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Hohenzollernstr. 1-3, 45128 Essen, Germany

Ruhr-Universität Bochum (RUB), Department of Economics
Universitätsstr. 150, 44801 Bochum, Germany

Technische Universität Dortmund, Department of Economic and Social Sciences
Vogelpothsweg 87, 44227 Dortmund, Germany

Universität Duisburg-Essen, Department of Economics
Universitätsstr. 12, 45117 Essen, Germany

Editors

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RUB, Department of Economics, Empirical Economics
Phone: +49 (0) 234/3 22 83 41, e-mail: thomas.bauer@rub.de

Prof. Dr. Wolfgang Leininger
Technische Universität Dortmund, Department of Economic and Social Sciences
Economics – Microeconomics
Phone: +49 (0) 231/7 55-3297, e-mail: W.Leininger@tu-dortmund.de

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Prof. Dr. Roland Döhrn, Prof. Dr. Manuel Frondel, Prof. Dr. Jochen Kluve
RWI, Phone: +49 (0) 201/81 49-213, e-mail: presse@rwi-essen.de

Editorial Office

Sabine Weiler
RWI, Phone: +49 (0) 201/81 49-213, e-mail: sabine.weiler@rwi-essen.de

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Michael Simora[1]

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Abstract

Despite general support for the transition towards renewable energies, local opposition may hamper the required power line construction. This paper evaluates a large randomized one shot binary choice experiment with about 10,000 observations to examine the effect of annual community compensations based on current legislation as well as the effect of household compensations on the willingness to accept new power line construction. Results reveal that community compensations have no bearing on the acceptance level, whereas personal compensations have a negative effect via crowding out intrinsic motivation to support the construction project or via signaling negative impacts for residents. Thus, policy makers should refrain from financial payments as an instrument to decrease local opposition.

JEL Classification: M52, C93, Q40

Keywords: Not-in-my-backyard; compensation payment; willingness to accept; motivation crowding out

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1 Introduction

Aiming at a 40% reduction of carbon dioxide emissions by 2020 relative to 1990 levels, Germany's ambition is to increase the share of renewable energy sources in the gross domestic energy production to 35% by 2020 and to 50% by 2030. With a current share of around 32%, Germany is even above the aspired extension path (AGEE Stat, 2016; BDEW, 2015a). Despite this meritorious progress, German energy economists unanimously agree on the urgency of a massive extension of the electricity grid, in particular the construction of new high voltage power lines that transmit electricity from North to South Germany. However, two main reasons hampering the extension are the complex licensing procedures as well as local opposition of residents (Andor et al., 2015). Generally, a high share of Germany's population supports the energy transition towards renewables (BDEW, 2015b). However, the so-called "not-in-my-backyard" (NIMBY) problem prevails, with many people hostile to the idea of renewable infrastructure projects in their communities. To counteract, economic theory would suggest monetary payments for residents to compensate for negative externalities thereby increasing acceptance.

Previous studies mainly analyzed the case of windmills, calculating the necessary compensation for residents to accept these constructions (see e.g. Groothuis et al., 2008; Krueger et al., 2011; Ladenburg & Dubgaard, 2007). Coursey & Kim (1997) theoretically scrutinize different compensation mechanisms for the siting of NIMBY projects and conclude that compensation for the host community must be in place to avoid opposition. Other scholars, however, argue that compensation payments are the wrong approach to foster acceptance as they might undermine an individual's intrinsic motivation and force them to see their situation through the economic lens (e.g. Krohn & Dambourg, 1999; Muradian et al., 2013; Tobiasson & Jamasb, 2016; Upham & Garcia, 2015). While several empirical studies analyzing the influence of monetary incentives on pro-social behavior found a negative effect (e.g. Gneezy & Rustichini, 2000a, 2000b; Jack, 2009; Kerr et al., 2012; Mellström & Johannesson, 2008), the siting

of NIMBY projects is rarely the focus of investigation. An exception is the study by Frey & Oberholzer-Gee (1997), who derive a negative effect of compensation offers on the acceptance of a nuclear waste deposit.

