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DISCUSSION PAPER

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Motivate the Crowd or Crowd-Them Out? The Impact of Local Government Spending on the Voluntary Provision of a Green Public Good

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Motivate the crowd or crowd-them out? The impact of local government spending on the voluntary provision of a green public good

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Abstract

Cities are increasingly hold accountable for climate action. By demonstrating their pro-environmentality through own climate-related activities, they not at least aspire to encourage individual climate protection efforts. Based on standard economic theory there is little reason to assume that this is a promising strategy. Financed by taxpayers' money, cities' contributions are considered as substitutes that crowd-out private contributions to the same public good. Inspired by research on providing information on reference group behavior, we challenge this argument and conduct a framed-field experiment to analyze the impact of reference group information on the voluntary provision of a green public good. We investigate whether information on previous contributions by fellow citizens or the city affect individual contributions. We do not find statistical evidence that city-level information crowds-out additional individual contributions. A reference to fellow citizens significantly increases the share of contributors as it attracts subjects that are not per-se pro-environmentally oriented.

Keywords: Voluntary provision of environmental public goods; Social Norms; Crowding-out; Willingness to pay; Framed-field experiment

JEL Classification: C93, C83, D9, H41, Q54

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1. Introduction

Cities are home to 55% of the world's population, consume about two-thirds of the world's energy and are responsible for 70% of global CO_2 emissions (UN-Habitat, 2021). At the same time, cities account for one-third of public expenditures, manage two-thirds of public investment and directly provide social services to their residents. This is why, not least in the recent IPCC AR6 report, cities are considered to play a key role in driving climate action. They are credited with being able to engage in mitigation and adaptation measures through different channels as they manage assets and public funds, have the power to regulate, and – of particular importance for our study – can mobilize voluntary action by encouraging behavioral lifestyle change (IPCC, 2022). And indeed, a recent interview study on German municipalities' own understanding of their primary tasks in combating climate change reveals that in their view the most important role for local authorities is to serve as a role model for their citizens in behaving pro-environmentally (Alsheimer et al., 2021).

The aim of this paper is to experimentally investigate whether cities can succeed in their self-defined role as catalysts for stimulating individual climate protection efforts. In our framed-field experiment, citizens have the possibility to voluntarily contribute to a local carbon sink through supporting a city governmental afforestation project. We present the contribution decision under three different treatments that allow us to investigate whether information on previous contributions by either fellow citizens or the city government affects individual contributions to the green public good compared to a baseline treatment without further references. By only varying the information on the reference group but not the reference level and using a single-dimension climate protection activity that is both measurable and substitutable, we provide clear insights into the causal relationship on the impact of different reference groups on individual contributions.

Our experimental design is mainly linked to two strands of the literature. First, we contribute to the literature analyzing the impact of governmental spending on voluntary contributions to public goods. Starting from a standard economic point of view, there is little reason to assume that the cities' intention to stimulate individual climate protection efforts is a promising strategy. Economic theory postulates that people only being concerned with the total supply of the public good treat government spending as a substitute for their own contributions. In that sense, voluntary private contributions to a public good are expected to be crowded-out dollar for dollar by government contributions to the same public good (Warr, 1982; Roberts, 1984; Bergstrom et al., 1986; Bernheim, 1986). This particularly holds if contributors, who are also taxpayers, consider the tax-financed donations as a substitute for their voluntary giving (Andreoni and Payne, 2003). However, the empirical evidence on crowding effects of government provision is mixed. It ranges from laboratory experiments that rather find substantial crowding effects (e.g. Andreoni, 1993, Eckel et al., 2005) to observational studies reporting crowding-out (i) to be incomplete and rather small (e.g. Kingma, 1989; Khanna et al., 1995; Payne, 1998; Andreoni and Payne, 2003), (ii) to follow a non-linear relationship (Brooks, 2000) or (iii) to be even positive (e.g., Payne, 2001).[1] A common finding in this literature is that crowding-out varies along several factors such as the level of government support (Wit and Bekkers, 2016) as well as fiscal transparency (Eckel et al., 2005). Other feasible explanations for incomplete crowding-out are offered by theories on other-regarding preferences that incorporate notions of fairness, altruism, social norms

[1] See also Steinberg (1991) and Wit and Bekkers (2016) for comprehensive reviews and meta-studies.

and commitment and thereby extend the standard economic theories (see e.g. Nyborg and Rege (2003) for a literature review of the theoretical and empirical evidence).

Second, our design allows us to combine the government-private-spending nexus with the literature on complying with social norms[2] as a derivative of the used reference groups. So far, it is an open question as to whether or not citizens are influenced by referencing city-level contributions, which may be mediated through a descriptive norm. In the norm literature it is well established that providing information on a prevalent behavior in a group can affect how individuals behave (Cialdini and Goldstein, 2004; Brennan et al., 2016). For norm conformity, "it potentially matters which members of the community have the attitudes and which don't" (Brennan et al., 2016, p. 34). Prior research has shown that providing information on reference group behavior is more effective for closer reference groups – that are among others friends, family or neighbors, than for more distant groups (Goldstein et al., 2008; Neighbors et al., 2008).

We conjecture that city governments are a special case of a rather distant reference group that could potentially serve as a relevant reference group too, and whose own behavior may then induce behavioral change of its citizens. If that is the case, cities could indeed serve as role model for their citizens and encourage individual climate protection efforts. Support for this hypothesis is among others provided by experimental studies find that leaders – as which we consider city governments – have a strong influence on following contributions (Güth et al., 2007; Potters et al., 2007; Drouvelis and Nosenzo, 2013). Within groups, group leaders action can be seen as reliable information on social norms and also transmit normative information towards citizens (Hogg, 2010). This is supported by the literature on the expressive effect of law (Cooter, 1998; McAdams, 2000b, 2000a; McAdams and Rasmusen, 2007), which postulates that laws, regulations and government actions inhibit an expressive power that may translate into socially desirable behavior and interfere with existing norms (Sunstein, 1996). We thus shed light on the question whether social norms can be transmitted through higher-scaled reference groups such as at the city-level. Whether these channels do influence individual behavior and mitigate potential crowding-out effects of governmental spending on private contributions to the same green public good remains an open empirical question. In our view, this is particularly surprising as cities are the scale at which the behavior of individuals is considered to be most directly influenced (Burch, 2010).

Based on our framed-field experimental analysis that comprises contribution decisions by almost 500 citizens we report two main results: First, we do not find evidence for a sizeable crowding-out of individual climate protection efforts when making salient the contributions of the city government at conventional levels of statistical inference. Neither do we observe that providing information of reference activities at the city level crowds-in significantly higher individual contributions. Second, in contrast, information on reference activities are effective at the fellow citizen level as they significantly increase the share of citizens that voluntarily contribute to the green public good. As a result, total contributions of all individuals are about 20% in the *Citizen* treatment compared to the baseline.

[2] Norms – comprising moral and social norms, as well as legal norms – make us accountable to one another, they can imbue behavior with social meaning and enable us to express shared values, meanings and identities (Brennan et al., 2016). Following the definition by Brennan et al. (2016), we understand norms as clusters of normative attitudes and the knowledge of those attitudes.

As norm-based behavioral interventions have gained increased popularity in recent years, future policy designs should carefully reflect the appropriate level of reference-based information. Based on our results we cannot recommend to provide information on city-level spending as a mechanism to stimulate the voluntary provision of green public goods at the individual level. A better strategy to encourage civil climate engagement would rather be a communication of activities within local neighborhood networks.

2. Data

2.1. Experimental Design and Procedure

This study bases on a framed-field experiment that we conducted in November 2020. We implemented the experimental intervention using an online survey created with LimeSurvey. We recruited subjects both from an existing citizen panel[3] and by random mail invitations in the City of Mannheim, Germany. The invitation email or letter invited subjects to participate in an online survey on the *EU General Data Protection Regulation* (GDPR), for which they received a fixed reimbursement of 15 EUR. With this, we ensured that subjects got a feeling of having earned the reimbursement instead of considering it as windfall money. The average time to complete the survey was 18 minutes. We did not inform subjects about the randomized experiment at the end of the survey, in which we scrutinize their behavior with respect to the outcome variable of interest for our study – which is their contribution behavior under the three different treatments with different reference groups.

For the experiment, we randomly assigned subjects into three treatment groups. In each treatment group, subjects had the opportunity to voluntarily contribute a freely chosen amount of their reimbursement to support additional tree planting at a local afforestation project[4] in Mannheim. Specifically, we asked subjects how much they would like to contribute for the removal of 100 kg CO_2 from the atmosphere as part of the local afforestation project serving as a carbon sink. For the contribution statement, we deployed a slider whose initial position was set at 0 EUR. Subjects could then adjust the slider to indicate the amount they wanted to contribute within 10 cents increments. Subjects could contribute a maximum of 15 EUR, which equals their full reimbursement. Prior to the contribution decision, subjects in all treatments received identical information on the need for climate protection, the Parisian climate goals, the role of trees as carbon sinks, and the local afforestation project (see Appendix Figure 2 for a translated version of the information provided and the treatments).

We conducted the experiment in two waves. The first wave only contained the first treatment (*Base*) and was implemented from 19 October to 4 November 2020. In this treatment, the contribution decision was framed in a neutral manner without giving information of any reference groups' behavior. Subjects

[3] The database was initially established by the research department Environmental and Climate Economics of the ZEW – Leibniz Centre for European Economic Research. At the time of the experiment, it contained 1,470 German participants mainly from the Rhein-Neckar-area. We used the experiment to recruit new participants. By recruiting new participants to the existing database, we keep it active and diverse for future interventions. The database covers a broad spectrum of age and income groups, religious affiliations, voting behavior as well as educational level. Compared to the general population, our sample is slightly younger and more educated. Compared to the actual voting behavior (2021), our sample stated voting behavior is greener, but still covers all parties (see Appendix Table 3).

[4] The project is part of the Bundesgartenschau (German National Garden Show) in 2023, which is a well-known federal horticulture show in Germany. It takes place every two years in varying cities –the city of Mannheim is the host 2023. For the event, sealed areas and brownfields are transformed into green areas creating recreational and conservation spaces, and an additional local carbon sink by permanently planting about 1.000 trees.

were only confronted with the question how much they would like to support the local afforestation project (in EUR). The second wave was conducted two weeks later and contained the second and third treatment that contain the reference values. To assure comparability and higher interpretability of the results in terms of the reference group, the references differed only with respect to the different societal levels (fellow-citizens vs. city) but not in their reference values (3 EUR).

In the second treatment (*Citizen*), we provided a descriptive norm information on the mean climate protection activities of fellow citizens living in Mannheim. The data basis for this was the observed mean willingness to pay in the *Base* treatment. We added the following sentences to the description of the donation option: *Maybe the following information is helpful for your decision: In the last weeks, 145 people have already participated in this survey. The average donation of survey participants from Mannheim was about 3€.* With the resulting contributions, conclusions can be drawn about the relationship between individual commitment to climate protection and the commitment of others. In the third treatment (*City*), we provided information on climate protection activities of the city government. For this reference value, the organizers of the local project provided us the actual estimated amount of planned tree plantings, as well as the average expected costs of a tree. Restricting our city-reference group to the inner city area enabled us to give a true expected reference point of 3 EUR in our *City* treatment. We added the following sentences to the description of the donation option: *Maybe the following information is helpful for your decision: In preparation for the Bundesgartenshow 2023, the Bundesgartenschau Mannheim 2023 gGmbH is planting native trees on behalf of the city of Mannheim. According to current information, the city invests about 3€ per citizen of the inner Mannheim city area for this purpose*. To further illustrate the reference information, we included a picture of a slider that is fixed at the value of 3 EUR above the adjustable slider for both *Citizen* and *City* treatments (see Appendix Figures 4 and 5).

