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Climate action for (my) children

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Climate action for (my) children

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This version: 23 October 2020

Abstract

Sustaining large-scale public goods, such as the environment, requires individuals to take action; however, motivating voluntary climate action (VCA) is difficult because decision-makers today do not stand to benefit from their investments. Here, we propose that parents invest more in VCA if their link to future generations—through their offspring—is made salient. In a novel lab-in-the-field experiment, we vary whether parents are observed during a VCA decision (i.e., investing in planting real-world trees) by their own child. In addition to a no-observer control, we run additional control conditions with an unrelated adult or an unrelated child observing the parent decision-maker. As predicted, VCA varies across conditions, with larger treatment effects occurring when a parent’s own child is the observer. In subgroup analyses, larger treatment effects occur among more educated parents. As a result of this study, VCA across conditions led to 14,000 trees being planted, offsetting approximately 8% of participants’ annual CO₂ emissions for around four generations.

JEL-Classification: C99, Q51, Q54, H49, D19

Keywords: voluntary climate action, intergenerational cooperation, parents, children, observability, lab-in-the-field experiment

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28 **1. Introduction**

29 Individual actions—referred to as voluntary climate action (VCA; see, e.g.,
30 Goeschl et al. 2020)—are needed to reduce the harmful effects of climate change.
31 VCA takes different forms on an individual level; however, one key unifying as-
32 pect of VCAs is that they necessitate incurring a cost to the individual to provide
33 a benefit to the environment, a general public good that is largely consumed in the
34 future (Fischer et al. 2004; Diederich and Goeschl 2014; Hauser et al. 2014). Ex-
35 amples of VCAs include investing in energy saving technology (e.g., solar pan-
36 els), switching to CO₂ friendly purchasing habits (e.g., buying less red meat), or
37 even engaging in small, everyday behaviors, such as spending less time in the
38 shower (Wynes and Nicholas 2017). In our study, we are interested in VCA that
39 has a long-lasting positive effect on the environment: we focus on CO₂ offsetting,
40 using a foresting program which plants climate-efficient trees, as such programs
41 have become increasingly widespread and available as means for individuals to
42 help reduce their “carbon footprint” (Kollmuss et al. 2010).

43 While past research has examined contextual changes (“nudges”) to moti-
44 vate VCAs (Thaler and Sunstein 2008; Hauser et al. 2018)¹, we propose a novel
45 perspective on how to solve VCA dilemmas by leveraging the intergenerational

¹Bruns et al. (2018) implement a default option to nudge experimental subjects in the lab to contributions to carbon offsetting reductions. Similarly, Araña and León (2013) show that an opt-out condition for VCA programmes increases a VCA, compared to an opt-in condition. Results from field studies suggest that if supporting a VCA is a pre-set default option, this also increases average contributions of experts in the field of environmental economics (Löfgren et al. 2012). This effect is stable over longer time periods (Kesternich et al. 2019). Stimuli like matching and rebate subsidies also have positive effects on increasing a VCA (Kesternich et al. 2016). Energy saving initiatives (such as social norm nudges) have also been found to be effective in creating long-lasting effects on a VCA (Allcott and Rogers 2014; Jachimowicz et al. 2018). A recent study by Böhm et al. (2020) find that changing the default contribution level as well as providing individuals with the possibility to commit themselves to inter-generational solidarity leads to higher investments into long-term contributions for future generations. Also Carattini and Blasch (2020) point out that nudges like leveraging social norms can be effective to increase carbon offsetting behavior.

46 aspect of VCA. Extant research has focused on public goods within the same gen-
47 eration (see, e.g., Fehr and Gächter 2000; Milinski et al. 2006; Rand et al. 2009),
48 or on cooperation between different generations (Charness and Villeval 2009),
49 whereas little research exists on intergenerational goods where future generations
50 cannot reciprocate the actions of the acting current generation and the incentives
51 to cooperate with the future are low (Fischer et al. 2004; Sutter et al. 2013; Hauser
52 et al. 2014; Kamiyo et al. 2017; Ponte et al. 2017; Shahrier et al. 2017; Dengler et
53 al. 2018). However, this does not imply that there exists no *link* to future genera-
54 tions: people—parents²—who have children are genetically related to the next
55 generation, and have an incentive and responsibility to care for their offspring’s
56 wellbeing. We argue that this personal genetic link to the future makes parents
57 particularly likely to engage in VCA—that sustains the intergenerational public
58 good and benefit their child in the future—especially when their own child ob-
59 serves this action.

60 Through an innovative lab-in-the-field experiment with parents and their
61 children, we propose to take advantage of parents’ genetic link to the future in
62 fostering more VCA today for the benefit of future generations. Thus, we exoge-
63 nously vary to what extent future generations, including their own children, are
64 salient to the parents when making their VCA decision. This is operationalized
65 using a between-subjects experimental design with four treatments. We vary the
66 salience of the genetic link to the future by using different types of observers: (I)
67 in the baseline treatment *NoObserver*, a parent is not observed while making the

² Having children is an essential dimension to test our hypotheses involving the intergenerational link: we acknowledge the potential for self-selection into who chooses to become a parent, but we argue this makes them more—not less—important to study in this context. According to Eurostat, one-third of all 220 million EU households have children (Eurostat 2017). Therefore, considering parents is plausible and economically significant, as they form a major part of active participants in a society. As parents are in their adult life stage—working, producing and consuming—they can be considered one of the largest contributors to CO2 emissions, compared to children or elderly persons (Zagheni 2011). Thus, getting parents to engage in any kind of VCA is likely to result in economically meaningful changes.

68 VCA decision; (II) in *StrangerAdult*, the parent is observed by another adult per-
69 son, who is a stranger to the parent; (III) in *StrangerChild*, the parent is observed
70 by a stranger child, to whom they are not related; and (IV) in *OwnChild*, the parent
71 is observed by his/her own child.

72 We hypothesize that parents will be especially likely to engage in VCA
73 when they are observed by their offspring, relative to other observers. While past
74 work has shown the importance of observers to motivate costly cooperative be-
75 haviors (see, e.g., Yoeli et al. 2013; Hauser et al. 2016), a parents' offspring is
76 critical here because it lets the parents recall their genetic link to the future. There-
77 fore parents, who have their children's wellbeing at heart, are reminded of the
78 benefits of investing into the future when their genetic beneficiaries are present
79 (Smith 1977; Nowak 2006).

80 We find a remarkable willingness of parents to invest in VCA: over 80% of
81 all parents invested in the VCA, which translates into almost 14,000 real trees
82 being planted due to this research project. Across our entire sample, we observe
83 some evidence for the hypothesis that parents give more when their children are
84 watching their VCA decision. Importantly, as in Diederich and Goeschl (2014),
85 higher education increases the willingness to engage in VCA, and, furthermore,
86 our treatment effects are substantially larger in the subsample of more educated
87 parents. Our data shows consistent evidence that more educated parents are more
88 likely to invest in VCA, especially when their own child is observing them.

