). Thus, we expect a positive sign of the coefficient of *mother* on the dependent variable *y* and a negative sign of the coefficient of *father*.

Hypothesis V: *The probability to choose the public award decreases if respondents fill in the questionnaire by themselves.*

The dichotomous variable *self_report* takes on the value 1 if the respondents fill in the questionnaire by themselves, otherwise it takes on the value 0. Respondents who fill in the questionnaire by themselves are not in a social situation like the interviewees. The interviewees might give social desirable answers to impress the interviewers or avoid to be judged by them (cf. Diekmann 2004). We assume choosing €10 is to a minor degree socially accepted than the public award. That is why people who fill in the questionnaire by themselves are more honest in answering such questions. Therefore, we expect a negative sign of *self_report's* coefficient.

Hypothesis VI: *The probability to choose the public award increases with a higher reputation.*

The dichotomous variable *born_ks* is 1 if the respondent was born in Kassel, otherwise it is 0. Individuals who were born in Kassel are rather likely acquainted with more people from Kassel where they live than people who were not born in Kassel. *Ks* is a dummy-variable as well and it is 1 if the respondent lives in Kassel, otherwise it is 0 what means that we also look at respondents living in a bordering district or in a faraway place or village near Kassel. Individuals who live in Kassel may have a closer connection to other people from Kassel than people who do not live there. Moreover, it can be assumed that the acquaintanceship between those people living in the area around Kassel is even closer. Both groups may have higher reputations than people who do not live in Kassel or its surrounding areas. Therefore the utility of those will be higher if they would be publically awarded, because there would be an article in the regional newspaper about them. However, building a reputation may be a lingering and long-standing process and this public awarding may have effects on individuals only if they are living in that place and knowing local people for long time. Thus, we define a proxy-variable for the reputation of having been born in Kassel (in Kassel's surrounding areas) and at the same time living in Kassel (in Kassel's surrounding areas) which in this case takes the value of one: *born & living=1* for respondents being born and living in the same place.¹⁴ We expect a positive sign of the coefficients of this variable *born & living*.¹⁵

Hypothesis VII: *The age as a continuous explanatory variable has a non-linear U-shaped impact on the probability for active voluntary and awarded environmental protection.*

The argumentation for this very last hypothesis might be twofold. To explain this, we point out that one has a choice between public award and a small reward of €10. We choose intentionally such a small hypothetical reward to distinguish between the main profession and financial reward for environmental protection. Firstly, we assume that the young people are

¹⁴ Another argument for the construction of this explanatory binary variable might be the solidarity with one's native locality and taking into account their needs.

¹⁵ Another argument for the construction of this explanatory binary variable might be the solidarity with one's native locality.

more aware about environmental protection as this issue has been more intensively discussed in the media in recent decades than in previous decades. Moreover, given the young people have more free time and given that those young people are more likely to spend their free time in nature or participating in sport in nature it might be rather likely that they are willing to contribute to the environmental protection on a voluntary basis.¹⁶ Similar arguments might hold for older people and they also might want to do something for future generations. Moreover, they have usually worked for a long time and achieved some financial security so that environmental protection shifts strongly into their focus. People who are middle-aged are usually very busy dealing with and solving different kind of tasks, related to career and family life, and have less free time to use for other things. Given their limited amount of free time, which is in this case more expensive for them, they may rather decide for a reward. Hence, middle-aged people may have lower utility for voluntary environmental protection. Secondly, we can refer to the microeconomic human capital theory of Mincer (1974) which states that working experience accumulates human capital in a manner of quadratic function resulting in higher income in mid-life than around it (meaning than in young and old years). We can assume that the age can be a proxy for working experience.¹⁷ Then opportunistically the free time might be more expensive in mid-life, because consuming free time means less working time. Thus letting one work more in mid-life means having less time for opportunistic activities in free time, that may result in the quadratic-like shape with firstly decreasing and then increasing vigilance for moneyless participation in environmental protection regarding the age of a person. In other words, the more free time the less valuable free time is and the higher motivation to invest free time for good things of a higher non-financial value and not for a small financial reward. Hence, we include the linear term of the variable *age* as well as its quadratic term in the econometric model.

Subsequently, we describe the control variables. Here, we do not expect a specific direction of influence on the dependent variable *y* because we miss concrete theoretical reasons in favor of one specific sign of corresponding parameters. However, these variables are also included in the econometric analysis to control for unknown but possible influences described as follows: Several dummy-variables control for possible geographic impacts. *Urban_c* is 1 if the

¹⁶ Moreover, one can observe a phenomenon of young people in big cities where there is a tendency to not use a car, but more often public transport and bicycles. This can also be a result of having a lower income, letting young people save money for trendy things like smart phones, tablet computers or holidays. Hence, a car may no longer be a status symbol which can be an indicator for other preferences by young people.