2.2. Survey Data

Working with an existing citizen panel offers the advantage to connect new data points with already existing data. In spring 2020 (i.e. 10 months before the experiment was implemented), we conducted a survey among registered subjects to update information on general socio-economics. Moreover, we queried general attitudes towards public infrastructure, housing, and personal climate engagement. In addition, the survey queried subject's identification with their city, whether they know about city climate policies, and if they think that their city engages enough in climate protection. Finally, the survey also covered the Global Preference Survey measures on risk, patience, negative reciprocity, altruism, and trust (Falk et al., 2016; Falk et al., 2018), as well as the New Ecological Paradigm (NEP) Scale that cover ecological beliefs and perceptions about how humans handle and relate to the environment (Dunlap et al., 2000). As we also recruited new subjects, we gave them the opportunity to additionally answer this survey after the experiment, for which they earned another 5 EUR. Appendix Table 1 include a description of variables we use from this survey. That is, our data contains a rich set of additional information that helps to explain more in depth the behavioral and motivational channels that drive our main outcome variable in the different treatments.

3. Literature & Hypotheses

We first derive our hypothesis for the *Citizen* treatment as it serves as a benchmark for analyzing the effects of reference groups' contribution on individual contributions. Individual attitudes and behavior

are strongly intertwined with social interactions and environments and embedded in a complex system of social preferences (Kelman, 1958; Fehr and Fischbacher, 2002). Within this process, social norms play a crucial role (Nolan et al., 2008; Tankard and Paluck, 2016). Social norms refer to common behaviors but also beliefs that support behavioral patterns in a given society. Social norms cover both perceptions about what behaviors are typically approved or disapproved in a society (injunctive norms), as well as perceptions about what actually is common practice and done by others (descriptive norms) (Brennan et al., 2016).

Past research on social norms clearly indicates that witnessing (Cialdini et al., 1991; Cialdini and Goldstein, 2004) or being informed (Schultz, 1999; Goldstein et al., 2008) about how individuals behave in a certain situation can induce behavioral change. This has been proven across a range of domains, such as energy, littering, voting, and recycling waste (Schultz, 1999; Cialdini and Goldstein, 2004; Schultz et al., 2007; Gerber and Rogers, 2009; Allcott, 2011). In this literature, the descriptive norm typically refers to a behavior that can be noticed in other individuals that are exposed to a similar situation, e.g. other citizens that stop littering (Cialdini et al., 1990) or other hotel guests that use their towel multiple times (Goldstein et al., 2008). This works because norms convey social rules of common behavior within a social networks or reference groups. Social identity theory postulates that networks and groups identity are defining aspects of peoples' self-concept and identity (Tajfel and Turner, 2004; Hogg and Reid, 2006). Against this background, groups are an important driver for social comparison, imitation, and repetition (Welsch and Kühling, 2009). Within these groups, people care about what others think about them, they seek approval and social esteem (Christensen et al., 2004), and are unwilling to depart too far from group standards and rather conform (Lewin and Gold, 1999; Cialdini and Goldstein, 2004). Thus, providing information about how a reference group behaves – as descriptive social norms do – can indeed alter behavioral change.

Based on the majority of these findings, we expect the information on the average contribution of previous survey subjects from Mannheim to increase individuals' willingness to contribute to the local afforestation project. Here, the reference group are the citizens of Mannheim that already participated in the survey. Our citizen panel consists to the largest part of individuals that either now live in Mannheim, or have at an earlier stage of recruitment lived in Mannheim and moved to a new city. A smaller portion of the subject pool covers individuals that live in close distance to Mannheim, such as Heidelberg. Nevertheless, we believe that the common factor of either living, having lived or living in close distance to Mannheim suffice to cause a reaction to the information of the reference groups' behavior. In addition, we control for this in the regression analysis. We formulate our first Hypothesis as follows.

H1: *Providing a reference to the average contribution of previous survey subjects from Mannheim in the Citizen treatment increases individuals' willingness to contribute to the local afforestation project compared to the control group* ($Contribution_{Citizen} > Contribution_{Base}$).

Rather explorative is the derivation of the hypothesis for the *City* treatment. Does providing a reference to city contributions crowd-out or crowd-in private contribution to the same good? Starting from standard economic theory, we would expect a negative effect of city government contributions on private contributions. Theoretical models predict that voluntary private contributions to a public good

would be crowded-out dollar for dollar by government contributions to the same public good (Warr, 1982; Roberts, 1984; Bergstrom et al., 1986). This particularly holds if individuals are concerned with the total supply of the public good and treat government spending as a substitute for their own contributions. This is especially true for contributors, who are also taxpayers that consider the tax-financed donations as a substitute for their voluntary giving (Andreoni and Payne, 2003).

However, the empirical evidence on crowding effects of government provision is mixed. The majority of studies looking at observational data from charities report crowding-out to be incomplete and likely to be small, however estimates differ e.g. depending on the considered sectors and time horizon[5]. A panel data analysis among prominent UK charities by Khanna et al. (1995) finds no significant evidence that public donations crowd-out private donations. Khanna and Sandler (2000), using accounting data for large British charities, even report a substantial crowding-in effect of between 13 and 89 cents per dollar of government spending. Brooks (2000) introduces a non-linear relationship between state and private donations and find that philanthropy might be encouraged at low levels of government, but after reaching a certain threshold crowding-out begins. Other than analyses based on observational data, laboratory experimental data find much higher crowding-out effects. Andreoni (1993) reports an average across all rounds of 71.5% crowding-out in this public good game setting. Eckel et al. (2005) play a dictator game and observe nearly 100% crowding-out in their tax frame.

Research provides several plausible explanations why crowding-out might be incomplete or even positive. Several theoretical extensions that describe moral or norm-based behavior including reciprocity, altruism, norms, fairness or commitment yield different predictions concerning a possible crowding-out (or crowding-in) effect of public policies on private contributions (see e.g. Nyborg and Rege (2003) for a literature review of the theoretical and empirical evidence). One channel which is particularly of interest for our setting is provided by Ribar and Wilhelm (2002). Extending Andreoni's impure altruistic model to an economy with an infinitely large number of donors they show that impurely altruistic preferences can lead to asymptotically zero crowding-out if public good provision is large and preferences are concave. Under these conditions, joy-of-giving motives remain effective among the population but large public expenditures depress the marginal utility being associated with altruism. Consequently, according to their model, an increase in government provision has a negligible effect on individual choices.[6]

Another explanation allows us to link incomplete crowding-out to our first hypothesis on the impact of group dynamics and making salient the prevalent norms inherent in a group. That is the literature on group identity and leadership, based on which we would still expect a positive effect of the *City* contribution on individual contributions. Experimental studies find that leaders have a strong influence on following contributions (Güth et al., 2007; Potters et al., 2007; Drouvelis and Nosenzo, 2013).[7]

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[5] A review study by Steinberg (1991) concludes that crowding-out exists but is relatively small as one dollar of government spending crowds-out between US$0.05 and US$0.35 of private donations. A more recent meta-study by Wit and Bekkers (2016) conclude that a $1 increase in government support is associated with an average $0.06 increase in private donations looking at nonexperimental data.

[6] Ribar and Wilhelm (2002) further argue that their theoretical results echo the differences in crowding-out effects between lab experiments and larger-scale econometric studies using field data. While experimental investigations tend to provide evidence for larger crowding-out effects, field data usually indicates lower crowding-out effects.

[7] We acknowledge the research and results found in the charitable giving literature on the role of leadership giving in encouraging individual donations. Leadership gifts in form of a "seed money" or as "matching gifts" have proven quite

Within groups, group leaders can (i) signal on the quality of the public good (Vesterlund, 2003; Andreoni, 2006) but also (ii) be seen as reliable information on social norms and also transmit normative information towards citizens (Hogg, 2010). Sunstein (1996) even postulates that governments cannot avoid affecting social norms and a major share of governmental action intends to change norms, meaning, or societal roles. With sufficiently high community identification, citizens align their behaviors along the normative information provided by (local) governments (Sunshine and Tyler, 2003; Tyler and Jackson, 2014). Signaling city commitment to change can thus encourage civic participation and cooperation[8] (Jackson et al., 2012; Tyler and Jackson, 2014; Romano et al., 2017).

Empirically it is not well tested whether social norms can indeed be transmitted through referencing behavior to higher-scaled groups such as at the city-level. To the best of our knowledge, the experimental study on social norm interventions to increase voluntary carbon offsetting by Huber et al. (2018) is the only other study that too investigates the impact of referencing a government-led intervention – in their study a government policy on carbon offsetting – as social norm. They conclude that government-led interventions could indeed promote voluntary pro-environmental behavior and foster (complementary) action among citizens.

As pointed out for our first hypothesis, most research on the impact of group attachment and norm following has been done at rather narrowly defined groups such as friends, family, neighbors, fellow citizens or hotel guests, and neglects wider defined and more public group memberships. Prior research has shown that providing information on reference group behavior is more effective for closer reference groups than for more distant groups (Goldstein et al., 2008; Neighbors et al., 2008). Thus, the effect of the provided reference frame may depend on how strongly the subjects identify with the group 'city'. In addition, studies find that the effect of leading-by-example is especially strong for democratically elected leaders as this increases their formal authority or representativeness (Güth et al., 2007; Drouvelis and Nosenzo, 2013). They are perceived as particularly legitimate and fair, which increases credibility, a feeling of shared moral values and normative alignment (Hogg, 2010; Jackson et al., 2012).

Based on the crowding literature, we would thus expect that providing an information on city government contributions to the sample public climate good face the risk of crowding-out individual contributions. This strong assumption is however moderated down by the empirical evidence of incomplete crowding and by the notion of existing other-regarding preferences and the interplay of group dynamics and norm following. We thus expect a positive, but smaller effect in our city treatment compared to the citizen treatment.

H2: *Providing a reference to the average contribution of the City has a positive but smaller effect than providing a reference to the average contributions of previous survey subjects from Mannheim (*$Contribution_{Citizen} > Contribution_{City} > Contribution_{Base}$*).*

effective in increasing the share of donors as well as total contributions. This holds for laboratory (Bracha et al., 2011; Eckel and Grossman, 2003; Saboury et al., 2022) as well as field experiments (Gneezy et al., 2014; Huck and Rasul, 2011; List and Lucking-Reiley, 2002; Rondeau and List, 2008).

[8] Only few studies investigate the relationship between actual leaders (local authorities) and public good contributions. In a field study in Bolivia, Jack and Recalde (2015) find that a local authority as an initial decision maker can increase public good contributions when the authority has been democratically elected.

4. Results and Discussion

4.1. Sample Description and Summary Statistics

We have 491 responses, of which 23% are newly recruited subjects while the majority were already registered subjects. The share of females is 46%, the average subject is 38 years old and has a net income between 1,500 – 2,000 Euros per month. The majority of our sample has a university degree and a job. About 48% of our sample would vote for the Green party if there were elections, followed by CDU/CSU (16%), and SPD (12%). Appendix Table 2 tests the balance of covariates across the three treatment conditions[9]. Subjects are close to equally split in treatments, 168 subjects are in the *Base*, 160 in the *Citizen*, and 163 subjects in the *City* treatment. We ran a power analysis based on the results of the first treatment. This analysis indicated that 174 (97, 41) observations are needed in a treatment group to establish a 15% (20%, 30%) difference in means[10] for a power of 0.8 when alpha equals 0.05. Given our total sample size, we can conclude that the experiment is well powered and large enough to detect and statistically identify effect sizes of about 15% or larger.