89 Our paper makes a number of contributions. First, we contribute to the lit-
90 erature on VCA, which has previously focused on nudges and contextual determi-
91 nants. Here, we instead demonstrate the importance of genetically-related children
92 on parents' VCA, especially among educated parents (Diederich and Goeschl
93 2014). Second, we contribute to the burgeoning literature on intergenerational
94 public goods: public goods games have previously not taken into account the ge-
95 netic component across generations (Fischer et al. 2004; Hauser et al. 2014),

96 which we demonstrate is critical to encourage contributions to intergenerational
97 public goods. Third, we contribute to the literature on child-parent interactions:
98 Previous work has shown that children's decisions are influenced by the behaviors
99 they observe in their parents (e.g., Ben-Ner et al. 2017; Fernández et al. 2004).
100 Here we demonstrate that this causal link can also act in reverse: when their own
101 children are present, parents act more generously. This may in part be driven by
102 the realization that one's own children may benefit from a good act today, but also
103 because parents may want to act as role models in front of their children.

104 The remainder of the paper is organized as follows. Section 2 formulates
105 our hypotheses based on the existing literature. Section 0 describes our experi-
106 mental method, and Section 0 summarizes details on the experimental sample.
107 Section 5 presents the results, and Section 6 covers the discussion of our findings.
108 We conclude in Section 7.

109 **2. Related literature and hypotheses**

110 *Public goods and observability.* Past work has shown that mechanisms such as
111 direct and indirect punishment, direct rewarding, as well as reputation building,
112 foster contributions to public goods in the laboratory (see, e.g., Rockenbach and
113 Milinski 2006; Milinski and Rockenbach 2012) and in the field (see, e.g.,
114 Balafoutas, Nikiforakis and Rockenbach 2014). Observability in conjunction with
115 punishment (Fehr and Gächter 2000), rewards (see, e.g., Hauser et al. 2016 and
116 Rand et al. 2009), communication (Miller et al. 2002; Bracht and Feltovich 2009;
117 Balliet 2010), and framing (Andreoni 1995; Rege and Telle 2004) also positively
118 influence cooperative behavior in the laboratory. Interestingly, when participants
119 can choose, they only make high contributions observable for others (Rockenbach
120 and Milinski 2011). Furthermore, a burgeoning literature using field experiments
121 has shown that being observed, even without the explicit mention or possibility
122 for punishment or reward, also increases cooperative behavior (see, e.g., Bateson,
123 Nettle, and Roberts 2006; Ekström 2012; Yoeli et al. 2013). The effect is typically

124 stronger in the case of “overt observability”, which means that actual identifying
125 information (e.g., name and face), as well as behavior, are revealed to the observer
126 at or after the point of decision (Bradley et al. 2018).

127

128 *Types of observers.* Most existing research has used adults (who are unrelated
129 and strangers to the decision-makers, or DMs) as observers. However, for observ-
130 ability to have the largest effect in an intergenerational public good, we argue that
131 a link between today’s DM and the future generation needs to be established. Past
132 research has found that increasing the salience of the beneficiaries of an altruistic
133 decision (the “identifiable victim”) can lead to more giving (Small et al. 2007).
134 Thus, we propose that an observer who directly benefits from the public good,
135 such as a representative of the future generation (e.g., a child today), will be more
136 influential on the DM’s decision than an observer from the current generation
137 (e.g., an adult). In addition, adults who are observed by a child may also want to
138 act as a role model by acting virtuously or in line with societal expectations
139 (Adriani et al. 2018).

140

141 *Genetic link to the future.* The effect of an observer can be further increased by
142 choosing a particularly relevant representative of the next generation – specifi-
143 cally, a parent’s own child (e.g., Ben-Ner et al. 2017). We expect one’s own off-
144 spring to be important, as parents have a vested genetic interest in their children
145 (Hamilton 1964a, 1964b; Trivers 1972; Rand and Nowak 2013) who benefit from
146 the VCA.³ In fact, there is evidence that knowledge and attitudes with respect to

³ This genetic connection can prompt other motivations in parents to act in positive ways in front of their children. For example, parents typically want to impart knowledge and good decision-making on their children (see, e.g., Ben-Ner et al. 2017) and be viewed as role models by their own children (see, e.g., Knafo and Schwartz 2001). Indeed, children are influenced by the behaviour of their parents when it comes to criminal behaviour (McCord and McCord 1958), educational choices (Dryler 1998), and career development (Keller and Whiston 2008).

147 climate change are exchanged between parents and children (Lawson et al. 2018).
148 For example, Lawson et al. (2019) find that parents become more concerned about
149 climate change when this issue is brought to them and discussed by their children.
150 Parents are even more likely to engage in actions that benefit their offspring, com-
151 pared to a situation where they themselves would benefit (Cassar et al. 2016).
152 Observation by their child will therefore most likely trigger the parent's invest-
153 ment in VCA, relative to other observers, as the genetic link to the future is most
154 salient in *OwnChild*. Our first hypothesis builds on this line of reasoning.

155 ***HYPOTHESIS 1:*** *Participants' VCA behavior is highest when the ob-*
156 *server is the participant's own child, is smaller when the decision is ob-*
157 *served by a stranger child, and further decreases when the observer is an*
158 *adult observer. VCA is lowest for the conditions without an observer.*

159

160 It is worth pointing out that *OwnChild* combines the individual components
161 of all treatments relative to *NoObserver* – i.e., (i) have DMs be observed, (ii) by a
162 representative of a future generation, (iii) to whom the DM has a genetic link to.
163 Thus, testing Hypothesis 1 not only contributes to our understanding of the role
164 of the genetic link in VCA but helps inform policy: if *OwnChild* has a significant
165 effect over *NoObserver*, a social planner would benefit from a policy intervention
166 that meets (i)–(iii). If, on the other hand, both *OwnChild* and *StrangerChild* are
167 significant relative to *NoObserver*, only (i) and (ii) need to be fulfilled, and if all
168 three conditions are significantly different from *NoObserver*, only (i) needs to be
169 met.

170 By examining and comparing the treatment variations in detail, we can de-
171 lineate further what drives the effect. In both *OwnChild* and *StrangerChild*, the
172 observer is a representative of the future generation, but only in the *OwnChild*
173 condition, the parent has a genetic link to the observer. Thus, the salience of the
174 genetic link to the future should be higher in *OwnChild*.

175 ***HYPOTHESIS 2: Participants' VCA behavior is higher when the decision***
176 ***is observed by their own child, relative to a stranger child.***

177

178 While traditional observability studies commonly use adults as observers
179 (e.g., Hoffman et al. 1996), both the *OwnChild* and *StrangerChild* conditions use
180 children who are representatives of future generations. In contrast, the
181 *StrangerAdult* condition resembles the more traditional observability condition
182 where an adult observes the decision. If being reminded of future beneficiaries
183 through the presence of a child observer, or wanting to act as a role model in front
184 of a child (regardless of whether or not there is a genetic link), plays an important
185 role, we should expect the treatments where children are watching to yield larger
186 effects than adult observers.

187 ***HYPOTHESIS 3: Participants' VCA behavior is higher when the decision***
188 ***is observed by a child, relative to an adult observer.***

189

190 Across all observability treatments, an observer—child or adult—is present
191 to watch the decision-maker relative to the *NoObserver* condition. Based on past
192 literature (see Bradley et al. (2018) for a review article on observability), DMs
193 would be expected to invest more in VCA if being observed, compared to not
194 being observed. Therefore, we compare all conditions with an observer combined
195 (*OwnChild*, *StrangerChild*, and *StrangerAdult*) to the *NoObserver* condition.