¹⁷ Winker (2006) states that e.g. one can approximate the working experience subtracting the first six years of life and the education time from the age justifying age as a proxy.

respondent lives in a town around Kassel, but not bordering it and visits Kassel regularly to get in contact with city life, e.g. to use to go shopping, to have dinner or to do cultural activities like going to the theater, to concerts or to the cinema, otherwise it is 0. *Bordering_ks* describes respondents who live in towns bordering Kassel by being 1, otherwise it is 0. *Center* takes on the value 1 if people live in the center of Kassel, more precisely in the district "Mitte", otherwise it is 0. *Far_away* takes on the value 1 if the respondent does not live in the area of Kassel respectively in the north of Hessen, otherwise it takes on the value 0. The dummy-variable *interviewer_m* tests for possible effects relating to the gender of the interviewer. It is 1 if the interviewer is male, otherwise it is 0. The discrete variable *household* indicates the number of members of the respondents' households and shall tests for possible effects in this regard.

Summing up, the following table 1 displays the expected signs of all independent and control variables. Table 4 in the appendix displays an overview of the definitions of all independent and control variables used in the econometric analysis.

dependent variable:	<i>award_yes</i> (y)		
<i>environmental_ngo</i>	+	<i>mother</i>	+
<i>hours_med</i>	+	<i>father</i>	-
<i>mon_birds_yes</i>	+	<i>self_report</i>	-
<i>biod_yes</i>	+	<i>born & living</i>	+
<i>mentioned_birds</i>		<i>urban_c</i>	?
<i>notice_birds</i>	+	<i>bordering_ks</i>	?
<i>gender</i>	+	<i>center</i>	?
<i>Wealthy</i>	+	<i>far_away</i>	?
<i>univ_degree</i>	+	<i>interviewer_m</i>	?
<i>Retiree</i>	-	<i>household</i>	?
<i>in_training</i>	-	<i>age</i>	<i>non-linear quadratic shape</i>
<i>Unemployed</i>	-		

+ = positive expected sign; - = negative expected sign; ? = no concrete sign expected

Table 1: Expected signs of the independent and control variables

3. Methods and Results

3.1 Methods

For all regressions and calculations we used the statistical software Matlab and the econometric toolbox provided by LeSage. Further, we use the logit model which uses maximum likelihood as estimation method to calculate which independent and control variable has which degree of impact on the decision to choose a public award ($y=1$) or €10 as a gratification for environmental protection commitment.

The probability p of "success" ($y=1$) is modeled in the logit model as following:

$$P(y = 1/\mathbf{x}) = G(\beta_0 + \mathbf{x}\boldsymbol{\beta}) = \frac{e^{\mathbf{x}\boldsymbol{\beta}}}{1 + e^{\mathbf{x}\boldsymbol{\beta}}}$$

This equation represents the probability, that y is 1, depending on the independent variables put into the matrix \mathbf{x} . The distribution function is described by G and is assumed here to be the logistic function. Thus, G always takes values between 0 and 1 where $\boldsymbol{\beta}$ stands for a column matrix for the coefficients of the independent variables \mathbf{x} .¹⁸ On this place, we want to point out that we also applied the alternative model to the logit, namely the probit model, where G is the function of the cumulative normal distribution. The obtained results do not differ qualitatively from the ones from the logit model. From the quantitative point of view both results are in the usually expected value frame when logit and probit are compared. Moreover, our sample properties do not allow for assumption that one should expect great differences in results from both models here.¹⁹

3.2 Descriptive statistics

Table 2 presents some basic descriptive statistics. Visible on table 2 the mean age of the respondents is 33 years. Furthermore 58% of the respondents are female and 65% are citizens of Kassel. The share of respondents who would participate in an environmental protection project voluntarily is 46% and the share of those who would participate in a bird count is

¹⁸ See Greene (2011) or Winker (2006) for further information about econometric analysis using logit-models.

¹⁹ Higher differences are to expect in data sets where the shares of zero and ones are highly non-proportional (Greene (2011)). This is not the case in our data sample.

32%. The data show that 41% of them filled in the questionnaire by themselves. The share who chooses the public award as a gratification for participating in an environmental project is 55%.

Descriptive statistics	
mean age	33
Female	58%
citizen of Kassel	65%
share of potential environmental commitment	46%
self report	41%
dependent variable (y): <i>award_yes</i>	55%

Table 2: descriptive statistics

3.3 Results

The obtained results are described as follows. Firstly, we applied a logit regression with all variables.²⁰ Secondly, after the first trial we dropped all variables with estimated coefficients whose p-values were bigger than 0.3 ($p > 0.3$), because these apparently do not have any significant impact on the dependent variable y at all. Thirdly, we ran a further regression including all remaining independent variables. We optimized the model trying different combination of explanatory variables and kept all variables for which the p-values of their estimated coefficients are less than 0.1. We could achieve very robust estimates where the significance of parameters remains stable without any sensitivity to the variables combinations, except in one case. When we put the variable *mother* into the model, this variable still showed no significant impact, but the variable *gender* became significant at the 10% significance level. That means if *mother* remains in the model, the variable *gender* becomes weakly significant in this case and, in fact, only in this case.