4.2. Contribution Decisions

As primary outcome measure, we analyze the willingness to contribute to a local forest project that supports the creation of a carbon sink in form of a voluntary contribution decision. We investigate both the extensive margin (i.e. share of donors) and intensive margin (i.e. amount of money contributed) effects of receiving information on the reference contributions of fellow citizens, the city, and no information. Over the whole sample, the total share of contributors amounts to 48.6%. Positive contributors give on average 7.4 EUR, which equals 49% of their total endowment. Considering the complete sample, subjects are willing to contribute on average 3.61 EUR.

Extensive Margin Effect

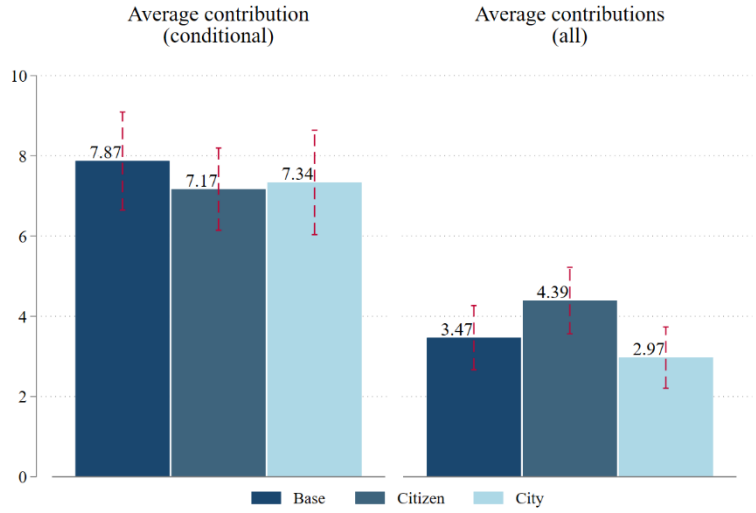
In the *Base* treatment, about 44% of all subjects were willing to make a positive contribution. In the *Citizen* treatments, 61% are willing to contribute, which is a significantly higher share compared to the *Base* treatment (Chi2-test, p-value: 0.002). In the *City* treatment, only 40% contribute. This share is significantly smaller compared to *Citizen* (Chi2-test, p-value: 0.000), but not statistically different from the *Base* (Chi2-test, p-value: 0.474). The regression analysis (see Table 1, columns 1 and 4) reveals that being in the *Citizen* treatment significantly increases the likelihood to contribute a positive amount compared to the *Base* treatment. The *City* treatment does not trigger such effects. We summarize these first findings in the following result:

Result 1: Providing a reference group of climate protection activities of fellow citizens increases the likelihood to give compared to the Base treatment. In contrast, introducing a reference group of climate protection activities of the city has no statistically significant effect on the likelihood to give compared to the baseline.

[9] Concerning the basic socio-economics, the balance table reports that participants in the *Citizen* treatment are significantly older than in the *Base* treatment. In addition, participants in the *Base* treatment are weakly more educated and have a university degree. To account for this, we control for the basic socio-economics in our regression analyses.

[10] Previous studies using descriptive norm treatments report rather large effect sizes of 20 to 30%. Goldstein et al. (2008) find that the descriptive treatment yielded a significantly higher towel reuse rate (44.1% vs. 35.1%). Cialdini et al. (1990) find that introducing the descriptive norm decreases littering (11% vs. 41%). Agerström et al. (2016) find that the descriptive norm treatments significantly increased the likelihood to donate compared to the control condition (69.6% vs. 42.6%).

Figure 1: Average contributions (in EUR) across treatments



Intensive Margin Effect

We next turn to the effects on the average contribution of those who give (see Figure 1). In *Base*, the average contribution of those who give is 7.9 EUR. Providing the *Citizen* reference causes a slight decrease to 7.2 EUR. Providing the *City* reference also causes a decrease of average contribution to 7.3 EUR. Both changes in the *City* and *Citizen* treatment are not statistically significant from the *Base* treatment. Median contributions are 5 EUR in all three treatments. The truncated regression analysis (see Table 1, column 2 and 5) confirms that neither the *Citizen* nor the *City* treatment has a significant impact on the contributions conditional on being a contributor.

Result 2: Neither providing a reference group of climate protection activities of fellow citizens nor a reference group of climate protection activities of the city have a statistically significant effect on the contributions conditional on being a contributor (compared to the Base treatment).

Considering the amount given over the whole sample, contributions in *Base* amount to 3.5 EUR. We have seen that the average contributions conditional on being a contributor decrease in the *Citizen* treatment (compared to *Base*). Compared to *Base* the average contributions increase to 4.4 EUR in *Citizen*, but this increase is not statistically significant from *Base* (t-test, p-value: 0.108). In *City*, the average contribution is 3 EUR; this decrease is not statistically significant from *Base* (t-test, p-value: 0.369). However, *Citizen* average contributions are statistically different from *City* average contributions (4.4 EUR vs. 2.9 EUR; t-test, p-value: 0.014). The regression analysis (see Table 1, columns 3 and 6) confirms both findings.

Result 3: Considering the whole sample, providing a reference group of climate protection activities of fellow citizen has a positive effect on the average contributions (compared to the Base treatment). Introducing a reference group of climate protection activities of the city has no statistically significant effect on the average contributions (compared to the Base treatment).

Table 1: Estimation results

	(1) Share	(2) Contribution (cond.)	(3) Contribution (all)	(4) Share	(5) Contribution (cond.)	(6) Contribution (all)
Treatment						
Citizen	0.44**	-1.50	0.92	0.56*	-0.87	1.11
	(0.14)	(1.75)	(0.57)	(0.22)	(1.57)	(0.81)
City	-0.09	-1.13	-0.50	-0.24	-1.23	-1.06
	(0.14)	(1.91)	(0.57)	(0.21)	(1.91)	(0.78)
Socio-Economics						
Age				0.01 (0.01)	0.15** (0.05)	0.08** (0.03)
Female (y/n)				0.41* (0.19)	2.22 (1.47)	1.66* (0.67)
Income				0.13* (0.05)	1.28*** (0.38)	0.65*** (0.17)
Has university degree (y/n)				-0.04 (0.21)	-1.97 (1.55)	-0.35 (0.71)
Sample characteristics						
Mannheim residence (y/n)				0.00 (0.18)	1.01 (1.38)	0.08 (0.69)
Newly recruited (y/n)				0.30 (0.29)	2.06 (1.97)	1.39 (1.05)
Climate Attitudes						
High climate engagement (y/n)				-0.65 (0.43)	-0.72 (3.30)	-2.27 (1.58)
Others motivate (y/n)				0.70* (0.30)	3.15 (1.93)	3.28** (1.13)
High NEP (y/n)				0.29 (0.19)	-4.11** (1.40)	-0.88 (0.69)
Vote green (y/n)				0.24 (0.18)	1.79 (1.50)	0.99 (0.63)
Impact BUGA				0.14 (0.17)	0.96 (1.35)	0.70 (0.60)
Economic Preferences						
Altruism				0.05 (0.04)	0.08 (0.36)	0.16 (0.13)
Time				0.03 (0.05)	0.67 (0.44)	0.22 (0.15)
Risk				0.03 (0.04)	-0.31 (0.33)	0.04 (0.14)
Perception				0.01 (0.04)	-0.40 (0.29)	-0.09 (0.15)
Constant	-0.15	4.03*	3.47***	-2.46***	-8.99	-6.44**
	(0.10)	(1.80)	(0.40)	(0.62)	(5.26)	(2.12)
Observations	491	491	491	266	265	265
Adjusted R^2			0.009			0.172

*Note: Models in columns 1-2 as well as 4-5 are two-stage hurdle models. The first stage (1 and 4) are probit regression models, where the dependent variable is equal to one for positive donations and zero otherwise (extensive margin). The second stage (2 and 5) are truncated linear regression models, where the dependent variable is the amount given for the local afforestation project, conditional on contributions being positive (intensive margin). Models 3 and 6 are OLS regressions, with the dependent variable being the amount given for the local afforestation project considering the whole sample. Standard errors in parentheses. *(**, ***) means that the given effect is different from zero at the 10% (5%, 1%) significance level.*

The results of Table 1 are robust when we control for certain characteristics of our subjects, e.g. whether the subject currently lives in Mannheim[11], and whether s/he was newly recruited and participated for the first time in a ZEW survey (see Appendix Table 4).

Summing up, we can confirm our first hypothesis *(*$\text{Contribution}_{Citizen} > \text{Contribution}_{Base}$*)* for the extensive margin. We do not find support for our second hypothesis *(*$\text{Contribution}_{Citizen} > \text{Contribution}_{City} > \text{Contribution}_{Base}$*)*. This points into the direction that while providing information of a reference groups' behavior that activated the social norm channel is effective at the *Citizen* level, scaling this reference frame up to the *City* level is not as effective.

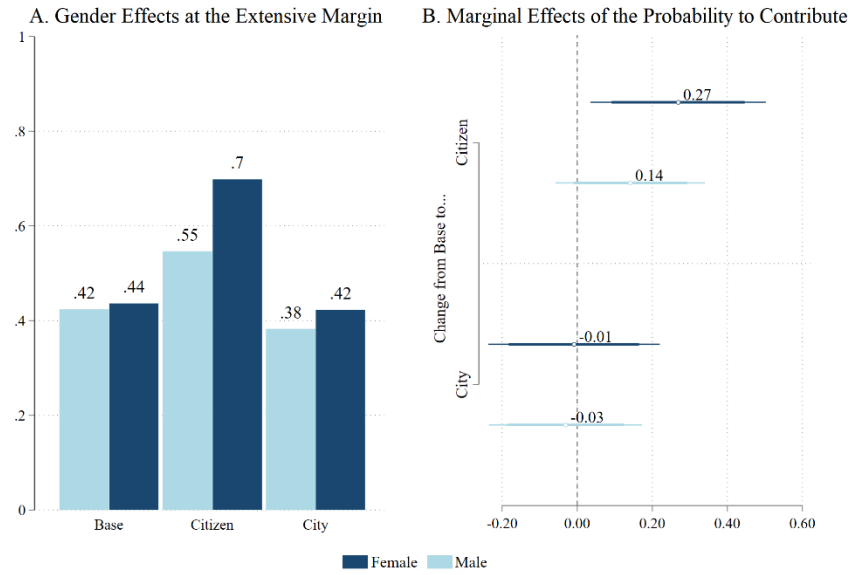
[11] We assume that the common factor of living, having lived or living in close distance to Mannheim suffice to cause a reaction to the reference values provided in both treatments that either refer to citizens or the city. To check the robustness of this, we test whether participants that live in Mannheim respond differently compared to not living in Mannheim – they do not.

4.3. Heterogeneities in Treatment Effects

In a next step, we focus on better understanding to which extent the characteristics of our sample explain contribution decisions. Measures come from additionally collected survey data (see section 2.2) and explore sample characteristics ranging from socio-economics, environmental and identification. We find that the most important characteristic driving the effects at the extensive margin is gender.