196 ***HYPOTHESIS 4: Participants' VCA behavior is higher when the decision***
197 ***to support VCA is observed by another person, relative to no observer.***

198

199

200 **3. Methods**

201 **3.1 Voluntary climate action and study context**

202 We carried out a novel lab-in-the-field experiment in Innsbruck, Austria.
203 The experiment included an incentive-compatible survey programmed in oTree
204 (Chen et al. 2016), and data were collected with tablets (see Online Appendix,
205 OA). Participation took no longer than 20 minutes and our treatment conditions
206 were randomly assigned to participants. Using a neutrally-framed recruitment
207 stand in public spaces, we recruited parents who were accompanied by at least
208 one of their own children aged between 7-14 years.⁴ At all times during the ex-
209 periment, only one parent (the DM) and one of the parent's own children (who is
210 an observer in one condition and not involved in the experiment in the other con-
211 ditions) were allowed to participate: in conditions where the child was not an ob-
212 server, s/he was asked to wait outside the study booth and participate in various
213 games and activities (supervised by research assistants).⁵ In addition, for our
214 conditions with observers who are not related to the participant, we employed
215 confederate adults and confederate children who were introduced to the partici-
216 pant as "helpers from the community" to act as observers.⁶

217 The VCA on offer to participants in our study was carefully designed based
218 on the extant literature. For example, the general public prefers investing in VCA
219 with local mitigation goals (Torres et al. 2015). In our setting, the VCA to offset
220 CO₂ takes the form of a local foresting program, for which we collaborated with
221 the forestry office Innsbruck ("Amt für Wald und Natur" of the city of Inns-

⁴ We chose this age range as our pre-experimental focus groups have shown that these children are old enough to understand the experimental setup but young enough so that parents still serve as role models (which may be less plausible for older teenagers).

⁵ Similarly, if a parent had more than one child with them, they were asked to wait outside and engage in the games and activities prepared for them.

⁶ We ensured that no deception was used: confederates were not part of the research team, or involved in any part of the research. These members of the public were recruited through our informal networks with the requirement that they fit the age ranges of typical parent and child participants.

222 bruck”). We chose a foresting program for forest restoration, because such pro-
223 grams are among the best climate change solutions available today (Bastin et al.
224 2019). Participants were asked to choose between keeping money for themselves
225 or spending that money on planting trees. All trees that participants decided to
226 plant will be planted in 2020 and 2021 on the “Nordkette” and “Patscherkofel”
227 mountain ranges in close proximity to Innsbruck, ensuring that the mitigation
228 strategy is truly local. Moreover, this particular area has a high suitability for the
229 VCA, as it has a high net plant productivity with the potential for forest restoration
230 (Bastin et al. 2019).

231 Following the experimental design by Goeschl et al. (2020), subjects re-
232 ceived a short and neutral description of the foresting program. In particular, they
233 were informed that the foresting program has the following characteristics: (1)
234 The trees would only be only planted if participants in our study actually chose to
235 spend their money on planting a tree. This ensured that the decision the partici-
236 pants faced was incentive-compatible and truly contributed towards reducing CO₂
237 in the environment. (2) The trees were selected in order to lead to a climate-
238 friendly mixed forest, including climate-efficient species of different fir trees or
239 deciduous trees. These tree types would usually not be planted as frequently due
240 to their cost. (3) Each tree has an expected minimum age of 120 years (estimate
241 provided by the forestry office Innsbruck). This means that each tree that was
242 planted by our participants lasted at least the equivalent of four average (human)
243 generations (following the Cambridge dictionary definition of a “generation”). (4)
244 The trees would be monitored and controlled annually to ensure they are healthy,
245 and they would be listed in the governmental forest database “Walddatenbank” to
246 ensure a “paper trail” of the planting exists. (7) The trees would be planted in a
247 forest that is certified with an internationally recognized “Program for the En-
248 dorsement of Forest Certification” (PEFC) certificate, ensuring environmental

249 sustainability.⁷ All these characteristics ensured the maximally possible credibil-
250 ity of our CO2 offsetting program.

251 Moreover, subjects were given information about greenhouse gas emissions
252 and the role of trees for CO2 reductions before deciding on the VCA. Since the
253 general population has relatively little prior knowledge about VCAs (Diederich
254 and Goeschl 2014), we ensured that all participants first gained a basic under-
255 standing of the VCA in this study. Whereas MacKerron et al. (2009), Löschel,
256 Sturm, and Vogt (2013), and Goeschl et al. (2020) provided information as text
257 on the screen, participants in our study watched a short video.⁸ The video informed
258 participants about the public goods character of CO2 reductions by explaining
259 how planting trees removes CO2 from the atmosphere and mitigates the effects of
260 global climate change. In particular, the video highlighted that reducing CO2 has
261 an impact not only on current generations, but also on future ones.

262

263 **3.2 Experimental conditions**

264 The experimental treatments are summarized in Table 1. We implemented
265 four conditions in a between-subjects design, varying observability, and the type
266 of observer. In all conditions, a parent received a windfall endowment of €69 and
267 was asked to decide how much of that money to keep for themselves and how
268 much to invest into the VCA (i.e., planting trees). Using their endowment, partic-
269 ipants could purchase between 0 and 46 trees, with each tree costing €1.50 (the
270 average cost of planting a tree in the foresting program).⁹ Any money not invested

⁷ Another type of certification exists in the form of a CO2 certification. However, Tyrolean forests are not yet CO2 certified, which is a process that takes years to qualify for and is currently underway (but not yet complete) by the local authorities. In the meantime, the current certification programme fulfils all our required characteristics (such as longevity and investment into the future) to qualify as VCA in our study.

⁸ We used a publicly available video by “youknow”, a leading provider of e-learning in the German-speaking world. The video is accessible here: <https://www.youtube.com/watch?v=ZGXVq9obUms>

⁹ In 2018, the average Austrian citizen emitted 9.2 tonnes of CO2 equivalent per capita (Eurostat 2018). According to the Tyrolean authorities, 46 trees from diverse climate-friendly species are needed to reduce approximately 10% of the annual CO2 emissions of

271 in planting trees was paid to participants in cash at the end of the experiment. We
 272 also collected data on basic demographics (e.g., gender, age, education, etc.) and
 273 included a short survey at the end of the experiment (see OA).

274 **Table 1. Experimental conditions, varying who observes the participant.**
 275

Condition	Observer	Intergenerational link?	Genetic link?
<i>NoObserver</i>	No observer	No	No
<i>StrangerAdult</i>	Adult (not related to DM)	No	No
<i>StrangerChild</i>	Child (not related to DM)	Yes	No
<i>OwnChild</i>	DM's own child	Yes	Yes

276

277 In our baseline *NoObserver* condition, the DM made the decision in private
 278 without being observed by anyone. In the *StrangerAdult* condition, the DM was
 279 observed by another adult who is a hired actor (confederate) to act as the observer
 280 and who is unrelated to the DM (see detailed information about the observability
 281 procedure in the OA). This condition is similar to the standard procedure used in
 282 observability experiments in the lab, where a DM is observed by another adult,
 283 which helps establish a “general observability” effect. In the *StrangerChild* con-
 284 dition, the observer was an actor who is a child between 7 and 14 years old and
 285 unrelated to the DM, which helps identify whether the VCA can be encouraged
 286 by having an observer from the future (beneficiary) generation. Finally, in the
 287 *OwnChild* condition, the observer was the child of the DM, in order to understand
 288 whether the DM's own child has an effect on the DM's VCA behavior. Detailed
 289 information on the experimental design can be found in the OA.

290

291

an average Austrian citizen. This is in line with estimations by the Environment Agency European (2012).