The present study contributes to this literature by analyzing the effect of financial compensations on the willingness to accept electric power line construction in the direct neighborhood. To this end, we conduct a large randomized one shot binary choice experiment exposing participants to a hypothetical referendum. The randomized setting allows for a causal interpretation of the outcome. The sample, consisting of about 10,000 observations, is randomly split into three experimental groups. The first treatment group receives the information that their community will be compensated based on the number of residential households, the second is offered a yearly financial compensation at the household level, and the control group receives no financial proposal. To our knowledge, this study is the first to conduct a large randomized experiment to analyze the effect of personal as well as community compensation offers on the acceptance of power line construction. Previous studies mostly focused on other determinants of and strategies for accepting power lines, for instance public perceptions of the impacts of construction or the communication process with locals (e.g. Ciupuliga & Cuppen, 2013; Cotton & Devine-Wright, 2013; Devine-Wright, 2012; Tobiasson et al., 2016). A rare exception is the study by Cohen et al. (2016), who examine the effect of community compensation as well as different framing approaches in the EU-27. These authors find a small positive effect for most countries except Germany, where a monetary compensation offer at community level leads to a reduction in the acceptance level. However, with less than 100 observations per treatment (for Germany) drawing statistical inference is somewhat limited.

As the construction of new power lines is essential for the ongoing success of Germany's energy transition towards renewables, the findings of our study are of high political relevance. In fact, our results reveal that financial compensations are a misleading approach: While we do not find any effect of the treatment at the community level, we detect a negative effect of the treatment at the household level. That is, the

share of pro power line votes is lowest among participants who received an individual compensation offer.

The paper is organized as follows. The subsequent section explains the experimental design in more detail. Results are depicted and discussed in Section 3. Finally, Section 4 summarizes and concludes.

2 Experimental Design and Data

Experimental Design

We set up the following randomized one shot binary choice experiment, a framework which Carson & Groves (2007) and Carson et al. (2014) found to be incentive compatible thus revealing respondent's true preferences. All participants are confronted with a hypothetical referendum on the construction of new overhead power lines in their immediate vicinity.[1] The first treatment group (henceforth called "community treatment") receives the information that their community will be compensated with either 100, 250, or 500 EUR per residential household per year. The exact offer is randomly allocated within the group to check for an influence of the amount of compensation. This treatment is based on German legislation, which states that communities must be compensated for constructions derogating the natural scenery. Furthermore, this law requires communities to use the received money for nature conservation and landscape preservation measures (BMUB, 2013). This additional information is included in our study and is given to all respondents in the community treatment. The second treatment group (henceforth called "household treatment") is proposed a yearly compensation at the household level, where the amount again differs randomly between 100, 250 and 500 EUR. Finally, the control group receives no compensation offer.

[1] For the exact wording see Questions 1a - 1c in Appendix A. Note that 1,325 participants are excluded who indicated to abstain from voting or marked a "I do not know".

Before voting in the referendum, all participants receive the information that power grid expansion is crucial for Germany's energy transition and that the construction of power lines in their neighborhood follows recommendations of expert net planers. With this framing we might introduce social desirability bias, confounding the share of pro power line votes upwards. However, this bias is argued not to be problematic for three reasons. First, it is not the intention of this study to forecast a potential outcome of a real referendum. Second, the framing is used for all experimental groups and consequently does not harm the validity of the treatment. Finally, in a real referendum similar information would most likely be given.

A disruptive force to the validity of the study to be reckoned with is hypothetical bias. In hypothetical situations, individuals typically overestimate their willingness to pay, respectively their willingness to accept (Blumenschein et al., 2008; Little & Berrens, 2004; List & Gallet, 2001; Nape et al., 2003). This would imply that in a real referendum, more individuals would accept the offered payment meaning that the share of pro power line votes in our treatment groups is biased downwards. This might lead to an overestimation of a potential negative effect, or an underestimation of a potential positive effect of the compensation, respectively. However, methods to cope with this issue exist and will be addressed and employed in the results section.

Data

The experiment is part of a survey among approximately 10,000 households that was funded by the Federal Ministry of Education and Research (BMBF) and focused on the social acceptance of the energy transition in Germany.[2] Data was collected by the German survey institute *forsa* via a state-of-the-art tool that allows respondents to complete the questionnaire at home using either a television or the internet. A large set of socio-economic and demographic background information on all household members is available from *forsa*'s household selection procedure and updated regularly.