In *Base*, the share of female and male contributors is almost identical (see Figure 2, Panel A). This changes in *Citizen*, where the share of female contributors is significantly higher than the share of males (Chi2-test, p-value: 0.049). In addition, the observed increase of female contributors by 27 percentage points from *Base* to *Citizen* is statistically significant at the 1% level (see Figure 2, Panel B). In *City*, the differences between male and female contributors dissipate. From that, we conclude that female subjects mainly drive our main extensive margins effect. This result is in line with a small but very consistent body of research that finds gender-specific differences in charitable giving (Israel, 2007; Croson et al., 2009; Einolf, 2011; Mesch et al., 2011), and gender-specific responses to social information treatments. Croson and Gneezy (2009) report that females react more sensitive to context variations in experimental settings. Goeschl et al. (2018) find in their experiment that females react more when high social information (using a reference value of 7 EUR (70% of the initial endowment) vs. 1 EUR (10% of the initial endowment)) are provided. In contrast, in a hypothetical choice experiment, Croson et al. (2009) find that males react more strongly towards social information.

Figure 2: Gender Effects



Notes: Panel A shows the likelihood to make a donation in each treatment for both males and females. In Panel B, we plot the main estimation results. Plots in the Citizen (City) domain indicate the difference in the likelihood to contribute in Citizen (City) compared to Base for both males and females. The full regression outputs for the male plots are reported in Supplementary Table 5, column 1, and for the female plots in Supplementary Table 5, column 3. We control for age, income and having a university degree.

In a next step, we consider a sub-group analysis of environmental preferences. Figure 3 shows the estimated marginal effects of the change from *Base* to *Citizen*, *Base* to *City,* as well as the interaction effects of those changes. Panel A and B of Figure 3 are concerned with attributes that relate to the environment. We asked participants on a 1-5 point Likert-Scale if they i) engaged in climate activities in the past, ii) are locally active, and if iii) are motivated when they observe climate activities of others. Additionally, we have iv) the NEP score of participants and v) their voting behavior. Panel A of Figure 3 shows the changes in behavior of those participants that we would classify as pro-environmental. That are those participants that indicated at least a 4 or 5 on a 5-point Likert-scale for questions i) – iii), as well as participants that vote the green party and have a NEP score above 3, which is the threshold above which someone is considered to have a pro-ecological worldview. Panel B of Figure 3 shows the changes in behavior of those participants that we would classify as non-pro-environmental. That are participants that indicated 1-3 for questions i) – iii), that do not vote the green party and have a NEP score below 3, which is the threshold above which someone is considered to have an anthropocentric worldview. In previous research, the NEP indicator was positively correlated with behavioral intentions and behaviors (Stern, 2000; Derdowski et al., 2020). Other survey measures have proven to be effective predictors of pro-environmental behavior, too. Huber et al. (2020), for example, finds that having performed pro-environmental tasks in the past (e.g. recycling) does strongly predict future recycling behavior.

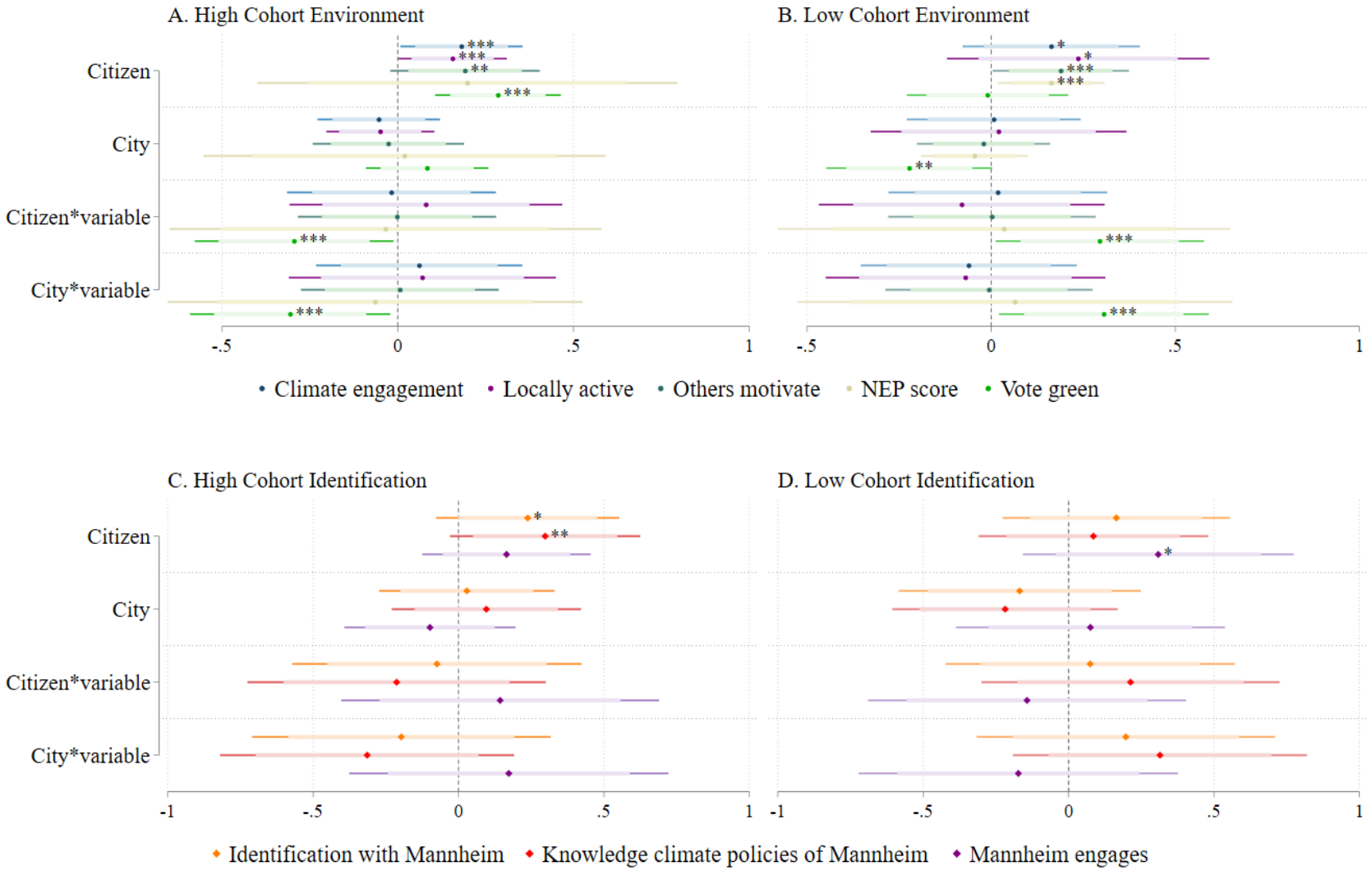
Pro-environmentally oriented individuals contribute more in *Citizen* than in *Base*. Panel A of Figure 3 shows that the share of contributors increases significantly for almost all defined pro-environmental cohorts but only in *Citizen* and not *City*. As Panel B of Figure 3 shows, the *Citizen* treatments appears to also have the power to motivate non-pro-environmental subjects to become contributors. The *Citizen* treatment significantly increases i.) the share of those that give and have a low NEP score by about 20 percentage points compared to *Base*, and ii) share of those that give and do not vote the green party by

over 30 percentage points. In addition, we see that *Citizen* crowds-in donations of those that stated that stated that they do not engage in climate activities by 18 percentage points.

Finally, we investigate sub-group effects of our identification variables (see Figure 3, Panel C and D). This is motivated by findings that contributions as well as complying with a group strongly depends on the strength of a shared group identity (Turner et al., 1979; Terry and Hogg, 2000). For example, individuals are more willing to give to charitable causes that favor individuals they feel close to (Jones and Rachlin, 2006; Harrison et al., 2011; Duclos and Barasch, 2014). We measure identification based on three survey measures. These measure if subjects i) have a high (Panel C) or low (Panel D) identification with the city of Mannheim, ii) have knowledge (Panel C) or not (Panel D) of the climate policies of the city of Mannheim, and iii) think that the city of Mannheim engages sufficiently (Panel C) or not sufficiently (Panel D) for climate protection.

We do not find that subjects with a high or low identification with Mannheim behave significantly differently from each other in *Base. Citizen* crowds-in further donations from subjects with a high identification (Panel C), but not for those with a low identification. For knowledge in climate policies of Mannheim, we see a slight difference in *Base* (Appendix Table 8, column 3 and 4): Participants that are aware of climate policies are 31 percentage points more likely to contribute than those who do not know the climate policies. In *Citizen*, more contributors are crowded-in in the aware cohort (Panel C), but not in the unaware cohort (Panel D). Concerning perceptions about the sufficiently of Mannheim's engagement for climate protection, we do not find differences in behavior in *Base* (Appendix Table 8, column 5 and 6). In *Citizen,* we observe an increase the share of donors among participants that believe that Mannheim does not engage sufficiently by 32 percentage points compared to *Base*.

Figure 3: Estimated Marginal Effects of the Treatments on the Probability to Contribute



*Note: see Appendix Table 6 for regression estimates on environmental preferences; and Appendix Table 8 for regression estimates on identification variables. *(**, ***) means that the given effect is different from zero at the 10% (5%, 1%) significance level.*

4.4. Anchoring Effects

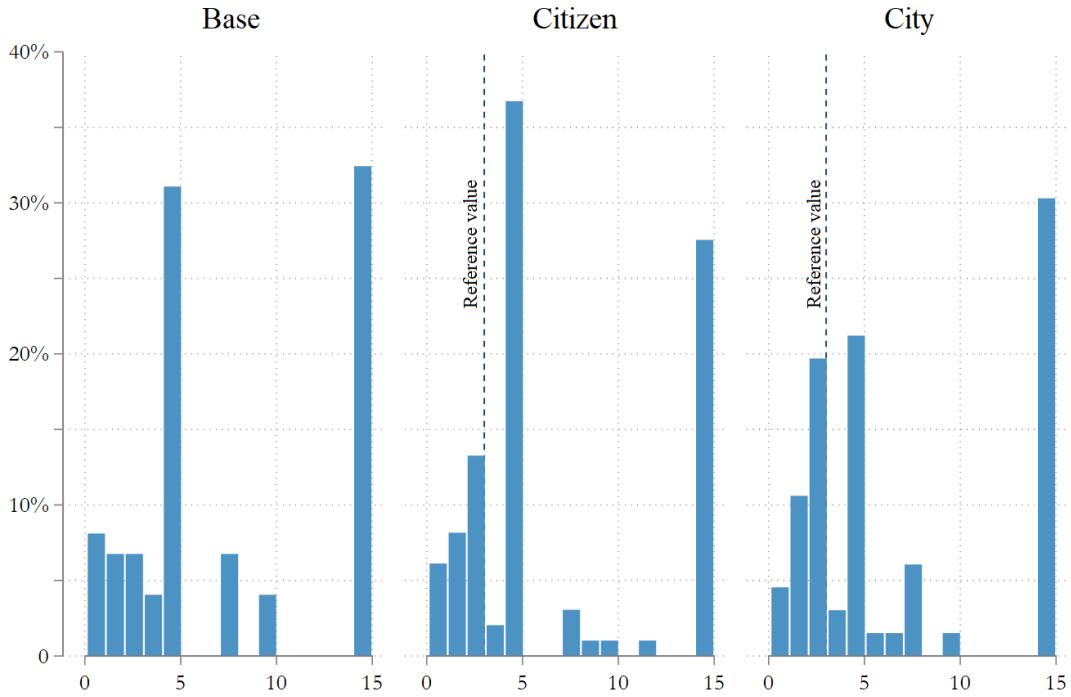
Lastly, we explore whether a specific design feature of our experimental design may influence reactions at the intensive margin - the anchoring effects. The anchoring effect is a cognitive bias: first impressions or short term memories on figures, which could even be a date of birth or a social security number can affect giving in experiments, which may then lead to an over- or underestimation of the actual effect to be measured (Cason and Mui, 1998; Ariely et al., 2003).