²⁰ That means that we were specifying our model using so-called top-bottom specification procedure. Using a lot different dummy-variables, we had additionally to beware the problem of multicollinearity. Hence, we made sure that no multicollinearity occurs.

However, because the significance level of *gender* is only 10% and *mother* is still not significant we can state that the variable *gender* as well as *mother* do not have significant impact on the probability for $y=1$ and exclude them from the final model. For all other variables with significant impact on the dependent variable, we could achieve very robust estimation results, most of them are between the 1% and 5% significance level and thus highly significant. Only the variable *born & living* has the coefficient which is significant only at the 10% level. Table 3 displays results of the final model, with the variables which parameters are statistically significant. These results will be discussed in the following section.²¹

4. Discussion

4.1 Discussion of the Hypotheses

Firstly, we give a short overview about the validity of the final models. The final model shows a LR- test against intercept model of 111.474 and is significant at a 1% level (see table 3). Thus, testing the joint null hypothesis that the coefficients of the independent variables are simultaneously all equal to zero, we can state that this null hypothesis can be rejected at a 1% level of significance. Vice versa, the validity of the model can be seen as proven and accepted.

The first important influence on the dependent variable comes from intrinsic motivation. All three direct indicators, namely *environmental_ngo*, *hours_med* and *mon_birds_yes*, show significant and positive, as expected, influence on the probability to chose the public award as gratification for voluntary environmental protection. Hence, this means that respondents who are members of an environmental NGO and/or respondents who would participate in environmental projects and/or the people who want to monitor birds choose the public award with a statistically significant higher probability than the other ones. Hence, **Hypothesis I** is widely confirmed with respect to the direct indicators.

²¹ We also applied the probit model to test all independent variables on the same way. The intention was to test for heteroscedasticity after the last regression (p-values of all estimated coefficients < 0.1). We found out that only *mother* has heteroscedastic errors. However, also in the probit model we could observe the same phenomenon. If *mother* remains in the model the variable *gender* becomes weakly significant while *mother* still remains insignificant. Hence, we can make the same statement as in the case of the logit model regarding *gender* and *mother* and we leaved both variables definitely out from the further analysis.

	Final Model	
Variable	Coefficient	Estimated errors
<i>Constant</i>	1.4166***	0.5050
<i>Age</i>	-0.0571***	0.0203
<i>age²</i>	0.0006***	0.0002
<i>environmental_ngo</i>	0.4633**	0.2066
<i>hours_med</i>	0.4228***	0.1133
<i>in_training</i>	-0.5627**	0.2208
<i>self_report</i>	-0.8035***	0.1493
<i>mon_birds_yes</i>	0.2743**	0.1222
<i>born & living</i>	0.1832*	0.1081
LR-statistic	111.474***	

*** significant at the 1% level, **significant at the 5% level, * significant at the 10% level.

Table 3: Estimation results

Contrary to direct indicators, we could not confirm significant impact from the four indirect indicators (*biod_yes*, *mentioned_birds*, *gender* and *notice_birds*) for intrinsic motivation based on estimation results.²² Altogether, the results show that intrinsic motivation is a very important factor to explain the choice for public award. Local politicians should pay attention to this issue by planning and using motivational gratifications for citizens who would participate in environmental projects. To show to which extent which of the four arguments mentioned in section 1 is responsible for crowding out intrinsic motivation, further research is necessary. Nevertheless the City of Kassel should consider these four arguments by developing an incentive system. It would be possible to get information about what argument has how much impact through additional questions. Nevertheless it is difficult to implement such questions in a survey like the used one, because one needs a catalogue of questions to determine that and a questionnaire including such a catalogue would increase the duration of an interview significantly.

Furthermore, a significant impact of indicators for low income can be shown. But only *in_training* significantly shows the expected sign, thus *retiree* as well as *unemployed* miss significance. Hence **Hypotheses II** can only be partly confirmed. Only 1.5% of the respondents stated they were unemployed. That is quite below Kassel's unemployment rate of 10.1% in October 2010 (Bundesagentur für Arbeit 2010). Maybe some participants were not honest in answering this question, because they do not want to be judged by the interviewers.

²² With exception of *gender* in combination with *mother*, as discussed above.

On the other hand, there are better indicators for low income, at best detailed data about the respondents' income. According to our results the probability to choose the public award decreases overall significantly if the respondent is in training. Thus, it can be recommended that the City of Kassel should start cooperation with schools. Hence, projects could be initiated where pupils or trainees work on an environmental project, for example in the Aue or the Habichtswald for a symbolic payment of €10.²³ This would generate additional utility according to the environmental education of Kassel's young people.