292 **4. Experimental sample**

293 We ran the experiment with a total of 368 parents, 92 in each of the four
294 treatment conditions.¹⁰ Data were collected starting at the end of 2019 until early
295 2020, in three different locations in the city of Innsbruck. In Table B-1 in the OA,
296 we provide background details on our participants based on the post-experimental
297 questionnaire. In Table B-2, descriptive statistics are further broken down by treat-
298 ment, showing that randomization worked: the randomly assigned participants are
299 comparable across a number of relevant characteristics. Across all treatments,
300 67% of our participants are female (248 out of 368) and the average age is 42
301 years. Participants have, on average, 2.06 children, and the vast majority (96%)
302 are currently employed. With respect to education, 86% received a high school
303 diploma (by completing an exam called “Matura”), which provides general access
304 to higher education and labor market qualifications.¹¹ Out of those with a high
305 school diploma, half (50%) have a university degree. The majority is married or
306 in a registered relationship (66%), and there is approximately an equal split be-
307 tween those living in the city (49%) versus those living in the countryside. Our
308 recruited sample is largely representative of the general population of Innsbruck
309 (Austria), where our trial took place.

310 Following Goeschl et al. (2020), we included a survey question asking par-
311 ticipants how risk-seeking they viewed themselves (based on Falk et al. 2018).
312 The mean reported value was 5.35 on a scale from 0 (not risk-seeking at all) to 10
313 (fully risk-seeking), and did not differ between treatments (Kruskal-Wallis test

¹⁰ We conducted a power analysis to estimate the minimum sample size in advance of the experiment based on the existing literature. Both the minimum sample size and main analyses were pre-registered (see “Saving the planet – one tree at a time” (#27772)). Unless otherwise noted, we follow the main analyses from the pre-registered analyses plan. Details can be found in the OA.

¹¹ The exam is called „Matura“ or “Reifeprüfung” in Austria. One is qualified to take the exam after a minimum of 12 years of schooling. It is comparable with a US high-school diploma or A-levels in the UK.

314 (kwallis), $p = 0.255$).¹² Additionally, we asked participants how patient they be-
315 lieve they are, as a proxy of their time preferences. The average reported score
316 was 5.92, measured on a scale from 0 (not at all patient) to 10 (fully patient). We
317 did not find any treatment differences for the patience measure (kwallis, $p =$
318 0.397).

319 In three out of four treatments, the participant was observed. We therefore
320 also provide summary statistics of the different observer characteristics. Stranger
321 adult observers (who were hired by the experimenters as confederates) in the
322 *StrangerAdult* condition were on average 39.89 years old and observing children
323 11.33 years (*StrangerChild*: 12.23 years; *OwnChild*: 10.43 years; Wilcoxon-
324 Mann-Whitney test (WMW), $p < 0.001$).¹³ The majority (55%) of observers was
325 female, and the number of female observers did not differ across treatments
326 (Fisher's exact $p = 0.231$). In Table B-6 in the OA, we provide a summary of the
327 gender matches of participants and observers for the treatments with observers.
328 Because both the participant sample as well as the observers were made up of
329 more women (F) than men (M), we have 99 FF matches, 88 FM, 54 MF, and 35
330 MM matches. Gender matches were balanced across treatment conditions (χ^2 , p
331 $= 0.497$).

332

333 5. Results

334 5.1 Total number of trees planted

335 Our first result is purely descriptive but nonetheless remarkable: across all
336 conditions, the 368 participants chose to plant a total amount of 13,988 trees (our

¹² All p -values in the paper and in the OA are based on two-sided tests.

¹³ We had to select the children observers in the *StrangerChild* treatment ahead of the experiment: we chose confederates of ages 7 to 14 for the reasons described earlier. Although the average age of children in the *OwnChild* treatment was less than 1.5 years lower (and statistically significantly so) than in the *StrangerChild* treatment, we do not believe that this small difference between the two treatments is sufficient to affect our results in a meaningful way.

337 outcome measure, labeled *VCA*; out of a maximum possible 16,928 trees). On
338 average, participants invested 82.63% of their €69 endowment into the *VCA*, with
339 66.58% of participants choosing to invest their *entire* endowment into planting all
340 possible 46 trees. The average *VCA* does not differ by the participant's gender
341 (female participants: 37.79 trees vs. male: 38.47 trees; WMW, $p = 0.724$).

342
343

344 **5.2 Covariates that predict VCA**

345 We begin by examining which variables are predictive of *VCA* across con-
346 ditions (see Table 2). Age is a significant predictor of *VCA* (coeff = 2.23, $p =$
347 0.037), whereas gender (coeff = 0.50, $p = 0.748$) and the participant's number of
348 kids are not significant (coeff = 0.91, $p = 0.209$). These results are all consistent
349 with past findings (see, e.g., Löschel, Sturm and Vogt 2013 and Diederich and
350 Goeschl 2014).

351 Higher education ("*High School Dipl.*") is associated with higher *VCA* (co-
352 eff = 10.77, $p < 0.001$), in line with Diederich and Goeschl (2014). Employment
353 is also positively associated (coeff = 11.37, $p = 0.001$), as one might expect that
354 being employed implies greater disposable income (see also Löschel, Sturm and
355 Vogt 2013). Meanwhile, neither risk nor patience is significantly associated with
356 *VCA* (*Risk*: coeff = 0.15, $p = 0.598$; *Patience*: coeff = -0.23, $p = 0.355$). Lastly,
357 we find some variation by study location.¹⁴

358

¹⁴ We discuss this variation by study (recruitment) location in more detail in the OA.

359 **Table 2. Regression results for the entire sample without treatments.**

	(1)	(2)	(3)	(4)
	<i>VCA</i>	<i>VCA</i>	<i>VCA</i>	<i>VCA</i>
<i>Age</i>	0.23** (0.11)	0.20* (0.11)	0.51 (0.34)	0.43 (0.33)
<i>Female</i>	0.50 (1.56)	0.65 (1.55)	2.70 (4.78)	3.30 (4.72)
<i>Nr. kids</i>	0.91 (0.73)	1.12 (0.73)	2.63 (2.21)	3.20 (2.19)
<i>Risk</i>	0.15 (0.29)	0.21 (0.29)	1.16 (0.88)	1.33 (0.87)
<i>Patience</i>	-0.23 (0.25)	-0.17 (0.25)	-1.01 (0.77)	-0.80 (0.76)
<i>High School Dipl.</i>	10.77*** (2.03)	9.69*** (2.05)	24.65*** (5.67)	21.69*** (5.64)
<i>Employed</i>	11.37*** (3.43)	11.36*** (3.41)	24.37*** (9.28)	24.44*** (9.18)
Constant	6.64 (6.24)	9.07 (6.24)	-13.69 (18.67)	-7.80 (18.46)
var(e.vca)			1063.18*** (168.38)	1024.69*** (161.91)
<i>N</i>	362	362	362	362
Location Fixed Effects	No	Yes	No	Yes

360 Notes: Ordinary least squares ((1)-(2)) and tobit regressions ((3)-(4)); upper limit 46 and
361 lower limit 0). Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01. Age
362 in years. Female equals 1 for female participants. The number of kids controls for the
363 respective variable for each participant. Risk measures self-assessed risk attitudes with
364 higher values indicating higher risk-seeking. Patience measures self-assessed time prefer-
365 ences with higher values indicating higher patience. High School Diploma. is equal to 1
366 for participants who completed secondary education and 0 otherwise. Employed is equal
367 to 1 if a participant is employed and 0 otherwise. Location Fixed Effects include dummies
368 for study locations Rathausgalerien, Herbstmesse, and Sillpark.