In our treatments, the anchoring effect could stem from the introduced reference of 3 EUR in the *Citizen* and *City* treatments, which could serve as 'anchor' in our subjects' decision making. Research on reciprocity and conditional cooperation confirms that donations increase (decrease) when reference values communicated to subjects are varied, e.g. from high to low. Goeschl et al. (2018) find that providing high social information (using a reference value of 70% of participants' initial endowment) significantly increases average donations by 43 percent relative to donations in their control setting. They do not find that providing low social information (using a reference value of 10% of participants' initial endowment) reduces giving significantly. Borgstede et al. (1999) find that by increasing the provided descriptive norm strength ("In the last survey 18% [20%, 40%, 60%, 80%] of the respondents thought that one should buy organic food.") also the stated willingness to buy organic food of subjects increases.

We have two reasons to assume that anchoring effects do not interfere with treatment effects in our setting. First, we introduce both in the *Citizen* and *City* treatment the same reference value of 3 EUR. We compare changes in contribution behavior in both treatments against the *Base* treatment. Thus, differences in behaviors between the two reference group treatments will not stem from an anchoring effect as they are subject to the same reference value. Second, we only observe differences in the *Citizen* and *City* treatment (compared to *Base*) at the extensive margin. Nonetheless, it still may be worthwhile to be worthwhile to examine the distribution given contributions (see Figure 4). All treatments have a contribution peak at 5 EUR (31.1% in *Base*, in *Citizen* 36.7%, and 21.2% in *City*), as well as 15 EUR (32.4% in *Base*, 27.6% in *Citizen* 30.3% in *City*). In addition, we observe an additional peak around 3 EUR in the *Citizen* and *City* treatments and find a weakly statistically significant relationship between treatment and choosing 3 EUR (Fisher's exact test, p-value: 0.065). While in the *Base* treatment, only 4.1% contributed 3 EUR, this share increases significantly in both treatments (see Appendix Figure 1). In the *Citizen* treatment the share increases to 11.2% (Chi2-test, p-value: 0.089) and in the *Citizen* treatment to 15.6% (Chi2-test, p-value: 0. 024). These results suggest that introducing a reference value does indeed affect contribution levels and result in 3 EUR-contribution peaks in both treatments.

However, our key concern is where this slight redistribution comes from. Contributions shift in the bottom third of the contribution range in the 3 EUR reference settings compared to the *Base* setting. In the *Citizen* treatment, very low contributions (1-2 EUR) are crowded-out and shift rather to 3 or 5 EUR. In the *City* treatment, the bunching around 3 EUR appears to be a bit more condensed. However, these shifts are comparably small considering the average contribution levels of around seven EUR.

Figure 4: Distribution of contributions by treatment and scaled to percentages



In our setting, the reference value resulted from the donation in the *Base* treatment and therefore left no room to test a variation in reference values. Given the responsiveness to certain social information frames – which appear to be especially strong for peer group references – but also the responsiveness to higher norms of generosity (expressed through high reference values), we believe that it would be worthwhile to investigate the potentials of larger reference values used to potentially boost the effectiveness of such behavioral interventions.

5. Concluding Remarks

Against the empirical trends of a more fragmented multi-level climate governance, this paper experimentally investigates whether cities can succeed in their self-defined roles as catalysts for stimulating individual climate protection efforts. Our experimental design was inspired by the notion that providing information on city-level activities on the one hand might result in a crowding-out of private contributions to the same green public good if individuals are primarily concerned with its total supply. On the other hand, following the literature on social norms, leadership and the expressive effect of laws, a reference to city-level activities could also counteract potential crowding effects if it translates into a descriptive norm of socially desired behavior.

We do not observe a statistically significant crowding-out of individual climate protection efforts through providing information of city-level activities. Neither do we observe a crowding-in of additional individual contributions. In contrast, providing a reference to the average contributions of the fellow citizens is effective as it significantly increases the share of citizens that voluntarily contribute to the green public good. As a result, total contributions of all individuals to the public good are about 20% higher in the *Citizen* treatment compared to the baseline. Against the vast research on descriptive social norms (Schultz et al., 2007; Goldstein et al., 2008; Allcott, 2011; Farrow et al., 2017) and their influence on individual pro-environmental behavior, these results are in line with previous findings.

As an important insight, we find that the positive effect of the *Citizen* treatment is primary driven by females. This observation is consistent with early findings from social psychology that women are more likely to react to social norms and support pro-environmental behavior and is in line with a small but very consistent body of research that finds gender-specific differences in charitable giving (Israel, 2007; Croson et al., 2009; Einolf, 2011; Mesch et al., 2011). In addition, one important further channel, which explains the dominance of the *Citizen* treatment in our setting, is the fact, that it attracts additional contributions from subjects, which are not per-se pro-environmentally oriented. Consequently, this treatment helps to successfully target a part of the population, which is difficult to reach through conventional environmental protection appeals. Based on our results we cannot recommend providing information on city-level spending as a mechanism to stimulate the voluntary provision of green public goods at the individual level. A better strategy to encourage civil climate engagement would rather be communication of activities within local neighborhood networks.

We hope that our experimental findings inspire future research on the scalability of social norms. A promising starting point is the role of different reference values. Given our research design, we have provided a fix reference value of 3 EUR in both treatments. Research on reciprocity and conditional cooperation shows that contributions increase (decrease) when subjects observe high (low) reference values. Goeschl et al. (2018) find that providing high-level reference points (using a reference value of 70% of the initial endowment significantly increases average giving, whereas providing a lower value (10% of the initial endowment) has no effect. Gerber and Rogers (2009) find that especially among individuals that do not engage often in the targeted behavior, the message "thousands people vote so you should too" can be more effective than the message "low proportion of people vote so you should do it." In addition, potential interactions with the treatment may influence the perception and effectiveness of the reference value as the references allow drawing conclusions about one's own engagement compared to the one of others. Schultz et al. (2007) find that subjects of their study began to use more electricity if they learned that they were using less electricity than the presented norm of their neighbors. A further interesting extension might combine different institutional norms with well-documented instruments from the charitable giving literature. Donations of lead- or well-known donors with high social status trigger following donations (Ebeling et al., 2017), especially when announcing these donation publicly (Vesterlund, 2003). The same effect is found for seed money or matching grants (List and Lucking-Reiley, 2002; Kesternich et al., 2016; Karlan and List, 2020). We consider this a promising avenue for further research.

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Supplementary Online Appendix

Appendix Table 1: Description of Dependent and Independent Variables

Label	Description
Treatment	Indicates the treatment [1 = *Base*; 2 = *Citizen*; 3 = *City*].
Main Outcomes	
Positive contributors	Has the value 1 when the participant made a positive contribution and 0 otherwise.
Contributions (cond.)	Indicates the amount given to the local reforestations project considering only the positive contributors.
Contributions (all)	Indicates the amount given to the local reforestations project considering the whole sample (positive and zero contributors).
Socio-Economics	
Age	Indicates the age of the participant.
Female	Has the value 1 when the participant is female and 0 otherwise.
Income	Indicates the net income of the participant [1 = <500€, 2= 500-1.000€, 3= 1.000-1.500€, 4= 1.500-2.000€, 5= 2.000-2.500€, 6= 2.500-3.000€, 7= 3.000-3.500€, 8= >3.500€].
Has uni degree	Has the value 1 when the participant has a university degree, and the value 0 if not. This includes having no degree, having graduated from the different German school types, or have finished an apprenticeship.
Sample Characteristics	
Mannheim residence	Has the value 1 when the participant lives at the time of the experiment in Mannheim and 0 otherwise.
Newly recruited	Has the value 1 when the participant was newly recruited to the panel and added to the database at the time of the experiment and 0 otherwise.
Climate Attitudes	
Climate engagement	Indicates to what extent the participant engages in climate protection activities. [1 = not at all, 2 = only a little, 3 = to some extent, 4 = rather much, and 5 = very much].
Climate engagement (high)	Dummy variable created from 'Climate engagement'. Has the value 1 when participant indicated that s/he engages 'very much' or 'rather much' in climate protection activities.
Others motivate	Indicates to what extent the participant is motivated by climate change activities of others [1 = not at all, 2 = only a little, 3 = to some extent, 4 = rather much, and 5 = very much].
Others motivate (high)	Dummy variable created from 'Others motivate'. Has the value 1 when participant indicated that s/he is either 'very much' or 'rather much' motivated by climate change activities of others and 0 otherwise.
High NEP	Indicates the 'pro-ecological' worldview of the participant. The score is constructed as mean of the nine NEP questions. A score above three is considered as the boundary between an anthropocentric and a pro-ecological worldview.
Vote green	Has the value 1 when the participant would vote the green party at the next election and 0 if the participant would vote any other German party but not the green party.

Locally active	Indicates to what extent the participant is participating actively in any local organizations [1 = not at all, 2 = only a little, 3 = to some extent, 4 = rather much, and 5 = very much].
Locally active (high)	Dummy variable created from 'Locally active'. Has the value 1 when participant indicated that s/he is either engaging 'very much' or 'rather much' in any local organizations and 0 otherwise.
Impact BUGA	Indicates to what extent participant believes that the spaces created by the German national garden show (BUGA) increase the living qualities in the city [1 = not at all, 2 = only a little, 3 = to some extent, 4 = rather much, and 5 = very much].
Impact BUGA (high)	Dummy variable created from 'Impact BUGA'. Has the value 1 when participant indicated that s/he thinks that the newly created spaces increase living quality either 'very much' or 'rather much' and 0 otherwise.
Identification Mannheim	
Identification with Mannheim	Indicates to what extent the participant identifies with the city of Mannheim [1=No identification, 2=weak identification, 3=average identification, 4=high identification, 5=full identification].
Identification with Mannheim (high)	Has the value 1 when participant indicated that s/he identifies with the city of Mannheim either 'full' or 'high' and 0 otherwise.
Knows climate policies of Mannheim	Has the value 1 when the participant knows about the climate policies or actions of the city of Mannheim and 0 if not.
Mannheim engages	Indicates whether participant believes that city of Mannheim engages sufficiently for climate change [1 = not at all, 2 = only a little, 3 = to some extent, 4 = rather much, and 5 = very much].
Mannheim engages sufficiently	Has the value 1 when participant indicated that s/he thinks that the city of Mannheim either engages 'rather much' or 'very much' in climate protection.
GPS Measures	
Altruism	Constructed based on two GPS questions on altruism using the following formula: Altruism = 0.6350048 × 'GPS question on willingness to give to good causes on a scale from 1 to 10' + 0.3649952 × 'GPS question on hypothetical donation'.
Time	Indicates if the participant is willing to give up something that benefits him/her today in order to benefit you more in the future on a scale from 1 to 10.
Risk	Indicates how much the participant is willing to take risks on a scale from 1 to 10.
Perception	Indicates whether participant is concerned about what others think about herself [1 = not at all, 2 = only a little, 3 = to some extent, 4 = rather much, and 5 = very much].