The indicators for high income (*wealthy* and *univ_degree*) are both insignificant. Hence, **Hypothesis III** must be rejected. This is perhaps a consequence of the quality of these indicators at least for *wealthy*. It is might not be adequate enough to measure the income by the unemployment rate of the respondents' residence. The unemployment rate may not indicate the income of the respondents in detail. Moreover only averages will be considered. Here again, a better indicator for income would be advantageous as mentioned above.²⁴

Also *mother* and *father* have not got significant influence on the probability of choosing the public award. **Hypothesis IV(a)** as well as **Hypothesis IV(b)** have to be rejected. Apparently it is due to the fact that the described role-models do not exist today anymore. The image of those role-models has perhaps vanished over time. Today it is not unusual that the father does the chores and stays at home to raise the children, while the mother goes to work and is responsible for the family's income. Therefore these role-models are becoming less distinct.

The results depict a significant distinction between the respondents who filled in the questionnaire by themselves and those answering it in an interview. Respondents who filled in the questionnaire themselves chose the public award with an overall lower probability as respondents in an interview. The expected negative sign and therefore **Hypothesis V** are confirmed and apparently due to the absence of social desirability (cf. section 2.2). If the City of Kassel wants to sign up citizens for particular environmental projects with a public award as gratification, it has to send interviewers to the streets to increase the probability of participating in the projects for the public award.

²³ The Aue is a recreational area within Kassel. The Habichtswald is a forest and a nature park near Kassel.

²⁴ At this point we want to point out that we also constructed an additional variable from *wealthy* and *univ_degree* which takes the value of 1 if both variables takes 1. The idea behind that was to have people with higher education degree living in upmarket area. This should model the tendency in our random sample for higher income. However, also this variable showed no significant impact.

Hypothesis VI must be rejected. People with a higher reputation who received a public award do not choose the public award with a higher probability than people without a higher reputation. The indicator *born & living*, as mix of both indicators *born* in a place and *living* in the same place at the same time, is weakly significant at 10% level. This weak significance may be due to the imprecision of the data collection because the questionnaire does not ask whether one was born in the area around Kassel.²⁵ Despite this ambiguity in the data collection, we can assume that the Hypothesis VI can be rejected.

Hypothesis VII cannot be rejected. We find highly significant estimates for the coefficient of the variables age and age squared. Hence, the probability for the public award may be minimal mid-life, exactly speaking, those who are 48 years old. Before this probability is decreasing and after that increasing. Hence, younger and older people are more likely to be willing to contribute to voluntary environment protection.

The control variables *urban_c*, *bordering_ks*, *center*, *far_away*, *household* as well as *interviewer_m* do not show significant impacts on the dependent variable *y*. Hence, the district itself where a respondent lives may be irrelevant with regard to the dependent variable *y*. The size of the respondents' households and gender of the interviewers do not have any significant impacts either.

4.2 Discussion of marginal effects

Because of the nonlinearity of the logistic function and thus of the estimated nonlinear probability function, the estimated coefficients are not the marginal effects itself like in a linear model. This means that a marginal effect is varying depending on the quantity of the independent variables. Hence, for different values of independent variables, one gets different marginal effects which we want to analyze for given independent variable *x* of interest. In this case, one would usually take the sample data mean or the median of all other independent variables and calculate the marginal effect for a specific value of the one particular independent variable given these means or medians. Another way to analyze marginal effects would be to evaluate all marginal effects at every observation of *x* and then to use the sample average of the individual marginal effects (Greene 2011). Furthermore, in the case that the independent variable is a dummy variable, say *d*, the appropriate marginal effect would be

²⁵ For example, there may be people neither born in Kassel nor in surrounding area but relocate to the Kassel area because of its unspoilt nature.

calculated as the difference between the estimated probability for the dependent variable $y=1$ with that dummy variable $d=1$ minus the same one but with $d=0$. This means practically that the dummy variable pulls up or down the probability function depending on the sign of its coefficient (plus or minus, respectively).

However, in our case given the fact that only one variable (age and therefore age^2 as well) can be seen as a continuous independent variable, we can just take a look at the whole estimated probability function where the shape of this probability function at some particular point (that means by given value of the age) is the marginal effect itself. This is represented in the figure 1 where the estimated probability function for choosing an award is given in dependency on age for a person to be in training and who is self-reporting where this means as being outside a social situation. Moreover, this profile of the person is to be understood as the one who is not living in the same place where she was born and thus does not care about her reputation.