369

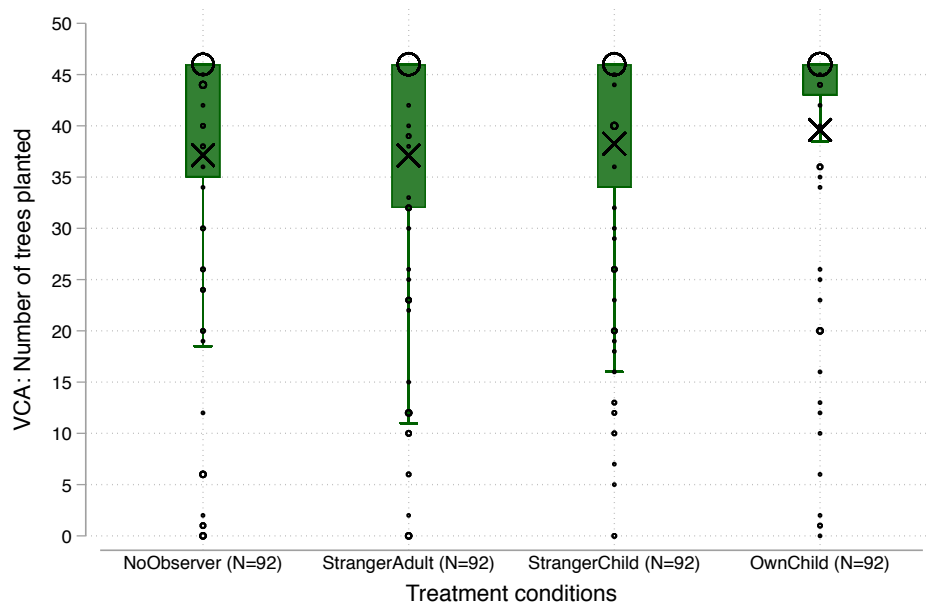
370

371

372 **5.3 Treatment effects on the VCA**

373 Turning to our conditions, we first descriptively summarize the raw *VCA*
374 values (see Figure 1). We observe the lowest *VCA* in *NoObserver* (mean = 37.12,
375 25th percentile = 35.00 and 75th percentile = 46.00) and *StrangerAdult* (mean =
376 37.09, 25th percentile = 32.00, 75th percentile = 46.00). *VCA* is slightly higher in
377 *StrangerChild* (mean = 38.24, 25th percentile = 34.00, 75th percentile = 46.00) and
378 it is highest in *OwnChild* (mean = 39.60, 25th percentile = 43.00, 75th percentile =
379 46.00).

380



381

382 **Figure 1. VCA: Number of trees planted by treatment condition ($N = 368$ subjects).**
 383 **Each box plot shows the average VCA of participants in each treatment. Box plots**
 384 **show the mean (indicated by black X signs), the 25th and 75th percentiles, Tukey**
 385 **whiskers (median \pm 1.5 times the interquartile range), and individual data points.**
 386 **Larger dots indicate a higher number of participants who invested the correspond-**
 387 **ing number of trees.**
 388

389 *Econometric specifications.* We examine the effect of our treatments econ-
 390 ometrically (see Table 3). Our analytical strategy is twofold: First, we estimate the
 391 treatment effects on VCA using ordinary least squares (OLS) regressions (in col-
 392 umns (1) and (2)). Second, we employ Tobit regressions (columns (3) and (4)) to
 393 estimate treatment effects, taking into account that the dependent variable is the
 394 number of trees planted (i.e., VCA), which is bounded by 0 trees on the lower end
 395 (if the participant keeps the entire endowment for him/herself) and by 46 trees on
 396 the upper end (if the participant invests the entire endowment into the VCA). For
 397 both models, we use the following specifications for columns (1) and (3), which
 398 shows the main effects of the independent variables (treatment dummies) without
 399 any control variables:

$$400 \quad VCA_i = \beta_0 + \beta_1 StrangerAdult_i + \beta_2 StrangerChild_i +$$

$$401 \quad \beta_3 OwnChild_i + \varepsilon_i \quad (1)$$

402 where $i = 1, \dots, n$ indicates participant i , VCA is a continuous variable (ranging
 403 from 0 to 46) measuring the number of trees a participant decided to plant, and
 404 the *StrangerAdult*, *StrangerChild*, and *OwnChild* dummies are 1 in the respective
 405 treatments and 0 otherwise, ε_i measures unobserved scalar random variables (er-
 406 rors).

407 In addition, we also report in columns (2) and (4) the same specification
 408 with a number of control variables (see Section 5.2 above for a discussion on co-
 409 variates):

$$\begin{aligned}
 410 \quad VCA_i &= \beta_0 + \beta_1 \text{StrangerAdult}_i + \beta_2 \text{StrangerChild}_i + \\
 411 \quad &\beta_3 \text{OwnChild}_i + \beta_4 \text{Rathausgalerien}_i + \beta_5 \text{Sillpark}_i + \beta_6 \text{Herbstmesse}_i + \\
 412 \quad &\beta_7 \text{Age}_i + \beta_8 \text{Female}_i + \beta_9 \text{NrKids}_i + \beta_{10} \text{Risk}_i + \beta_{11} \text{Patience}_i + \beta_{12} \text{Educ}_i + \\
 413 \quad &\beta_{13} \text{Employed}_i + \varepsilon_i \qquad (2)
 \end{aligned}$$

414

415 where *Rathausgalerien*, *Sillpark*, and *Herbstmesse* are dummy variables for each
 416 of the three study locations and 0 otherwise, *Age* is a continuous variable and *Fe-*
 417 *male* a dummy variable for the participant's age and gender, *NrKids* is a continu-
 418 ous variable capturing the participant's number of kids, *Risk* and *Patience* are self-
 419 reported scale measures (scale range from 0 to 10), *High School Dipl.* is a dummy
 420 variable which is 1 if the participant completed secondary education ("Matura")
 421 and *Employed* is a dummy variable which is 1 if the participant is currently em-
 422 ployed; all other variables are as defined in Eq. (1).

423

424
425**Table 3. Regression results for the entire sample.**

	(1)	(2)	(3)	(4)
	VCA	VCA	VCA	VCA
<i>OwnChild</i>	2.48 (2.09)	3.68* (1.98)	9.44 (6.52)	11.79* (6.02)
<i>StrangerChild</i>	1.12 (2.09)	2.06 (1.96)	4.16 (6.37)	5.60 (5.79)
<i>StrangerAdult</i>	-0.03 (2.09)	2.54 (2.00)	2.02 (6.35)	9.49 (5.99)
<i>Age</i>		0.20* (0.11)		0.45 (0.33)
<i>Female</i>		0.69 (1.55)		3.64 (4.70)
<i>Nr. kids</i>		1.11 (0.73)		3.14 (2.20)
<i>Risk</i>		0.19 (0.29)		1.25 (0.87)
<i>Patience</i>		-0.18 (0.25)		-0.82 (0.76)
<i>High School Dipl.</i>		10.02*** (2.06)		22.77*** (5.66)
<i>Employed</i>		11.78*** (3.42)		25.75*** (9.20)
Constant	37.12*** (1.47)	6.27 (6.42)	57.12*** (4.81)	-16.60 (18.86)
var(e.VCA)			1315.15*** (209.16)	1007.66*** (159.05)
<i>N</i>	368	365	368	365
Location Fixed Effects	No	Yes	No	Yes