Appendix Table 2: Summary Statistics

				Mean (Std. Dev.)				t-test, p-value	
	N	Min	Max	All	Base (1)	Citizen (2)	City (3)	(1)-(2)	(1)-(3)
Socio-Economics									
Age	484	18	88	37.6 (14.2)	36.3 (12.3)	40 (15.8)	36.5 (14.1)	-3.8**	-0.3
Female	481	0	1	0.5 (0.5)	0.4 (0.5)	0.5 (0.5)	0.5 (0.5)	-0.0	-0.1
Income	421	1	8	4.3 (2.2)	4.8 (2.3)	4.5 (2.2)	4.3 (2)	0.3	0.5*
Has university degree	480	0	1	0.7 (0.5)	0.7 (0.5)	0.6 (0.5)	0.7 (0.5)	0.1*	-0.0
Sample Characteristics									
Mannheim residence	422	0	1	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.6 (0.5)	-0.0	-0.0
Newly recruited	491	0	1	0.2 (0.4)	0.3 (0.4)	0.2 (0.4)	0.2 (0.4)	0.1*	0.0
Identification Mannheim									
Knows climate policies Mannheim	218	0	1	0.5 (0.5)	0.4 (0.5)	0.5 (0.5)	0.5 (0.5)	-0.1	-0.1
Mannheim identification	228	1	5	3.2 (1)	3.2 (0.9)	3.3 (1)	3.1 (1.1)	-0.1	0.1
Mannheim identification (high)	230	0	1	0.4 (0.5)	0.3 (0.5)	0.5 (0.5)	0.3 (0.5)	-0.2*	-0.0
Mannheim engages	185	1	5	2.9 (0.8)	2.7 (0.8)	3 (0.7)	2.8 (1)	-0.2	-0.1
Mannheim engages sufficiently	230	0	1	0.3 (0.5)	0.3 (0.5)	0.3 (0.5)	0.4 (0.5)	-0.0	-0.1
Climate Attitudes									
Climate engagement	442	0	5	3 (1)	3 (1)	2.9 (0.9)	3 (0.9)	0.1	-0.0
Climate engagement (high)	491	0	1	0.3 (0.5)	0.4 (0.5)	0.3 (0.5)	0.3 (0.5)	0.1	0.0
Others motivate	432	1	5	3.4 (1.1)	3.4 (1.1)	3.3 (1)	3.4 (1.1)	0.2	0.0
Others motivate (high)	491	0	1	0.6 (0.5)	0.6 (0.5)	0.5 (0.5)	0.6 (0.5)	0.1*	0.1
NEP score	453	2.2	4.9	3.7 (0.5)	3.7 (0.5)	3.7 (0.5)	3.7 (0.5)	0.0	0.0
NEP score (high)	491	0	1	0.9 (0.2)	0.9 (0.3)	1 (0.2)	1 (0.2)	-0.0	-0.0
Vote green	491	0	1	0.4 (0.5)	0.4 (0.5)	0.4 (0.5)	.4 (0.5)	-0.0	0.0
Impact BUGA	403	1	5	3.6 (1)	3.6 (1.1)	3.6 (1)	3.5 (1)	-0.0	0.1
Impact BUGA (high)	403	0	1	0.6 (0.5)	0.5 (0.5)	0.6 (0.5)	0.5 (0.5)	-0.1	0.0
Locally active	451	1	5	1.8 (1)	1.8 (1.1)	1.8 (1)	1.7 (1)	0.0	0.1
Locally active (high)	491	0	1	0.2 (0.4)	0.2 (0.4)	0.1 (0.3)	0.1 (0.4)	0.0	0.0
GPS Measures									
Altruism	453	0	10	7.3 (2.1)	7.4 (2.2)	7.2 (2.1)	7.4 (2.2)	0.2	0.0
Time	449	0	10	7.4 (1.8)	7.4 (1.8)	7.5 (1.7)	7.4 (1.8)	-0.0	0.0
Risk	451	0	10	5.4 (2.2)	5.3 (2.1)	5.4 (2.2)	5.4 (2.3)	-0.0	-0.1
Perception	446	0	10	5.4 (2.4)	5.5 (2.4)	5.3 (2.4)	5.5 (2.5)	0.2	-0.0

*Note: The values displayed for the t-tests are the differences in means across the defined groups (1-3). ***, **, and * indicate significance at the 1, 5, and 10 percent critical level*

Appendix Table 3: Comparison with German Representative Data

	Germany	Sample
Share Females	50,7%	46,15%
Mean age[12]	44,6	37.58
Distribution in age groups[13]		
18-20	2,95%	1.86%
21-24	4,45%	14.46%
25-39	18,98%	51.03%
40-59	28,11%	22.31%
60-64	7%	3.10%
65	21,97	7.23%
Net Income[14] 2020	2.084 EUR	2.000 - 2.500 EUR
Uni Degree 2018[15]	22%	66,25%
Living[16] 2020		
Own House	38.3%	13.1%
Own Flat	6.2%	10.7%
Living for rent	55.5%	76.2%
Voting behavior	(actual 2021)	(stated)
CDU / CSU	28.5%	15.86%
SPD	26.4%	12.02%
AfD	10.1%	2.30%
FDP	8.7%	10.74%
Die Linke	5.0%	6.14%
Grüne	14.0%	48.59%
Sonstige	7.2%	4.35%
Religion[17] 2018		
Catholics	28,6	13.44
Protestants	25,8	16.70
Orthodox	2,2	0.41
Muslim	3,5	2.65
Buddhists	0,7	0.20
Jews	0,1	0.61
Hindu	0,1	-
Non-believer	26,9	57.84
Other	9,9	0.40
Don't know	2,2	7.74

12 https://de.statista.com/statistik/daten/studie/1084430/umfrage/durchschnittsalter-der-bevoelkerung-in-deutschland/
13 https://de.statista.com/statistik/daten/studie/382409/umfrage/verteilung-der-bevoelkerung-deutschlands-nach-altersgruppen/
14 https://de.statista.com/themen/293/durchschnittseinkommen/#dossierKeyfigures
15 https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bildung-Forschung-Kultur/Bildungsstand/Publikationen/Downloads-Bildungsstand/bildung-deutschland-5210001209004.pdf?__blob=publicationFile
16 https://de.statista.com/statistik/daten/studie/171237/umfrage/wohnsituation-der-bevoelkerung/
17 https://www.bpb.de/kurz-knapp/zahlen-und-fakten/soziale-situation-in-deutschland/145148/religion/

Appendix Table 4: Regression results of treatment effects on contribution decisions differentiated by sample characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sample:	Whole			Mannheim Residents			Newly Recruited		
	OLS	Hurdle		OLS	Hurdle		OLS	Hurdle	
		1st stage	2nd stage		1st stage	2nd stage		1st stage	2nd stage
Treatment									
Citizen	1.04	0.49**	-1.29	1.12	0.55*	-1.75	0.24	0.59+	-2.74
	(0.67)	(0.18)	(1.68)	(0.95)	(0.25)	(2.02)	(1.27)	(0.34)	(2.59)
City	-0.27	-0.11	-0.28	-0.09	-0.10	0.79	0.14	0.10	-1.37
	(0.68)	(0.18)	(1.87)	(0.95)	(0.24)	(2.19)	(1.23)	(0.33)	(2.53)
Age	0.10***	0.01+	0.20***	0.07**	0.01	0.14**	0.09+	-0.01	0.23**
	(0.02)	(0.01)	(0.05)	(0.02)	(0.01)	(0.05)	(0.05)	(0.01)	(0.09)
Female	1.12*	0.34*	2.10	0.55	0.19	0.78	-1.06	-0.19	-0.64
	(0.54)	(0.15)	(1.43)	(0.77)	(0.20)	(1.68)	(1.04)	(0.28)	(2.19)
Income	0.50***	0.10*	1.37**	0.46*	0.03	1.61**	0.13	0.07	-0.10
	(0.14)	(0.04)	(0.44)	(0.21)	(0.06)	(0.53)	(0.28)	(0.08)	(0.57)
Has uni degree	0.24	0.06	-0.26	0.84	0.22	-0.21	1.31	0.39	0.66
	(0.60)	(0.16)	(1.67)	(0.82)	(0.21)	(2.08)	(1.11)	(0.30)	(2.58)
Mannheim residence	-0.40	-0.08	0.30						
	(0.54)	(0.15)	(1.42)						
Newly recruited	1.22	0.31	1.49						
	(0.76)	(0.20)	(1.98)						
Constant	-3.29**	-1.20***	-11.25**	-2.21	-0.75+	-8.22+	-0.05	-0.38	-0.27
	(1.09)	(0.30)	(4.10)	(1.46)	(0.39)	(4.39)	(1.69)	(0.46)	(3.74)
Constant Hurdle		1.85***			1.77***			1.67***	
		(0.10)			(0.12)			(0.18)	
Observations	365	365		199	199		92	92	
Adjusted R^2	0.133	-		0.094	-		0.050	-	

Note: The OLS models in columns 1, 4 and 7 have as dependent variable the amount given for the local reforestation project based on the whole sample. The Hurdle models have two stages. The first stage models are probit regression models, where the dependent variable is equal to one for positive contributions and zero otherwise (extensive margin). The second stage models are truncated linear regression models, where the dependent variable is the amount given for the local reforestation project, conditional on contributions being positive (intensive margin). Models (1)-(3) cover the whole sample and have additional controls for being a current resident of the city of Mannheim, as well as being newly recruited. The models (4)-(6) are only based on the participants that are currently living in Mannheim. Models (7)-(9) are based on the participants that where newly recruited and have never participated in a ZEW survey before. Robust standard errors in parentheses. +(, **, ***) means that the given effect is different from zero at the 10% (5%, 1%, 0,1%) significance level.*

Appendix Table 5: Heterogeneity Analysis – Gender

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Share Contributors				Contributions (conditional)			
Variable:	Female		Male		Female		Male	
Citizen	0.26**	0.27**	0.12+	0.14+	-2.29+	-2.29+	0.61	0.08
	(0.08)	(0.09)	(0.07)	(0.08)	(1.20)	(1.22)	(1.14)	(1.08)
City	-0.01	-0.01	-0.04	-0.03	-2.22+	-2.51+	1.07	1.32
	(0.08)	(0.09)	(0.07)	(0.08)	(1.32)	(1.34)	(1.27)	(1.22)
Variable	-0.01	-0.05	0.01	0.05	-2.35+	-2.83*	2.35+	2.83*
	(0.08)	(0.09)	(0.08)	(0.09)	(1.27)	(1.28)	(1.27)	(1.28)
Citizen#**Variable**	-0.14	-0.13	0.14	0.13	2.89+	2.37	-2.89+	-2.37
	(0.11)	(0.12)	(0.11)	(0.12)	(1.66)	(1.63)	(1.66)	(1.63)
City#**Variable**	-0.03	-0.02	0.03	0.02	3.29+	3.83*	-3.29+	-3.83*
	(0.11)	(0.12)	(0.11)	(0.12)	(1.83)	(1.81)	(1.83)	(1.81)
Age		0.00		0.00		0.11***		0.11***
		(0.00)		(0.00)		(0.03)		(0.03)
Net income		0.03**		0.03**		0.53**		0.53**
		(0.01)		(0.01)		(0.20)		(0.20)
Has uni degree		0.01		0.01		-0.23		-0.23
		(0.06)		(0.06)		(0.82)		(0.82)
Constant	0.44***	0.20*	0.42***	0.14	9.19***	2.62+	6.85***	-0.21
	(0.06)	(0.10)	(0.05)	(0.10)	(0.95)	(1.43)	(0.84)	(1.40)
Observations	481	414	481	414	232	201	232	201
Controls		x		x		x		x
Adjusted R^2	0.034	0.064	0.034	0.064	-0.000	0.165	-0.000	0.165