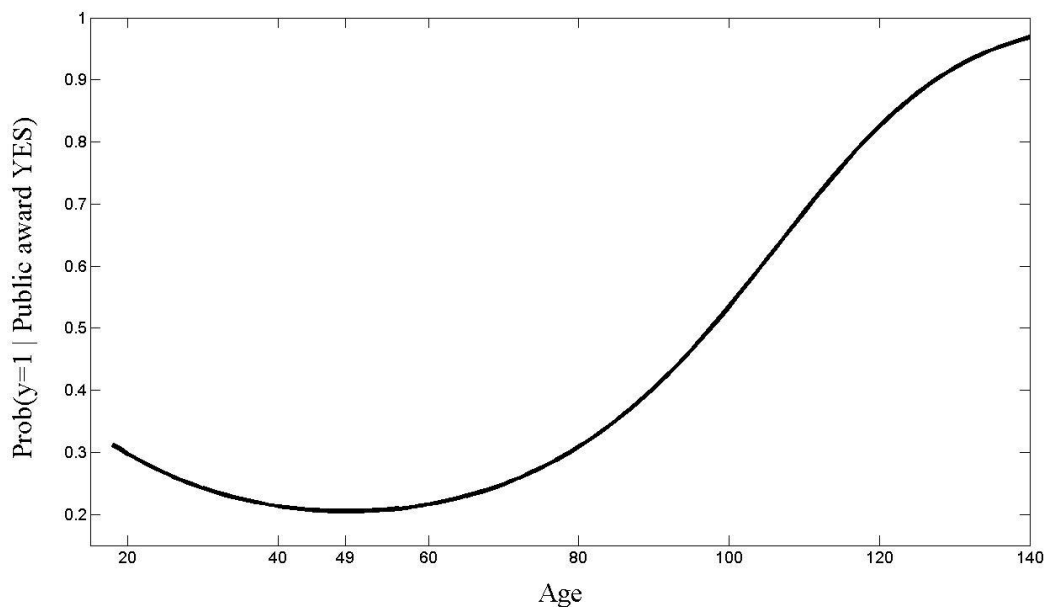


Figure 1: The estimated probability function as the function of age and age^2 of a person in training who is also self-reporting

Although we do not expect that it is realistic to expect a person to be in training and 120 years old at the same time, in fact we even do not expect to have individuals in our data set being older than 110, we just show this function for this data range up to 140 years age for the sake of better illustrating the estimation results. From figure 1, we can interpret our estimation result in the following way: The probability that a person prefers the award instead of the

reward for environmental protection is overall smaller than 0.5 for an age less than 100 years. Hence, based on this result we would not expect that this kind of persons would contribute to environmental protection without paying them. Moreover, the minimum probability for choosing award in this person's profile is achieved with the age of 49. Whether it is likely to expect someone to be in training at 49, we will not discuss at this point. Now, we will take a look at the person who may not be anymore in training and her estimated probability function for taking award which is presented in figure 2.

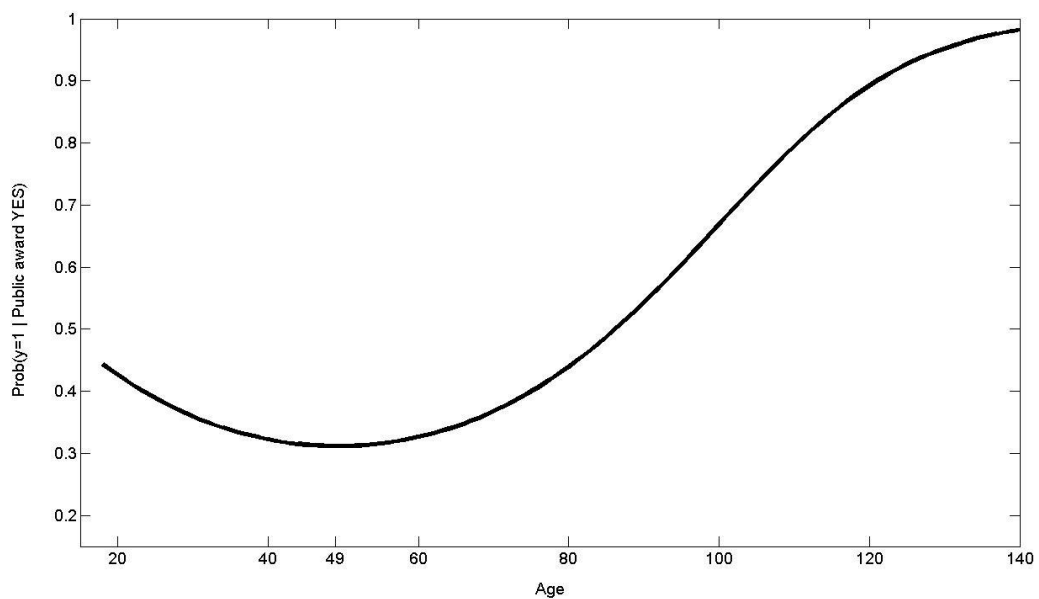


Figure 2: The estimated probability function as the function of *age* and age^2 of a person who is self-reporting

So, we can see that the estimated probability function has been shifted up, e.g. this kind of person who is 18 years old would have rather higher estimated probability to choose the award, but still lower than 0.5. Given that the probability function is just shifted up, the minimal probability can be found again by someone who is 49 years old and lies about the value of 0.3. Hence, one would conclude that this type who is around 49 years old would not accept an award, but rather the reward for the environmental protection. Now putting those people in a social situation what is modeled through an interview and not through self-reporting, we can estimate their probability for the choice of award for environmental protection. It is presented in the figure 3. The overall estimated probability is higher than 0.5. However, this estimated probability in the range of the age between 32 and 66 years is smaller

than 0.55 and thus only slightly higher of 0.5 what would be assumed as a likely choice for public award.