426 Notes: Ordinary least squares ((1)-(2)) and tobit regressions ((3)-(4)); upper limit 46 and
427 lower limit 0). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *StrangerAdult*, *StrangerChild*,
428 *OwnChild* equals 1 for the respective treatment, and 0 otherwise (baseline is the *NoOb-*
429 *server* treatment). *Age* is measured in years. *Female* equals 1 for female participants. The
430 number of kids controls for the respective variable for each participant. *Risk* measures
431 self-assessed risk attitudes with higher values indicating higher risk-seeking. *Patience*
432 measures self-assessed time preferences with higher values indicating higher patience.
433 *High School Dipl.* is equal to 1 for participants who completed secondary education and
434 0 otherwise. *Employed* is equal to 1 if a participant is employed and 0 otherwise. Location
435 Fixed Effects include dummies for study locations *Rathausgalerien*, *Herbstmesse*, and
436 *Sillpark*.
437

438 *Main results.* As Table 3 shows, the largest coefficient relative to the base-
439 line *NoObserver* is the *OwnChild* treatment. Without control variables, the
440 *OwnChild* coefficient is positive but not significant (OLS: coeff = 2.48, $p = 0.236$;
441 Tobit: coeff = 9.44, $p = 0.149$), whereas with control variables, the *OwnChild*
442 treatment leads to significantly larger *VCA* (OLS: coeff = 3.68, $p = 0.064$; Tobit:
443 coeff = 11.79, $p = 0.051$). Neither the coefficient on *StrangerAdult* nor
444 *StrangerChild* is significant with or without control variables. Thus, in line with

445 our descriptive and graphical results (Figure 1), some of our econometric results
446 suggest that *OwnChild* leads to the highest VCA, relative to the *NoObserver* base-
447 line condition. These results are partly in line with hypothesis 1, specifically in
448 that *OwnChild* has the largest coefficient relative to *NoObserver*.

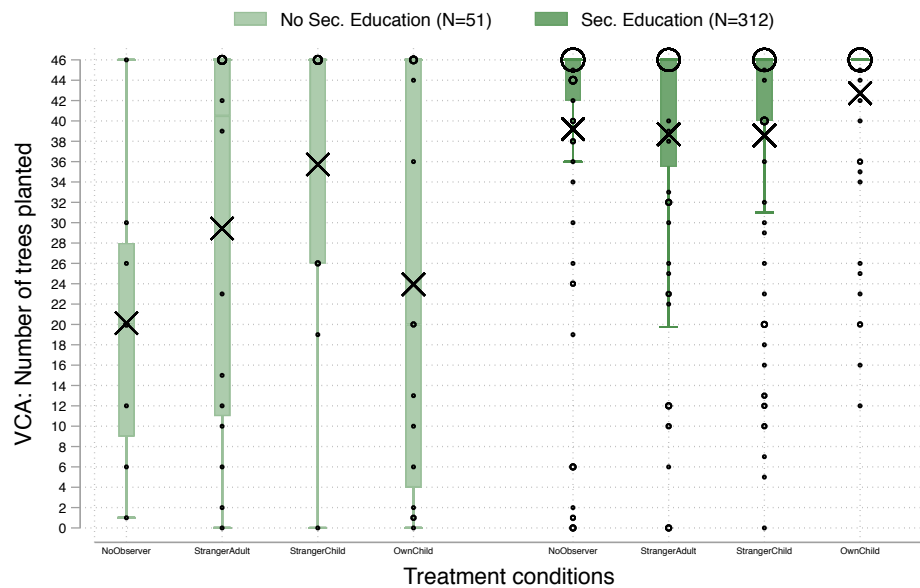
449 *Potential mechanisms.* These results suggest directionally (but not always
450 significantly) that parents may be affected by the presence of their own children
451 when making the VCA decision, but not with other observers present. To isolate
452 the potential mechanisms at work, we explore three explanations using non-para-
453 metric tests.¹⁵ First, we investigate to what extent the genetic link in particular
454 matters (hypothesis 2), holding constant the “observer’s generation”. While *VCA*
455 is higher, as predicted, in *OwnChild* (39.60 trees planted) than in *StrangerChild*
456 (38.24 trees planted), this difference is not significant (WMW, $p = 0.419$).

457 Second, we examine hypothesis 3 to test whether a representative of the
458 future generation as an observer has a larger impact on VCA than an adult ob-
459 server (hypothesis 3). We pool *VCA* across the two treatments, in which a child is
460 the observer (*StrangerChild* and *OwnChild*), and compare it with *VCA* in
461 *StrangerAdult*. Again, as expected, the average VCA is higher (38.92 trees
462 planted) when being observed by a child, but not significantly different from the
463 average VCA (37.09 trees planted) when being observed by an adult (WMW, $p =$
464 0.471).

465 Finally, we investigate a general “observability effect” (hypothesis 4), com-
466 paring *VCA* in *NoObserver* with the average *VCA* from across the three treatments
467 with observers (*StrangerAdult*, *StrangerChild*, and *OwnChild*). Even though *VCA*
468 is higher, the difference between the pooled observer conditions (38.31 trees
469 planted) and the *NoObserver* condition (37.12 trees planted) is also not significant
470 (WMW, $p = 0.328$).

¹⁵ We pre-registered the use of non-parametric tests for this analysis. However, an alter-
native specification testing the joint coefficients from Table 2 yields similar results.

471

472 **5.4 Treatment effects by education¹⁶**

473

474 **Figure 2. VCA: Number of trees planted by condition and education (N = 363 sub-**
 475 **jects). Each set of four box plots shows the average VCA of participants for each**
 476 **education level. Respective condition order for each education level: *NoObserver,***
 477 ***StrangerAdult, StrangerChild, and OwnChild.* Box plots show the mean (indicated**
 478 **by black X signs), the 25th and 75th percentiles, Tukey whiskers (median \pm 1.5**
 479 **times the interquartile range), and individual data points. Larger dots indicate a**
 480 **higher number of participants with the corresponding number of trees.**

481

482

483 Since education has been found to be a key determinant of the willingness
 484 to invest in VCA (Diederich and Goeschl 2014), we examine our treatment effects
 485 in two sub-analyses (pooling across locations).¹⁷ Specifically, we look at partici-
 486 pants with versus without *High School Diploma*. Average *VCA* by treatment and
 487 *High School Diploma* groups are graphically summarized in Figure 2. First, we
 488 observe a substantial main effect of having a high school diploma, pooled across
 489 treatments, consistent with prior research (Diederich and Goeschl 2014): whereas
 490 participants with secondary education invested in planting 39.37 trees on average
 (25th percentile = 40.00, 75th percentile = 46.00), participants without secondary

¹⁶ The sub-group analysis by education level was not pre-registered. In Table B-4 in the OA, background information on participants by education can be found.

¹⁷ Separately, we also analyze treatment effects by another subgroup—study location—in the OA.

491 education invested at a significantly lower rate of 27.61 trees (25th percentile =
492 10.00, 75th percentile = 46.00; WMW, $p < 0.001$).