Note: Models in columns 1 to 4 are linear probability models, where the dependent variable is equal to one for positive contributions and zero otherwise (extensive margin). Models in columns 5 to 8 are linear regressions models, with the dependent variable being the amount given for the local reforestation project conditional on contributions being positive (intensive margin). Standard errors are in parentheses. +(, **, ***) means that the given effect is different from zero at the 10% (5%, 1%, 0,1%) significance level.*

Appendix Table 6: Heterogeneity Analysis – Pro-Environmental Traits at the Extensive Margin

	Dependent variable: Share contributors									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable:	Climate engagement (high)		Locally active (high)		Others motivate (high)		NEP score (high)		Vote green	
	yes	no	yes	no	yes	no	yes	no	yes	no
Citizen	0.20**	0.20+	0.18**	0.29+	0.24**	0.19*	0.16	0.20**	0.33***	0.02
	(0.07)	(0.10)	(0.06)	(0.15)	(0.09)	(0.08)	(0.24)	(0.06)	(0.08)	(0.09)
City	-0.05	0.04	-0.04	0.00	-0.00	-0.01	-0.10	-0.02	0.13+	-0.23*
	(0.07)	(0.10)	(0.06)	(0.17)	(0.09)	(0.08)	(0.23)	(0.06)	(0.07)	(0.09)
Variable	0.10	-0.10	-0.13	0.13	0.26**	-0.26**	-0.11	-0.11	0.37***	-0.37***
	(0.09)	(0.09)	(0.12)	(0.12)	(0.08)	(0.08)	(0.16)	(0.16)	(0.08)	(0.08)
Citizen#**Variable**	-0.00	0.00	0.11	-0.11	-0.05	0.05	0.03	-0.03	-0.31**	0.31**
	(0.12)	(0.12)	(0.17)	(0.17)	(0.11)	(0.11)	(0.25)	(0.25)	(0.12)	(0.12)
City#**Variable**	0.10	-0.10	0.04	-0.04	-0.00	0.00	0.08	-0.08	-0.36**	0.36**
	(0.12)	(0.12)	(0.18)	(0.18)	(0.12)	(0.12)	(0.24)	(0.24)	(0.12)	(0.12)
Constant	0.07	0.17	0.13	0.01	-0.06	0.20*	0.03	0.14	-0.04	0.32**
	(0.09)	(0.11)	(0.09)	(0.13)	(0.10)	(0.09)	(0.17)	(0.09)	(0.10)	(0.10)
Observations	414	414	414	414	414	414	414	414	414	414
Controls	x	x	x	x	x	x	x	x	x	x
Adjusted R^2	0.076	0.076	0.063	0.063	0.115	0.115	0.063	0.063	0.104	0.104

Note: Models in columns 1 to 10 are linear probability models, where the dependent variable is equal to one for positive contributions and zero otherwise (extensive margin). Climate engagement (high) has the value 1 (=yes) if participants stated that they engage either 'strongly' or 'very strongly' in climate protection activities. It has the value 0 (=no) if participants answered with 'not at all', 'rather not', or 'sometimes'. Locally active has the value 1 (=yes) if participants stated that they engage either 'strongly' or 'very strongly' in in local organizations or groups. It has the value 0 (=no) if participants answered with 'not at all', 'rather not', or 'sometimes'. Others motivate (high) has the value 1 (=yes) if participants stated that it motivates them either 'strongly' or 'very strongly' to get involved in own climate protection activities when those around them are involved. It has the value 0 (=no) if participants answered with 'not at all', 'rather not', or 'sometimes'. NEP score (high) has the value 1 (=yes) if participants have a NEP score over 3 and are considered to have an anthropocentric worldview. It has the value 0 (=no) if the NEP score is below 3. Vote green has the value 1 (=yes) if participants indicate that they would vote the green party at the next election. It has the value 0 (=no) if they would vote any other party except the green party. The controls include age, female, net income and having a university degree. +(, **, ***) means that the given effect is different from zero at the 10% (5%, 1%, 0,1%) significance level.*

Appendix Table 7: Heterogeneity Analysis – Pro-Environmental Traits at the Intensive Margin

	Dependent variable: Contributions (conditional)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable:	Climate engagement (high)		Locally active (high)		Others motivate (high)		NEP score (high)		Vote green	
	yes	no	yes	no	yes	no	yes	no	yes	no
Citizen	-0.57	-1.28	-0.90	-0.50	-1.82	-0.39	-4.32	-0.75	-0.21	-1.11
	(1.03)	(1.33)	(0.87)	(2.31)	(1.48)	(1.00)	(3.93)	(0.83)	(1.23)	(1.11)
City	0.17	-1.22	-0.60	1.47	-1.37	0.05	2.24	-0.48	0.52	-0.89
	(1.18)	(1.45)	(0.96)	(2.84)	(1.67)	(1.09)	(4.39)	(0.92)	(1.34)	(1.32)
Variable	0.71	-0.71	-1.10	1.10	-0.65	0.65	0.39	-0.39	1.45	-1.45
	(1.28)	(1.28)	(1.95)	(1.95)	(1.42)	(1.42)	(2.89)	(2.89)	(1.31)	(1.31)
Citizen#**Variable**	-0.71	0.71	0.40	-0.40	1.42	-1.42	3.57	-3.57	-0.90	0.90
	(1.68)	(1.68)	(2.46)	(2.46)	(1.80)	(1.80)	(4.01)	(4.01)	(1.65)	(1.65)
City#**Variable**	-1.39	1.39	2.07	-2.07	1.43	-1.43	-2.71	2.71	-1.41	1.41
	(1.89)	(1.89)	(3.00)	(3.00)	(1.99)	(1.99)	(4.48)	(4.48)	(1.88)	(1.88)
Constant	0.44	1.15	0.81	-0.29	1.12	0.47	0.30	0.69	-0.29	1.15
	(1.46)	(1.62)	(1.40)	(2.15)	(1.85)	(1.39)	(3.00)	(1.39)	(1.62)	(1.45)
Observations	201	201	201	201	201	201	201	201	201	201
Controls	x	x	x	x	x	x	x	x	x	x
Adjusted R^2	0.142	0.142	0.143	0.143	0.145	0.145	0.151	0.151	0.146	0.146

Note: Models in columns 1 to 10 are linear regressions models, with the dependent variable being the amount given for the local reforestation project conditional on contributions being positive (intensive margin). Climate engagement (high) has the value 1 (=yes) if participants stated that they engage either 'strongly' or 'very strongly' in climate protection activities. It has the value 0 (=no) if participants answered with 'not at all', 'rather not', or 'sometimes'. Locally active has the value 1 (=yes) if participants stated that they engage either 'strongly' or 'very strongly' in in local organizations or groups. It has the value 0 (=no) if participants answered with 'not at all', 'rather not', or 'sometimes'. Others motivate (high) has the value 1 (=yes) if participants stated that it motivates them either 'strongly' or 'very strongly' to get involved in own climate protection activities when those around them are involved. It has the value 0 (=no) if participants answered with 'not at all', 'rather not', or 'sometimes'. NEP score (high) has the value 1 (=yes) if participants have a NEP score over 3 and are considered to have an anthropocentric worldview. It has the value 0 (=no) if the NEP score is below 3. Vote green has the value 1 (=yes) if participants indicate that they would vote the green party at the next election. It has the value 0 (=no) if they would vote any other party except the green party. The controls include age, female, net income and having a university degree. +(, **, ***) means that the given effect is different from zero at the 10% (5%, 1%, 0,1%) significance level.*

Appendix Table 8: Heterogeneity Analysis – Identification Analysis at the Extensive Margin

	Dependent variable: Share contributors					
	(1)	(2)	(3)	(4)	(5)	(6)
Variable:	Identification with Mannheim (high)		Knows climate policies of Mannheim		Mannheim engages sufficiently	
	yes	no	yes	no	yes	no
Citizen	0.24^{+}	0.16	0.30*	0.09	0.17	0.31^{+}
	(0.12)	(0.15)	(0.13)	(0.15)	(0.11)	(0.18)
City	0.03	-0.17	0.10	-0.22	-0.10	0.07
	(0.12)	(0.16)	(0.12)	(0.15)	(0.11)	(0.18)
Variable	0.05	-0.05	0.31*	-0.31*	-0.07	0.07
	(0.16)	(0.16)	(0.16)	(0.16)	(0.17)	(0.17)
Citizen#**Variable**	-0.07	0.07	-0.21	0.21	0.14	-0.14
	(0.14)	(0.14)	(0.20)	(0.20)	(0.21)	(0.21)
City#**Variable**	-0.20	0.20	-0.31	0.31	0.17	-0.17
	(0.20)	(0.20)	(0.19)	(0.19)	(0.21)	(0.21)
Constant	0.18	0.23	0.10	0.41*	0.24	0.17
	(0.15)	(0.19)	(0.15)	(0.18)	(0.15)	(0.19)
Observations	199	199	190	190	199	199
Controls	x	x	x	x	x	x
Adjusted R^2	0.035	0.035	0.057	0.057	0.033	0.033

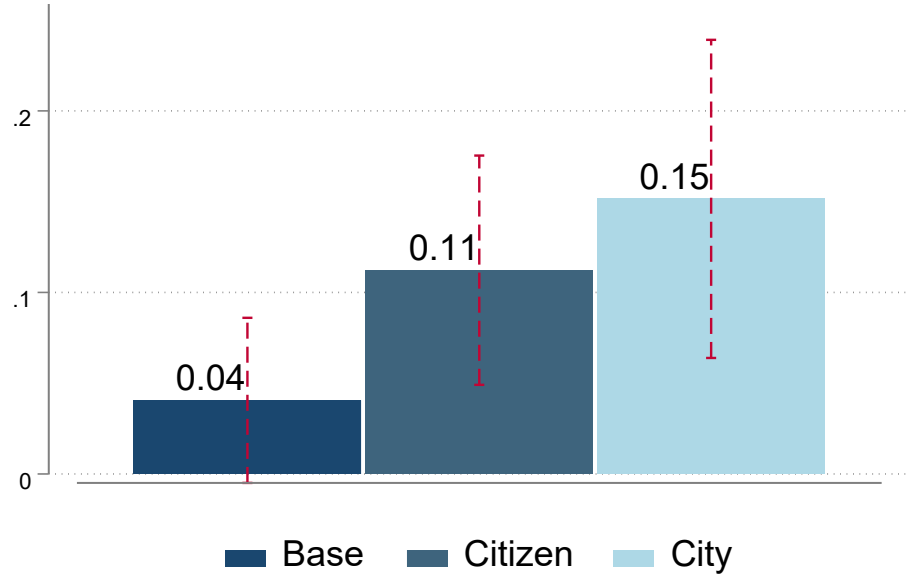
Note: Models in columns 1 to 6 are linear probability models, where the dependent variable is equal to one for positive contributions and zero otherwise (extensive margin). Identification with Mannheim (high) has the value 1 when participant indicated that s/he identifies with the city of Mannheim either 'full' or 'high', and 0 otherwise. Knows climate policies of Mannheim has the value 1 when subjects are aware of the climate policies of the city of Mannheim. Mannheim engages sufficiently has the value 1 when participant indicated that s/he thinks that the city of Mannheim either engages 'rather much' or 'very much' in climate protection. The controls include age, female, net income and having a university degree. Standard errors are in parentheses. +(, **, ***) means that the given effect is different from zero at the 10% (5%, 1%, 0,1%) significance level.*