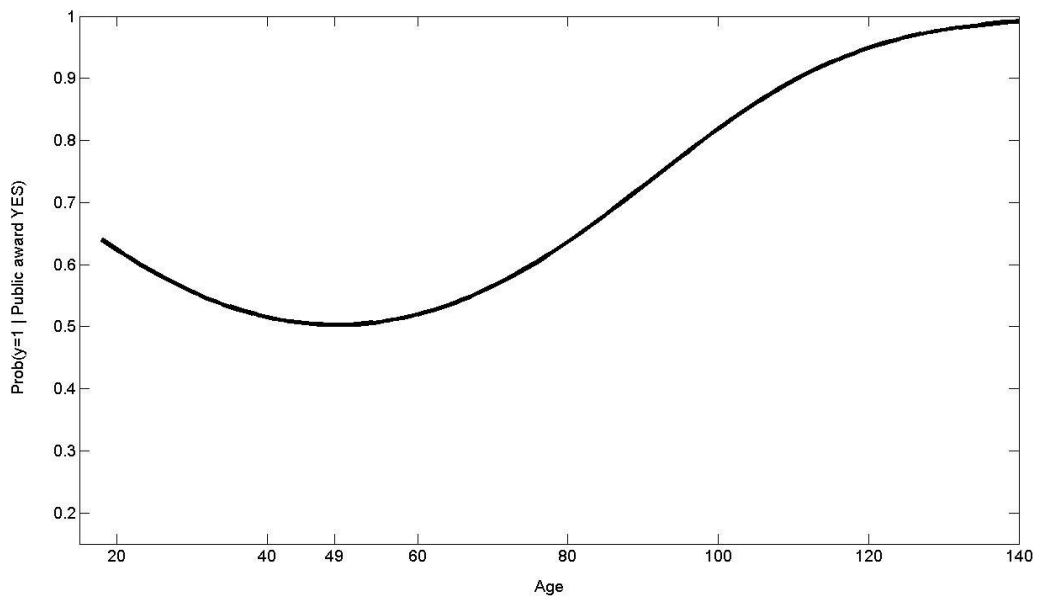


Figure 3: The estimated probability function as the function of age and age^2

Last but not least, we show the estimated probability for choosing a public award for contributing voluntarily to environmental protection for a person who is in a social situation, out of training and who possesses intrinsic motivation and also is concerned about her reputation. This is shown in figure 4. We can see that the estimated probability function for this type of person is overall far away from the value of 0.5 meaning that those people are rather likely to contribute to environment protection on honorary basis. We point out that also in this case the probability for that is lowest around the age of 49 years.²⁶

4.3 Implication of results for political-economical recommendations

According to the results presented in figure 1, it is obvious that the crowding effects of the people in training and without being in a social situation are strongest. Hence, this may let such kind of people rather choose the hypothetical reward of €10. On the other hand, the people who are intrinsically motivated, concerned about their reputation and arranged in a

²⁶ For example, the estimated probability between 42 and 56 years is overall slightly smaller than 0.8 and lowest for the age of 49 years with the value of 0.7948.

social situation may be most likely to possess smallest crowding effects and thus to choose public award.

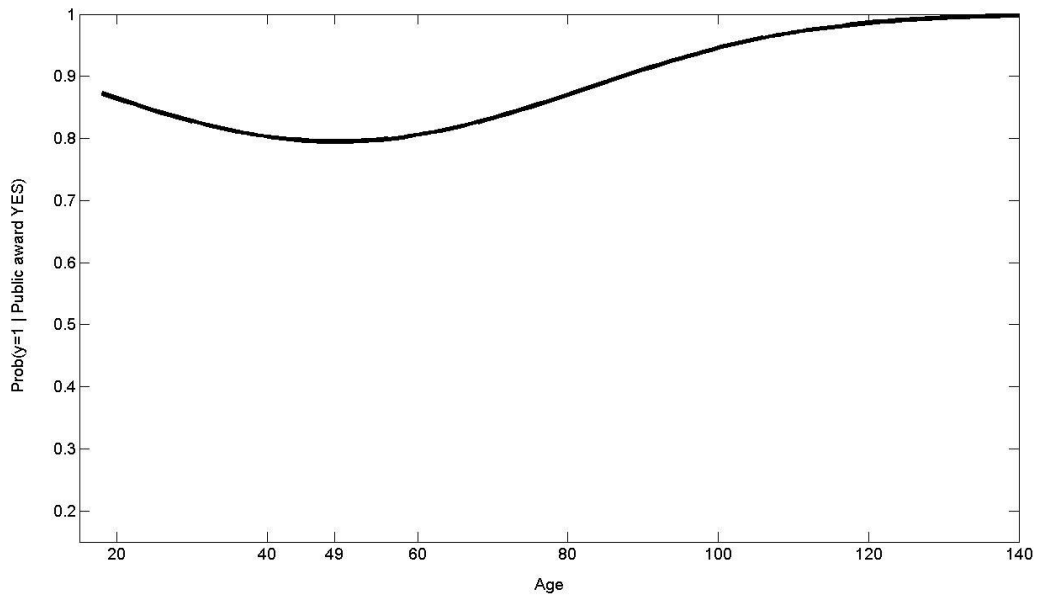


Figure 4: The estimated probability function as the function of *age* and age^2 of an *intrinsically motivated person who takes care about her reputation*