[2]For more information on the project, the underlying questionnaires and a summary of the descriptive results, please visit http://en.rwi-essen.de/forschung-und-beratung/umwelt-und-ressourcen/projekte/287/

Table 1: Descriptive statistics of control variables

Variable	Explanation	Control Group	Community Treatment	Household Treatment
male	Dummy: 1 if respondent is male	0.686	0.665 (1.51)	0.670 (1.17)
age	Age of respondent	55.58	54.91 (1.66)	55.02 (1.40)
homeowner	Dummy: 1 if respondent is homeowner	0.623	0.630 (-0.52)	0.629 (-0.42)
children	Dummy: 1 if respondent is living with children	0.146	0.149 (-0.33)	0.159 (-1.15)
employed	Dummy: 1 if respondent is employed	0.571	0.574 (-0.17)	0.592 (-1.37)
college	Dummy: 1 if respondent has college preparatory degree	0.394	0.398 (-0.32)	0.402 (-0.56)
east	Dummy: 1 if respondent lives in East Germany	0.211	0.198 (1.06)	0.200 (0.87)
rural	Dummy: 1 if respondent lives in rural area	0.204	0.183 (1.70)	0.208 (-0.33)
intermediate	Dummy: 1 if respondent lives in intermediate area	0.446	0.448 (-0.11)	0.423 (1.53)
urban	Dummy: 1 if respondent lives in urban area	0.350	0.369 (-1.28)	0.369 (-1.30)
income	Household's net income per person (EUR)	1536	1526 (0.46)	1519 (0.72)
ppi	PPI of respondent's postal code area	1.90	1.91 (-0.49)	1.84 (1.90)
green	Dummy: 1 if respondent is inclined to Green Party	0.101	0.120 (-2.02)	0.107 (-0.67)
powertowers	Dummy: 1 if pre-existing power towers in respondent's postal code area	0.799	0.787 (0.91)	0.782 (1.33)
renewables	Dummy: 1 if pre-existing renewable power generating stations in respondent's postal code area	0.580	0.549 (2.09)	0.554 (1.72)
fossils	Dummy: 1 if pre-existing fossil power generating stations in respondent's postal code area	0.093	0.086 (0.90)	0.073 (2.49)
N		2,151	2,241	2,176

Note: Table depicts means. t-statistics comparing group means to control group in parentheses.

The set of control variables is depicted in Table 1. Two-sample t-tests for equal means indicate that the experimental groups do not differ significantly among most variables. The high share of males in our sample is due to the design of the underlying survey where household heads were asked to fill in the questionnaire, that is, those members of the household who typically make investment decisions.

The categories of the degree of urbanization of the household's vicinity follow the regional typology established by the OECD, which distinguishes between rural, intermediate and urban areas (OECD, 2011). We expect respondents living in a rural area to vote less frequently in favor of construction as they are presumably more inclined towards landscape preservation. On the other side, respondents living in an extremely urban surrounding might be less able to imagine a construction of new power lines within their *immediate* vicinity and might therefore vote more frequently in favor of construction. Furthermore, we expect homeowners to vote less frequently in favor of construction as they might fear a decrease in property value, regardless of whether there actually is an effect on housing prices (Baxter et al., 2013; Gregory & Von Winterfeldt, 1996; Sims et al., 2008; Soini et al., 2011). Additionally, having invested in housing signals willingness to stay in the current neighborhood and hence these

households might be more inclined to an untouched landscape. The latter argument likewise holds for households with children as well as for employed persons.