Appendix Table 9: Heterogeneity Analysis – Identification Analysis at the Intensive Margin

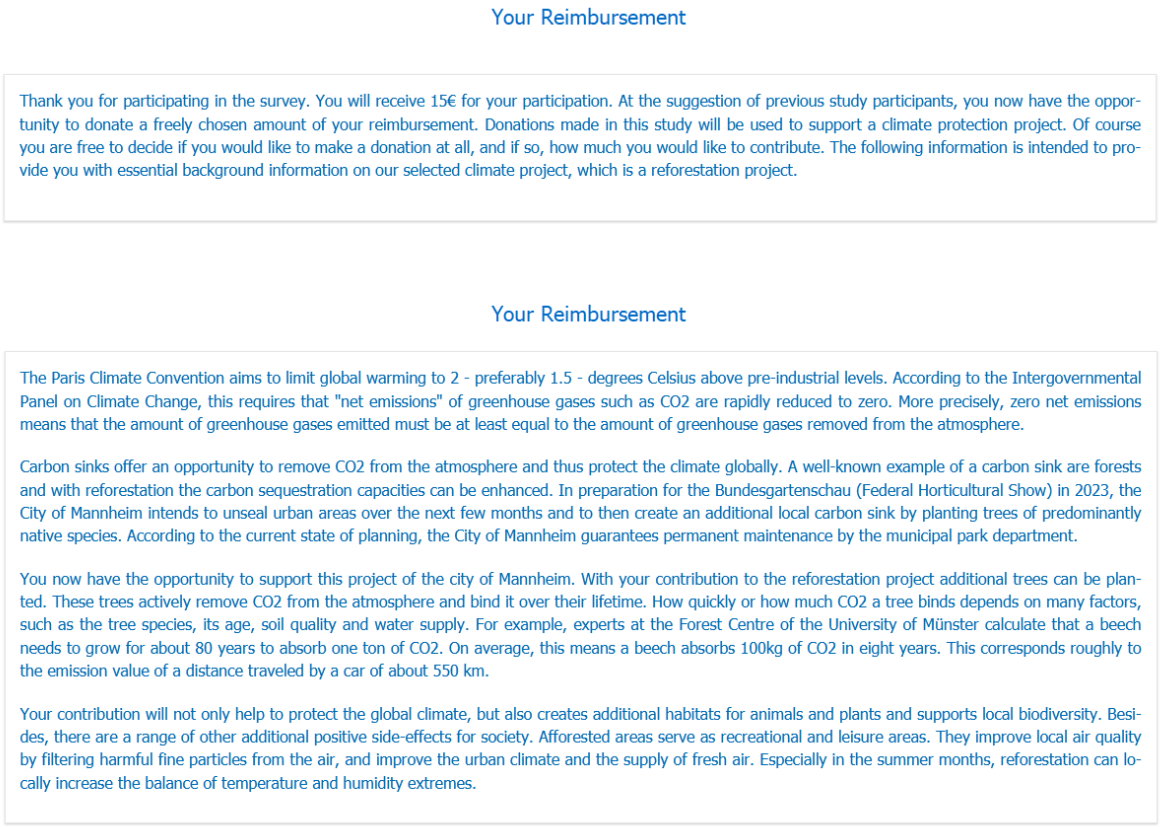
	Dependent variable: Contributions (conditional)					
	(1)	(2)	(3)	(4)	(5)	(6)
Variable:	Identification with Mannheim (high)		Knows climate policies of Mannheim		Mannheim engages sufficiently	
	yes	no	yes	no	yes	no
Citizen	0.40	-2.88	-0.20	-1.48	-0.77	-0.28
	(1.67)	(1.96)	(2.03)	(1.89)	(1.58)	(3.81)
City	1.99	-2.60	1.16	-0.07	-0.57	0.14
	(1.73)	(2.49)	(2.17)	(2.07)	(1.86)	(4.14)
Variable	2.98	-2.98	0.40	-0.40	-0.37	0.37
	(2.16)	(2.16)	(2.36)	(2.36)	(3.74)	(3.74)
Citizen#**Variable**	-3.28	3.28	-1.27	1.27	0.49	-0.49
	(2.54)	(2.54)	(2.81)	(2.81)	(4.23)	(4.23)
City#**Variable**	-4.60	4.60	-1.24	1.24	0.71	-0.71
	(3.07)	(3.07)	(3.04)	(3.04)	(4.72)	(4.72)
Constant	-1.23	1.75	0.07	0.47	0.15	-0.22
	(2.20)	(2.53)	(2.48)	(2.42)	(2.37)	(4.04)
Observations	98	98	93	93	80	80
Controls	x	x	x	x	x	x
Adjusted R^2	0.195	0.195	0.156	0.156	0.180	0.180

Note: Models in columns 1 to 6 are linear regressions models, with the dependent variable being the amount given for the local reforestation project conditional on contributions being positive (intensive margin). Identification with Mannheim (high) has the value 1 when participant indicated that s/he identifies with the city of Mannheim either 'full' or 'high', and 0 otherwise. Knows climate policies of Mannheim has the value 1 when subjects are aware of the climate policies of the city of Mannheim. Mannheim engages sufficiently has the value 1 when participant indicated that s/he thinks that the city of Mannheim either engages 'rather much' or 'very much' in climate protection. The controls include age, female, net income and having a university degree. Standard errors are in parentheses. +(, **, ***) means that the given effect is different from zero at the 10% (5%, 1%, 0,1%) significance level.*

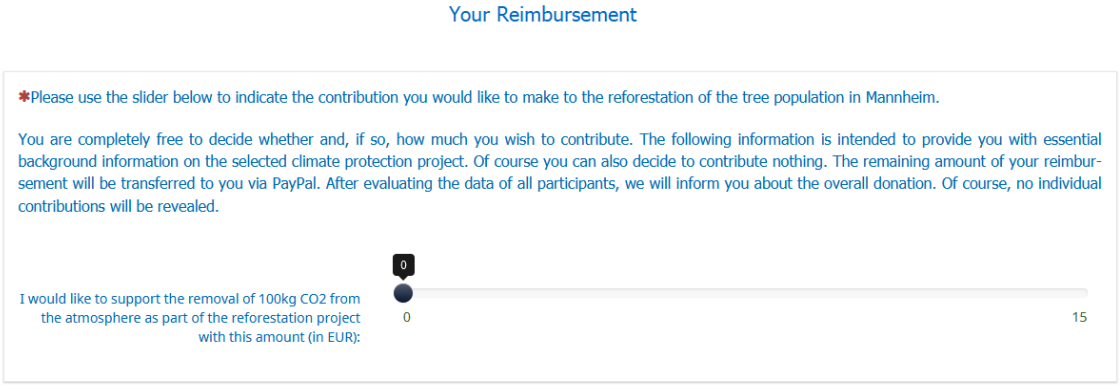
Appendix Figure 1: Share of subjects that contribute 3 EUR



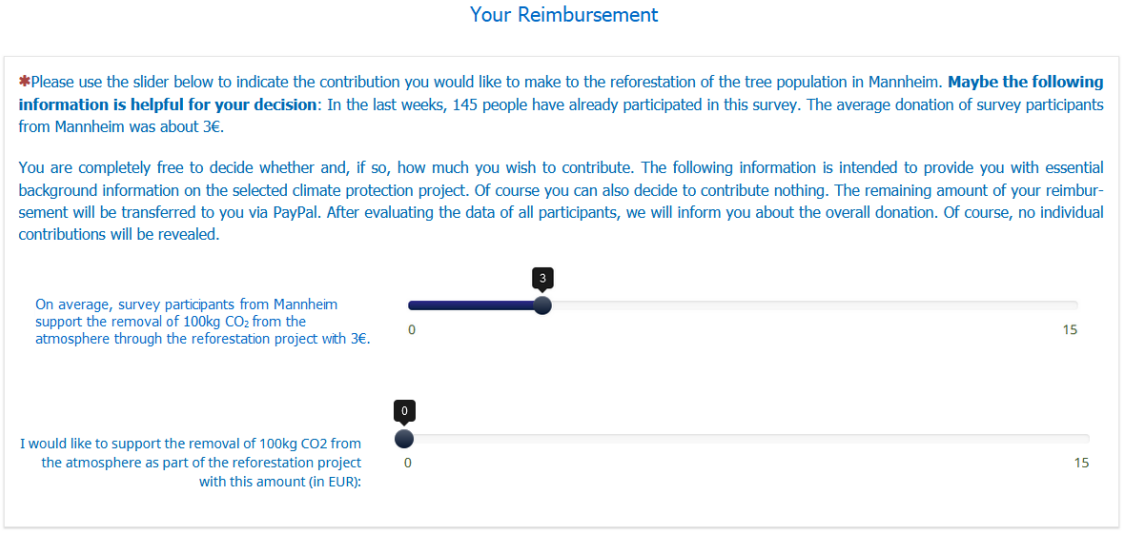
Appendix Figure 2: Background Information before treatment decisions



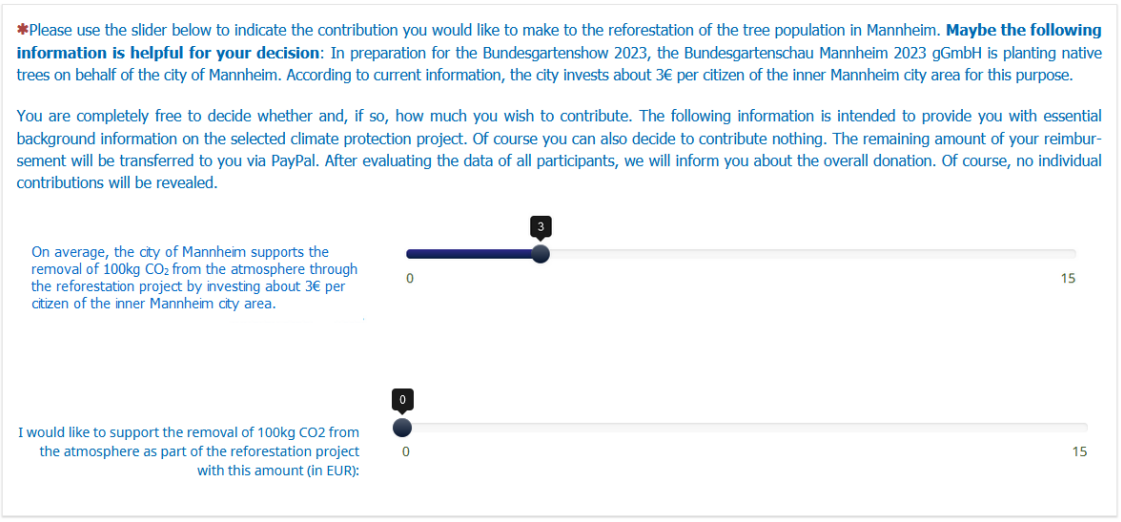
Appendix Figure 3: Base Treatment Contribution Screen



Appendix Figure 4: Citizen Treatment Contribution Screen



Appendix Figure 5: City Treatment Contribution Screen



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