Hence, we would recommend to the government to organize public projects for environment protection via social groups which would create a social situation and therefore increasing the probability for choosing public award by the broader population. This effect may be stronger in the sum if intrinsically motivated people are mixed with non-intrinsically motivated people. Also mixed public group projects where natives and other citizens are mixed together may raise group probability in the sum for choosing the public award. With this approach people maybe experience that even an award instead of money can be an appreciation of one's commitment. Perhaps future projects could be started where people work for the environment for awards more likely. However, young people in training and middle-aged people have lower estimated probability for choosing a for public award. Hence, they should be indeed motivated with other economic, financial or tax incentives to the point to actively contribute to environmental protection. The simplest way would be on direct way via a monetary motivation through reward or an indirect way via increasing their income, e.g. through a tax deduction in the case of an active participation in environmental protection.

5. Conclusion and outlook

This paper reveals motives why people choose a public award instead of €10 as reward for environmental protection which occurs in their free time. The results are achieved on the grounds of a unique data set through interviews and questionnaires. Hence, on this basis political recommendations can be given. According to this, intrinsic motivation to work for the environment is a crucial factor to choose the public award. People who are intrinsically motivated prefer the public award, because their intrinsic motivation is not crowded out as with a €10 reward. Moreover, the reputation may be also an important factor for a not crowded-out motivation for public award. The results also show that people with low income, especially those who are in training, tend to choose €10 which is due to achieving higher marginal utility compared to people without a low income. Also individuals who filled in the questionnaire by themselves instead of participating in an interview, and thus miss a social situation, prefer rather likely the €10. It is obvious that the city of Kassel has to consider those motives according to the specific social groups to motivate them for environmental protection work.

Interesting results by a modified rerunning of the survey could be generated by adding extra variables like questions if the respondent accepts or likes the City of Kassel as an institution, which might have influences on the decision between a public award and €10 as described in section 1. Moreover, better indicators, for example, regarding income or knowledge about the environment could show more accurate results and perhaps effects which do not appear because of missing significance in this paper. Further, more specific questions about intrinsic motivation and about the reasons of their crowding out could explain this issue in more detail.

Furthermore, interesting results could be created with a slight modification of the survey and therefore of the dependent variable. It could be asked if people would rather choose a public award as a reward for environmental commitment or a payment of a realistic hourly wage around €9/h. Probably, the low income effect could be shown in a more evident way. There could also be weaker effects of the crowding out of intrinsic motivation, because of the countervailing effects between increasing utility by higher payments and the crowding out of intrinsic motivation. Considering other exogenous variables, other cities for gathering new data, and other aims in this context may give topics for future research.

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United Nations Environment Programme (UNEP), URL: <http://www.cbd.int/2010/welcome> call date: 10th of February.

Appendix

Variable	Unit	Explanation	Categories
<i>environmental_ngo</i>	Dummy	Member of an environmental NGO	1, if yes, otherwise it is 0
<i>hours_med</i>	Dummy	Respondent would do nature protection work	1, if yes, otherwise it is 0
<i>mon_birds_yes</i>	Dummy	Respondent would do bird count	1, if yes, otherwise it is 0
<i>biod_yes</i>	Dummy	Respondent has heard something about biodiversity	1, if yes, otherwise it is 0
<i>mentioned_birds</i>	Discrete variable	Number of bird species respondent is able to name	0-16 named bird species
<i>notice_birds</i>	Dummy	Respondent notice birds	1, if yes, otherwise it is 0
<i>gender</i>	Dummy	Gender of the respondent	1, if female, otherwise it is 0
<i>wealthy</i>	Dummy	Respondent's residence has an unemployment rate below 7.7%	1, if yes, otherwise it is 0
<i>univ_degree</i>	Dummy	Respondent has an university degree	1, if yes, otherwise it is 0
<i>retiree</i>	Dummy	Respondent is retiree	1, if yes, otherwise it is 0
<i>in_training</i>	Dummy	Respondent is student, pupil or trainee	1, if yes, otherwise it is 0
<i>unemployed</i>	Dummy	Respondent is unemployed	1, if yes, otherwise it is 0
<i>mother</i>	Dummy	Respondent is a mother	1, if yes, otherwise it is 0
<i>father</i>	Dummy	Respondent is a father	1, if yes, otherwise it is 0
<i>self_report</i>	Dummy	Respondent filled in the questionnaire by themselves	1, if yes, otherwise it is 0
<i>born_ks</i>	Dummy	Respondent was born in Kassel	1, if yes, otherwise it is 0
<i>Ks</i>	Dummy	Respondent lives in Kassel	1, if yes, otherwise it is 0
<i>urban_c</i>	Dummy	Respondent's residence is in the area of Kassel but not bordering Kassel	1, if yes, otherwise it is 0
<i>bordering_ks</i>	Dummy	Respondent's hometown borders Kassel	1, if yes, otherwise it is 0
<i>center</i>	Dummy	Respondent lives in the district "Mitte"	1, if yes, otherwise it is 0
<i>far_away</i>	Dummy	Respondent's residence is not around Kassel or Northern Hessen	1, if yes, otherwise it is 0
<i>interviewer_m</i>	Dummy	Interviewer is male	1, if interviewer is male, otherwise it is 0
<i>household</i>	Discrete variable	Number of members in respondent's household	1-15 household member
<i>children</i>	Dummy	Respondent has children or grandchildren	1, if yes, otherwise it is 0
<i>Age</i>	Discrete variable	Respondent's age	9-89 years
<i>born & living</i>	Discrete variable	Interviewer was born and lives in the same place	1, if it is assumed to be true, 0 otherwise