To control for general environmental attitudes we include a dummy indicating whether the respondent is inclined to vote for Germany's Green Party.[3] While Baxter et al. (2013) conclude that green attitudes foster the support of necessary construction work, Soini et al. (2011) derive less acceptance of power lines among respondents with stronger pro environmental attitudes. Further, we control for the household's economic situation by including monthly net income per person.[4] As previous studies derived that the economic situation of the whole community influences the acceptance of NIMBY projects (Jobert et al., 2007), we incorporate the mean purchasing power index (PPI) of the household's postal code area.[5]

Finally, we include information about pre-existing power towers and power generating stations in the respondent's postal code area by incorporating respective dummies.[6] Soini et al. (2011) observe that respondents who live in an area with a relatively high amount of power lines are more likely to have a positive attitude towards them. Contrary, Cohen et al. (2016) conclude that if a respondent's vicinity recently faced renewable infrastructure developments, the acceptance of new construction is reduced. Likewise, Upham & Garcia (2015) argue that in areas with an already high share of wind mills, the acceptance of new projects is lowered. However, these findings are either of descriptive nature or derived using rather rough measures. We are the first to make use of highly resolved spatial data to analyze the effect of pre-existing electricity infrastructure on the acceptance of new construction. For power generating stations, we distinguish between renewable and fossil energies including nuclear energy

[3]We tested further proxies for general environmental attitudes, namely a dummy whether the household has a green electricity tariff and a dummy whether the household head is member of an environmental organisation. Signs, magnitude, and significance levels do not change when using these proxies.

[4]Initially, income is measured in intervals of 500 EUR, ranging from 700 to 5700 EUR. For our purpose, we assume households to lie in the middle of the interval and divide this amount by the number of persons living in the household. Using the intervals instead does not change results.

[5]Information is obtained from microm data on purchasing power (doi:10.7807/microm/kaufkraft:V4), with mean purchasing power in Germany normalized to 1.

[6]Data is received in January 2017 from OpenStreetMap.org, licensed under the Open Data Commons Open Database License (ODbL).

to check for heterogeneity in the effect for different energy sources.[7]

3 Results and Discussion

Results

As treatments were randomly assigned, we begin our analysis with a simple comparison of group means. Table 2 depicts the shares of pro power line votes in the different experimental groups as well as corresponding t-statistics comparing the outcome to the control group. While there is no statistical difference between the community treatment groups and the control group, the household treatments with 100 and 250 EUR compensation exhibit a significantly lower acceptance rate. In these groups, the compensation offer decreased the probability to vote in favor of construction by approximately 4.8 and 5.4 percentage points, respectively. Further note that in all groups more than 50% of the respondents indicated to vote in favor of the construction. However, these shares do not necessarily translate into real referendum outcomes due to social desirability bias, hypothetical bias and an overrepresentation of males.

In a next step, we add the control variables mentioned in Section 2 and estimate a probit model of voting in favor of construction.[8] In addition to being of interest in their own right, the inclusion of these variables serves to gauge the robustness of the descriptive results and, as argued by Angrist & Pischke (2008:23f), potentially increases the precision of the estimates.

Table 3 shows the regression results. Note that we follow Greene (2007: E18-23, 2010: 292) who argues that in non-linear models, such as probit, tests on the statistical significance of an explanatory variable should be based on its coefficient, for which we depict asterisks. The magnitude of the impact can thereupon be inferred from the marginal effects. The community treatment has no significant bearing on power line

[7] Using the number of power towers and power generating stations in the respondent's postal code area instead of dummies does not change our results.

[8] Regressions of a logit model as well as OLS gave similar results, see Table B2 in Appendix B. Likewise, results were robust to a successive inclusion of the further controls.

Table 2: Share of pro power line votes in different experimental groups

	Share (in %)	t-statistic	N
Control	66.81	–	2,151
Community Treatment 100EUR	64.69	1.07	776
Community Treatment 250EUR	64.59	1.10	737
Community Treatment 500EUR	67.72	-0.45	728
Household Treatment 100EUR	62.03	2.31	698
Household Treatment 250EUR	61.38	2.66	725
Household Treatment 500EUR	64.41	1.20	753

Note: t-statistics comparing group mean with control group.