493 *Parents with more educational attainment.* We repeat our empirical strategy
494 (see Eqs. (1) and (2)) for each subgroup analysis. Participants with high school
495 diploma form the majority of our sample (312 of 368 participants, or 86%). Fo-
496 cusing on these participants first, we observe consistent and sizeable effects of
497 the OwnChild treatment: across all specifications, parents who are observed by
498 their own child are significantly more likely to invest in VCA (see OwnChild co-
499 efficient all columns in). We do not find any evidence that being observed by a
500 stranger adult or stranger child leads to higher VCA. Consistent with our results
501 across the entire sample, these findings suggest that the OwnChild condition
502 leads to the highest VCA for more educated parents.

503 *The genetic link uniquely matters for more educated parents.* Furthermore,
504 we also find evidence that parents invest significantly more when being observed
505 by their own child, compared to being observed by a stranger child (WMW, $p =$
506 0.031). This result supports hypothesis 2, demonstrating that, for more educated
507 parents, the genetic link between a parent and their own child uniquely matters for
508 VCA, even when holding constant that the observer is a representative of a future
509 generation.

510

511 **Table 4. Regression results for parents with a high school diploma.**

	(1)	(2)	(3)	(4)
	<i>VCA</i>	<i>VCA</i>	<i>VCA</i>	<i>VCA</i>
<i>OwnChild</i>	3.52*	5.03**	13.73*	18.11**
	(2.01)	(1.97)	(7.25)	(7.07)
<i>StrangerChild</i>	-0.62	0.70	-0.83	3.54
	(1.95)	(1.92)	(6.50)	(6.32)
<i>StrangerAdult</i>	-0.51	2.14	1.01	11.33
	(1.98)	(2.00)	(6.70)	(6.94)
<i>Age</i>		0.05		0.12
		(0.11)		(0.36)
<i>Female</i>		0.56		2.96
		(1.52)		(5.21)
<i>Nr. kids</i>		1.52**		4.53*
		(0.74)		(2.59)
<i>Risk</i>		0.18		1.31
		(0.29)		(0.99)
<i>Patience</i>		-0.20		-1.14
		(0.24)		(0.85)
<i>Employed</i>		15.87***		38.32***
		(3.81)		(11.67)
Constant	39.20***	18.73***	61.59***	7.98
	(1.37)	(6.54)	(5.15)	(21.60)
var(e.VCA)			1180.56***	1030.96***
			(217.36)	(189.84)
<i>N</i>	312	311	312	311
Location Fixed Effects	No	Yes	No	Yes

512 Notes: Ordinary least squares ((1)-(2)) and tobit regressions ((3)-(4)); upper limit 46 and
513 lower limit 0). errors in parentheses. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *StrangerAdult*,
514 *StrangerChild*, *OwnChild* equals 1 for the respective treatment, and 0 otherwise (baseline
515 is the *NoObserver* treatment). *Age* is measured in years. *Female* equals 1 for female par-
516 ticipants. The number of kids controls for the respective variable for each participant. *Risk*
517 measures self-assessed risk attitudes with higher values indicating higher risk-seeking.
518 *Patience* measures self-assessed time preferences with higher values indicating higher pa-
519 tience. *Employed* is equal to 1 if a participant is employed and 0 otherwise. Location Fixed
520 Effects include dummies for study locations Rathausgalerien, Herbstmesse, and Sillpark.
521

522 *Parents with lower educational attainment.* Turning to participants with-
523 out a high school diploma ($N = 51$), we find that the treatment effects look quali-
524 tatively different. Specifically, average *VCA* is low in the *NoObserver* condition
525 (20.13) and, remarkably, also in the *OwnChild* condition (23.94). The highest
526 mean *VCA* is observed in the *StrangerChild* condition (35.73), which is signifi-
527 cantly different from the *NoObserver* condition without covariates (see columns
528 1 and 3 in Table 5) but not significant with covariates (columns 2 and 4). The
529 *StrangerAdult* condition (29.44) falls in the middle.

530

531 **Table 5. Regression results for parents without a high school diploma.**

	(1)	(2)	(3)	(4)
	VCA	VCA	VCA	VCA
<i>OwnChild</i>	3.81 (7.72)	-1.44 (8.05)	6.30 (12.58)	-2.48 (11.83)
<i>StrangerChild</i>	15.60* (8.28)	11.95 (8.08)	27.94* (14.37)	18.95 (12.52)
<i>StrangerAdult</i>	9.31 (7.72)	2.78 (7.70)	15.12 (12.74)	2.79 (11.33)
<i>Age</i>		1.26*** (0.40)		2.18*** (0.68)
<i>Female</i>		4.28 (6.08)		9.47 (9.71)
<i>Nr. kids</i>		-0.33 (2.38)		-1.40 (3.59)
<i>Risk</i>		1.19 (1.01)		2.19 (1.65)
<i>Patience</i>		-1.67 (1.10)		-2.57 (1.70)
<i>Employed</i>		1.81 (8.75)		3.78 (12.79)
Constant	20.13*** (6.30)	-28.70 (20.17)	22.10** (10.15)	-65.04* (32.32)
var(e.VCA)			800.58*** (241.69)	550.50*** (164.17)
<i>N</i>	51	51	51	51
Location Fixed Effects	No	Yes	No	Yes

532 Notes: Ordinary least squares ((1)-(2)) and tobit regressions ((3)-(4)); upper limit 46 and
533 lower limit 0). Standard errors in parentheses. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
534 *StrangerAdult*, *StrangerChild*, *OwnChild* equals 1 for the respective treatments, and 0 for
535 the baseline *NoObserver* treatment. *Age* is measured in years. *Female* equals 1 for female
536 participants. The number of kids controls for the respective variable for each participant.
537 *Risk* measures self-assessed risk attitudes with higher values indicating higher risk-seeking.
538 *Patience* measures self-assessed time preferences with higher values indicating higher
539 patience. Location Fixed Effects include dummies for study locations *Rathausgalerien*,
540 *Herbstmesse*, and *Sillpark*.
541

542 6. Discussion

543 In an intergenerational public good (for example, planting trees that offset
544 CO2 emissions), the beneficiaries (future generations) are not the same as the de-
545 cision-makers (current generation). We conjectured that parents, who have a ge-
546 netic link to the future through their children, would be particularly likely to invest
547 in planting trees, a measure of VCA. In our novel lab-in-the-field study, we found
548 a remarkable willingness of parents to invest in the VCA: over 80% of all parents
549 invested in the VCA, with two-thirds of all participants investing their *entire* en-
550 dowment into planting trees. This is far more than the usual VCA contributions
551 found in the literature: Bruns et al. (2018) report that participants spent 35% of a

552 default amount of money on VCA, while Diederich and Goeschl (2014) find that
553 only 16% of subjects chose the emission reduction instead of a cash amount.

554 We proposed that VCA would be heightened when a parent is being ob-
555 served by their own offspring. The parent's own child would serve multiple pur-
556 poses, most importantly as a reminder of the fact that a (genetic) link connects the
557 parent (decision-maker) to their own child (future beneficiary). Across our entire
558 sample, we find some evidence for the hypothesis that parents give more when
559 their children are watching their VCA decision. Importantly, education plays a
560 key role: as Diederich and Goeschl (2014) note, higher education increases the
561 willingness to engage in VCA and, furthermore, in our setting, our treatment ef-
562 fects are substantially larger in the subsample of participants with a high school
563 diploma. We find consistent evidence that parents with a high school diploma are
564 more likely to invest in VCA when their own child is observing them, both relative
565 to when no observer is present as well as when another child (to whom they are
566 not related) observes them. This latter finding rules out the explanation that these
567 parents engage in the VCA when a non-genetically linked future beneficiary is
568 present, consistent with the argument that intergenerational transmission of bene-
569 fits is driven by parents' realization that VCA today helps their own children in
570 the future.