Table 4: Variable definition

Bürgerbefragung zur Biologischen Vielfalt in Kassel		Antworten			
1. Informationen		2. Fragen			
		bitte ankreuzen bzw. ausfüllen			
Vereinte Nationen: 2010 Internationales Jahr der biologischen Vielfalt. Dabei geht es u.a. um Artenvielfalt in der Natur, der Pflanzen- und Tierwelt und den Naturschutz. Auch die Stadt Kassel hat sich bereit erklärt die Biologische Vielfalt in der Stadt zu fördern. Hier weiterschreiben, wenn Platz nicht ausreichend.	1	Haben Sie bisher schon mal etwas von „Biologischer Vielfalt“ gehört?	ja	nein	ein wenig
	2	Wenn Sie die Wörter „Biologische Vielfalt“ hören, womit verbinden Sie die? Welche Begriffe fallen Ihnen dazu ein? (bitte ca. 3 Begriffe nennen)	Begriffe:		
Naturschutz ist überwiegend vom persönlichen Einsatz Ehrenamtlicher abhängig.	3	Für wie viele Stunden im Monat, könnten Sie sich vorstellen, sich in einem Naturschutzprojekt persönlich zu engagieren? (in etwa)	Anzahl Stunden:		
Zur Natur gehört auch die Vogelwelt. Vögel sind sehr mobil, fliegen dahin wo sie die besten Lebensbedingungen finden. Das sind gleichzeitig die Räume mit hoher Biologischer Vielfalt! Hier weiterschreiben, wenn Platz nicht ausreichend.	4	Haben Sie in Ihrem Alltag Begegnungen mit der Vogelwelt ? (Vögel gehört oder gesehen)	ja	nein	ein wenig
	5	(Wenn „ja“ oder „ein wenig“) Können Sie sich erinnern welche Vogelarten dabei waren? (bitte ca. 5 Namen nennen)	Nennungen:		
Wie kriegt man raus wo eine hohe Vielfalt in der Vogelwelt ist? Durch Vogelbeobachtungen bzw. Zählungen - überwiegend von Ehrenamtlichen in Zusammenarbeit mit Wissenschaftlern. (Bundesamt für Naturschutz) Die Beobachtungen sind im Sommer (wenn die Vögel singen).	6	Könnten Sie sich vorstellen bei der Beobachtung und Erfassung einer bestimmten Vogelart mitzuwirken? (Kosten sind damit nicht verbunden, nur ein bisschen Engagement)	ja	nein	
Nehmen Sie an, die Stadt Kassel hätte Geld zur Erhebung der städtischen Artenvielfalt zur Verfügung und Sie könnten mitbestimmen wie dieses Geld verwendet wird. Sie hätten die Wahl: Lösung 1: Eine bezahlte Expertengruppe erfasst die Artenvielfalt. Lösung 2: Die Stadt führt eine groß angelegte Zählaktion mit Beteiligung der Bevölkerung durch und jeder Bürger der sich beteiligt bekommt 10,- EUR . Hier weiterschreiben, wenn Platz nicht ausreichend.	7	Welche Lösung würden Sie wählen?	1	2	
	8	Wenn die Stadt Lösung 2 wählen würde - wäre eine öffentliche Ehrung der beteiligten Bürger besser als die Zahlung von 10,- EUR ?	ja	nein	
Hier weiterschreiben, wenn Platz nicht ausreichend.	9	In welchem Stadtteil wohnen Sie?			
	10	Sind Sie In Kassel geboren?	ja	nein	
	11	Wie alt sind Sie?			
	12		Weiblich		Männl.
	13	Haben Sie Kinder (oder Enkelkinder)?	ja	nein	
	14	Wie viel Personen leben in ihrem Haushalt?	Anzahl:		
	15	Sind sie Mitglied in einem Naturschutzverband oder -verein?	ja	nein	
Hier weiterschreiben, wenn Platz nicht ausreichend.	16	Was machen Sie beruflich? (od. früher beruflich gemacht - od. Schule / Ausbildung / Studiengang etc.)	Nennungen:		

Vielen Dank!

5_9 – 11 /2010

Figure 5: Questionnaire