Table 3: Probit estimation on pro power line votes: Regression results

Variable	Coefficient		Marginal effect	
Community 100EUR	-0.049	(0.055)	-0.017	(0.019)
Community 250EUR	-0.050	(0.056)	-0.018	(0.020)
Community 500EUR	0.018	(0.057)	0.006	(0.020)
Household 100EUR	-0.116**	(0.057)	-0.042	(0.021)
Household 250EUR	-0.141***	(0.056)	-0.051	(0.020)
Household 500EUR	-0.063	(0.056)	-0.023	(0.020)
male	0.400***	(0.035)	0.143	(0.012)
age	0.002	(0.002)	0.001	(0.001)
homeowner	-0.271***	(0.037)	-0.097	(0.013)
children	-0.116**	(0.051)	-0.042	(0.018)
employed	-0.079*	(0.042)	-0.028	(0.015)
college	0.036	(0.035)	0.013	(0.013)
east	0.031	(0.041)	0.011	(0.015)
intermediate	-0.036	(0.048)	-0.013	(0.017)
urban	0.052	(0.055)	0.019	(0.020)
income	-0.003	(0.002)	-0.001	(0.001)
ppi	0.030*	(0.017)	0.011	(0.006)
green	0.251***	(0.054)	0.090	(0.019)
powertowers	0.042	(0.044)	0.015	(0.016)
renewables	-0.065*	(0.036)	-0.023	(0.013)
fossils	0.076	(0.060)	0.027	(0.021)
N	6,568		6,568	

*Note: Marginal effects averaged over observations. Robust standard errors in parentheses. ***,**,* denote statistical significance at the 1 %, 5 % and 10 % level, respectively.*

acceptance, irrespective of the offered amount. The household treatment, in contrast, significantly reduces the share of pro power line votes in those groups being proposed 100 or 250 Euro compensation by 4.2 and 5.1 percentage points, respectively. The 500 Euro household treatment has no significant influence on the acceptance rate, though suggests that higher compensation offers at some point might exhibit the desired effects, albeit for a questionable price to pay. This is in line with the findings of Gneezy & Rustichini (2000b) who suggest higher compensation payments to result in higher desired outcomes, except if the monetary incentive is "too small", which results in a reduction of the recipient's motivation.

If we specify our model a bit differently and include dummies for the community and the household treatment irrespective of the amount and control for the latter as a separate explanatory variable, we arrive at similar conclusions (see Table B1 in Appendix B). While the community treatment has no effect on power line acceptance, the household treatment significantly reduces the probability to vote in favor of construction by 5.5 percentage points. The amount of compensation plays a negligible role in determining power line acceptance.

Furthermore, we can detect several other interesting effects in our regression. First, with a marginal effect of 14.3 male respondents have a substantially higher probability to vote in favor of construction. Second, as expected, being a homeowner decreases the probability to vote in favor of construction, as does living with children and – to a lesser extent – being employed. However, the latter two effects were not found to be robust (compare Table 4). In line with Baxter et al. (2013) we moreover derive that green attitudes positively relate to pro power line votes. As the amount of compensation plays a minor role, it is less surprising that the household's per capita income has no significant bearing on the voting decision. Likewise, we do not find a robust effect of the economic power of the community. Regarding electricity infrastructure we infer that pre-existing power towers have no influence on the acceptance of new construction projects. Furthermore, neither the presence of renewable nor fossil power generating facilities in the respondent's neighborhood is found to have a consistently

significant effect. Though we anticipated an influence of urbanization, its likely correlation with the infrastructure variables renders the estimates statistically insignificant.

As it is quite unlikely that urban neighborhoods would be affected by construction if a similar referendum was held in reality, we exclude all respondents living in an urban area in a robustness check. The first column of Table 4 shows that the marginal effects of all household treatments shrink and become insignificant in this exercise. On the other hand, the 250 EUR community treatment becomes significantly negative at the 10% level, reducing the probability to vote in favor of construction by 4.2 percentage points. The effects of gender, homeownership and general environmental attitude retain statistical significance.

The further robustness checks aim at tackling hypothetical bias. Therefore, subsequent to indicating their referendum vote, respondents were asked about the certainty of their response.[9] Those respondents who did not confirm to be sure about their actual voting behavior, are excluded from analysis.[10] Several studies (e.g. Blumenschein et al., 2008; Little & Berrens, 2004; Ready et al., 2010; Whitehead & Cherry, 2007) showed that hypothetical bias can be reduced using this approach. In our case, this exercise leads to even stronger effects of the household treatments. While the marginal effects of the 100 EUR and 250 EUR household treatments increase to -4.7 and -6.2, respectively, the 500 EUR treatment has a marginal effect of -3.8 being significant at the 10% level. The further effects do not change considerably. In particular, the community treatment does not have a significant bearing on voting behavior (see Table 4 column 2).