571 Our study makes several contributions to the literature. First, we contribute
572 to the literature on VCA. Previous studies have studied both the personal charac-
573 teristics that determined engagement with VCA (Diederich and Goeschl 2014)
574 and contextual cues—often in the form of nudges—that can lead to more VCA
575 (see, e.g., Araña and León 2013; Böhm et al. 2020; Carattini and Blasch 2020). In
576 this paper, we focus instead on a novel context that we use as an intervention – the
577 role of the genetic link across the generations. Since VCAs are intergenerational
578 by nature, we argue that VCA interventions can benefit from taking into account
579 the intergenerational structure of families. We show that parents are indeed more

580 willing to invest in future public goods when they are observed by their children,
581 not just other adults or children – an effect that is particularly strong among more
582 educated parents.¹⁸ The presence of their child might have triggered several re-
583 sponses in parents, through which the treatment may have worked, including mak-
584 ing salient to the parent that their child is a direct future beneficiary of their actions
585 today, that they serve as a role model to their child on environmental issues, or
586 even that their child might hold them accountable for selfish behavior.

587 Second, we contribute to the burgeoning literature on intergenerational pub-
588 lic goods. Previous research has studied resource replenishment rates (Fischer et
589 al. 2004), institutions (Hauser et al. 2014), and peer punishment (Lohse and
590 Waichman 2020). However, a previously neglected aspect of intergenerational
591 public goods is relatedness (Nowak 2006): decision-makers may not be present to
592 reap the benefits of their actions in the future, but their own descendants could
593 benefit. As a result, genetic offspring should be considered in other interventions
594 to increase contributions to intergenerational public goods.

595 Furthermore, our study also speaks to standard public goods game: alt-
596 hough observability is a widely studied intervention in economics (e.g., Hoffman
597 et al. 1996; Yoeli et al. 2013), our study suggests that the “qualitative” type of
598 observers matters: while adults are typically recruited for studies using observa-
599 bility, we show that variation in observers can yield differing results. In our set-
600 ting, adult observers did not affect VCA, neither in the main nor subgroup anal-
601 yses. Our findings document the importance of choosing an observer that manip-
602 ulates the theoretical construct in question.

603 Finally, we contribute to the long-standing literature on child-parent inter-
604 actions. Most of this literature has only investigated one direction of this causal

¹⁸ The importance of the role of education on VCA has previously been noted (see Diederich and Goeschl 2014).

605 relationship—how parents influence their children—such as, for example, the ex-
606 tent to which parents' sharing behavior in the dictator game influences their
607 child's subsequent dictator game behavior (Ben-Ner et al. 2017). Similarly, prior
608 fieldwork has found that preferences are shaped by their parents' behavior in
609 childhood and persist into adulthood (Fernández et al. 2004). Here, we reverse the
610 causal direction of this relationship, finding that parents' behavior is shaped by
611 their children. Our intervention is relatively minimal and only involves observa-
612 tion by children, leaving open the possibility that children's actual influence on
613 their parents is much larger in reality.

614 Our findings offer practical implications for policy-makers and research
615 questions for scholars across a variety of domains. We focused on VCA, specifi-
616 cally planting trees. However, parents make many important decisions in daily life
617 that have consequences, if not always for future generations, at least for years and
618 decades to come that also shape the lives of the next generation. Consider, for
619 instance, voting: in many countries (including Austria), adults are not allowed to
620 take their children into the voting booth. Would parties that emphasize long-term
621 investments in education and environmental protection receive a greater voting
622 share if parents had to choose under the watchful eyes of their own children?
623 While this is an open empirical question, one could imagine that voting systems
624 may take such considerations into account (e.g., Kamijo et al. 2017). Even in more
625 mundane activities, such as shopping for groceries (e.g., buying meat or vegetar-
626 ian alternatives), or choosing whether to take the bike to work or on the school
627 run, a parent's behavior may be affected if their own children are present during
628 the decision-making process.

629 Of course, our study is not without limitations. Our results only speak to a
630 certain segment of society: adults with at least one child. We did not investigate
631 how parents are different in their VCA behavior from adults who are not parents.

632 We chose not to compare parents and non-parents for several reasons. First, po-
633 tential selection issues would complicate the interpretation of any results: do non-
634 parents choose not to have children for reasons that are related to intergenerational
635 considerations (e.g., environmental burden, overpopulation), or did they initially
636 want to have children but were not able to have them for one reason or another?
637 Second, there is no obvious “kin” equivalent for non-parents who could act as the
638 relevant observer: children are a parent’s obvious connection to the future,
639 whereas for non-parents other relatives (e.g., their own parents or siblings) may
640 not benefit from the intergenerational public good in the future. Other proxies
641 (e.g., nephews or nieces) may not be as close to the non-parent as a parent’s own
642 child.

643

644 7. Concluding remarks

645 In conclusion, we demonstrated that different observers may differentially
646 affect parents’ costly investment into VCAs. Because of the intergenerational as-
647 pect of VCAs, we argued that the parent’s own child is a particularly effective
648 observer to encourage parental VCA behavior, as children are a genetic link for
649 parents to the future. As climate change continues to accelerate, more research
650 will be needed to understand how researchers and policy-makers can encourage
651 VCA – one pathway may be through the leverage and watchful eyes of children
652 who stand to gain from encouraging today’s investments into the future.

653

654 **Other information**

655 *Ethical Approval:* The ethics committee of the University of Innsbruck has
656 approved this research (Certificate of good standing, 43/2019; July 29 2019).

657 *Pre-Registration:* The project has been pre-registered before data collection
658 (see “Saving the planet – one tree at a time” (#27772) on aspredicted.org). The
659 pre-analysis plan is available on request.

660 *Author Contributions:* Both authors contributed equally to all aspects of the
661 project, including, but not limited to, experimental design, project planning, im-
662 plementation, manuscript writing, and data analysis.

663 *Competing Interests:* The authors declare no competing interests.

664

665

666 **Availability statements**

667 *Data:* The datasets generated and analyzed will be made available through
668 the Open Science Framework after publication:

669 https://osf.io/2kdgz/?view_only=ae4b96704c8f41d8b66eebd1e5ce7bbf

670 *Code:* Custom code that supports the findings of the study will be made
671 available through the Open Science Framework after publication:

672 https://osf.io/2kdgz/?view_only=ae4b96704c8f41d8b66eebd1e5ce7bbf

673

674

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697

698

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Helena Fornwagner, Oliver P. Hauser

Climate action for (my) children

Abstract

Sustaining large-scale public goods, such as the environment, requires individuals to take action; however, motivating voluntary climate action (VCA) is difficult because decision-makers today do not stand to benefit from their investments. Here, we propose that parents invest more in VCA if their link to future generations-through their offspring-is made salient. In a novel lab-in-the-field experiment, we vary whether parents are observed during a VCA decision (i.e., investing in planting real-world trees) by their own child. In addition to a no-observer control, we run additional control conditions with an unrelated adult or an unrelated child observing the parent decision-maker. As predicted, VCA varies across conditions, with larger treatment effects occurring when a parent's own child is the observer. In subgroup analyses, larger treatment effects occur among more educated parents. As a result of this study, VCA across conditions led to 14,000 trees being planted, offsetting approximately 8 % of participants' annual CO₂ emissions for around four generations.

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