A second strategy for dealing with hypothetical bias goes a step further. As individuals typically overestimate their willingness to accept, some respondents refuse the hypothetical offer but would accept it in a real referendum.[11] For this reason, we recoded all respondents who indicated to vote against the construction but were not

[9] For the exact wording see Question 2 in Appendix A.

[10] In total 1,449 observations were dropped in this step, out of which 579 voted against construction and 870 voted in favor of construction.

[11] That is, if for a respondent $WTA_{hypothetical} > offer > WTA_{real}$ holds.

Table 4: Probit estimation on pro power line votes: Marginal effects of robustness checks

	(1) Excluding urban respondents		(2) Just sure respondents		(3) Recoding unsure "No" to "Yes" votes	
Community 100EUR	0.007	(0.024)	-0.026	(0.022)	-0.015	(0.018)
Community 250EUR	-0.042*	(0.026)	-0.035	(0.023)	-0.010	(0.018)
Community 500EUR	0.014	(0.026)	0.003	(0.022)	0.004	(0.018)
Household 100EUR	-0.026	(0.027)	-0.047**	(0.023)	-0.035*	(0.019)
Household 250EUR	-0.040	(0.026)	-0.062***	(0.022)	-0.054***	(0.019)
Household 500EUR	0.015	(0.025)	-0.038*	(0.022)	-0.023	(0.018)
male	0.141***	(0.016)	0.160***	(0.013)	0.095***	(0.011)
age	0.002**	(0.001)	0.001	(0.001)	-0.000	(0.001)
homeowner	-0.105***	(0.018)	-0.113***	(0.015)	-0.087***	(0.012)
children	-0.020	(0.023)	-0.045**	(0.021)	-0.026	(0.017)
employed	-0.017	(0.020)	-0.030*	(0.017)	-0.036**	(0.014)
college	-0.011	(0.016)	0.007	(0.014)	0.009	(0.012)
east	0.013	(0.018)	0.007	(0.016)	0.002	(0.014)
intermediate	-0.012	(0.018)	-0.002	(0.019)	0.009	(0.016)
urban	–		0.033	(0.022)	0.034*	(0.018)
income	-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)
ppi	0.011	(0.007)	0.011	(0.007)	0.006	(0.006)
green	0.067***	(0.026)	0.099***	(0.022)	0.071***	(0.018)
powertowers	0.048*	(0.025)	0.013	(0.018)	0.017	(0.015)
renewables	-0.020	(0.016)	-0.020	(0.014)	-0.028**	(0.012)
fossils	-0.014	(0.028)	0.026	(0.024)	0.016	(0.020)
N	4,186		5,119		6,568	

*Note: Marginal effects averaged over observations. Robust standard errors in parentheses. ***,**,* denote statistical significance at the 1 %, 5 % and 10 % level, respectively. Statistical significance is infered from estimation coefficients (cf. Greene, 2007:E18-E23, 2010: 292), which can be found in Table B3 in Appendix B.*

sure, to pro power line votes (cf. Blumenschein et al., 1998; Champ et al., 1997; Morrison & Brown, 2009; Ready et al., 2010).[12] With this approach, the marginal effect of the 100 EUR household treatment loses significance (p=0.062), whereas the other effects stay robust compared to the baseline model. In particular, the community treatments are insignificant and the 250 EUR household treatment has a significantly negative marginal effect of -5.4 (see Table 4 column 3).

[12]The recoding was done for 579 respondents. Whether the 870 unsure pro-power line voters are kept or excluded from analysis does not lead to different conclusions.

Since our main results prove to be robust against these specifications, there is no indication of a severe hypothetical bias in our experimental outcomes. Likewise, some previous studies came to the conclusion that hypothetical bias is not universal. For instance, hypothetical binary referendum outcomes were similar to follow-up real referendum outcomes in cases, where the experimental setting was kept simple and the respondents were familiar with the object of choice (Johnston, 2006; Smith & Mansfield, 1998; Taylor et al., 2001; Vossler & Kerkvliet, 2003), both being aspects which can reasonably be said to apply in the present setting.

To summarize, we find a significant and mainly robust negative effect of the 100 EUR and 250 EUR household treatments and no noteworthy effect of the community treatment. We conclude that offering individuals a financial compensation with the aim to reduce local opposition against necessary construction work is not expedient. While hypothetical bias is arguably a threat to our study, robustness checks showed that the negative effect of the personal compensation offer does not vanish when this bias is levered. At the very least, there is no hint on a positive effect of such compensations.

Discussion

One possible theoretic underpinning of our result is *motivation crowding out*. According to this theory, which was first proposed by Titmuss (1970), the "good feeling" individuals relate to altruistic behavior is reduced or even removed by monetary compensations, leading to a lower willingness to conduct the socially desirable behavior. The famous example of Titmuss (1970) are blood donations, which were less frequently performed after a small monetary compensation was introduced. Frey & Oberholzer-Gee (1997) provide a theoretical framework to this theory. Using a randomized experiment they furthermore give an empirical example showing a lower acceptance rate for a nuclear waste deposit in a respondent's community if financial compensation is offered. Further empirical evidence for a motivation crowding out effect of financial incentives in various settings can be found in the reviews by Bowles & Polania-Reyes

(2012), Frey & Jegen (2001) and Rode et al. (2015).

However, alternative explanations for the reduced acceptance rate in case of personal compensation offers are possible. Following the hypothetical referendum, respondents who voted against construction were asked for their reasons.[13] A first rationale might be strategic behavior of the respondents: The initial offer is refused, hoping that a higher one will be made. However, the first column of Table 5 reveals that only 10% of those refusing the proposed compensation stated that it was too low. Additionally, regression results unveiled that the amount of compensation plays a minor role in determining voting behavior. Hence, we conclude that strategic behavior of respondents or an insufficient compensation offer do not explain the observed treatment effects. Interestingly, there is hardly any variation in indicating this reason over experimental groups or offered amount. However, males were almost twice as likely as females to assess the offer as too low.

A second reason to vote against construction might be that participants interpret the compensation as a signal for negative consequences and a higher risk for residents than they previously ascribed to the construction (cf. Frey & Oberholzer-Gee, 1997). If people perceive a risk for their health, irrespective of whether there is an objective risk, they strongly refuse construction (Baxter et al., 2013; Cotton & Devine-Wright, 2013; Jay, 2007; Upham & Garcia, 2015). In our case, respondents initially might not see a big risk, but get suspicious as soon as a compensation for the construction is offered. Seemingly, this negative signaling is a valid concern as it is identified by approximately 37% of those refusing the financial compensation and voting against construction (see Table 5 column 2). Some scholars argue in a similar way, claiming that if the compensation is perceived as bribery, it is refused (Aitken, 2010; Walker et al. 2014).

Thirdly, respondents who voted against the construction were asked whether they are simply not willing to impair the natural scenery and prioritize an untouched landscape over financial matters. As column 3 in Table 5 reveals, this holds true for more

[13] For the exact wording see questions 3a-3b in Appendix A.

Table 5: Reasons to vote against construction (in shares)

	Compensation too low	Compensation received as negative signal	No landscape derogation	(Community) Compensation not useful
Total	10.0	37.1	53.8	21.0
Community 100EUR	8.8	38.7	58.8	21.5
Community 250EUR	10.7	37.2	55.2	20.3
Community 500EUR	8.9	34.5	58.3	21.3
Household 100EUR	12.8	41.5	49.1	–
Household 250EUR	8.6	32.9	50.0	–
Household 500EUR	10.5	38.1	51.9	–
Males	12.4	37.9	51.5	24.3
Females	6.6	36.0	57.1	16.6
Rural	10.1	37.1	58.9	14.0
Intermediate	8.7	34.5	53.5	20.3
Urban	11.8	40.8	51.0	26.6
N	1,583	1,583	1,583	770

Note: Share related to subsample who voted against construction. Respondents could indicate more than one reason for voting against the construction.

than half of those respondents. Remarkably, participants in the community treatment tend to mention this reason more frequently than those in the household treatment, despite being informed that the community compensation would be reinvested in landscape preservation. The finding that residents in rural areas more frequently indicated importance of an untouched landscape compared to respondents living in an intermediate or urban area, is less surprising. Visual aesthetic concerns hence play a major role in the opposition towards construction, a result which has also been derived in previous studies (Cotton & Devine-Wright, 2013; Eltham et al., 2008; Jobert et al., 2007; Upham & Garcia, 2015). This clear preference for an untouched natural scenery, however, is relatively independent of financial compensation offers and hence, besides explaining opposition does not provide an explanation for the revealed treatment effect.

Finally, respondents voting against the construction in the community treatment group were asked whether they assess the community level compensation as personally unbeneficial, which is the case for 21% of those respondents (see Table 5 column

4). Similar to the other financial rationale, males indicated this point more frequently than females. Moreover, we see a high variation in this motive among the degree of urbanization. While only 14% of respondents in rural areas do not see a personal benefit in the community compensation, this is true for 20% of intermediate and nearly 27% of urban respondents, which is probably due to the fact that the community compensation was tied to measures of landscape preservation.

To summarize, it is difficult to disentangle the different channels through which the financial compensation offer reduces the willingness to accept the power line project. Besides crowding out intrinsic motivation, a negative signaling of the compensation seems to take place.

4 Summary and Policy Implications

This paper analyzed the effect of financial compensation offers on the individual acceptance of new overhead power line construction in the direct neighborhood. In a large randomized one shot binary choice experiment respondents were confronted with a hypothetical referendum. Different experimental groups were offered either no compensation (control group), a yearly payment at the community level (community treatment) or a yearly payment at the household level (household treatment). The former treatment is based on German legislation, according to which communities have to be compensated for construction work that derogates the natural scenery. However, this treatment had no significant bearing on the referendum outcome.

Thus, even though compensating communities and tying it to landscape preservation measures is ecologically appealing, there is no effect on reducing local opposition. The household treatment was found to have a significant negative effect, i.e. the proposed financial compensation diminished the willingness to accept the construction project. As the referendum under scrutiny was of hypothetical nature, our study might face a hypothetical bias. However, methods for coping with this issue were applied and the negative effect of the household treatment remained robust. Hence, monetary

offers do not increase acceptance by compensating residents for negative externalities. We rather observe a reduction in the acceptance rate since payments might signal negative consequences for residents or crowd out their intrinsic motivation to accept the socially desirable but personally unwanted construction.

Instead, several scholars stress that construction plans must be made transparent ab initio and locals must be included in an early planning stage to avoid a feeling of governmental enforcement and being passed over (Aitken, 2010; Ciupuliga & Cuppen, 2013; Cotton & Devine-Wright, 2013; Eltham et al., 2008; Krohn & Dambourg, 1999; Upham & Garcia, 2015). When informing residents, community benefits and environmental usefulness should be highlighted (Cohen et al., 2016; Walker et al., 2014). Devine-Wright (2012) and Tobiasson et al. (2016) further underline the importance of trust in the network operator as well as in the local government. Without these preconditions fulfilled residents build up opposition. As this leads to delay and further costs and as the expansion of the electricity grid is urgent, policy makers have to aim at preventing distrust and ensuring transparency and local project involvement. Financial compensation offers for residents are likely to be insufficient or even counterproductive as they force recipients to see their situation through an economic lens (Muradian et al., 2013; Tobiasson & Jamasb, 2016).

Appendix A: Survey questions

Question 1a for control group:

A crucial part of the energy transition is grid expansion. Please assume that - following the advice of expert net planners - it is intended to build a new overhead power line through your immediate vicinity. In a referendum, residents are asked to vote on this construction. How would you personally vote in this referendum?

(i) I would vote in favor of constructing the new power line

(ii) I would vote against constructing the new power line

(iii) I would abstain from voting

(iv) I do not know

Question 1b for community treatment group:

A crucial part of the energy transition is grid expansion. Please assume that - following the advice of expert net planners - it is intended to build a new overhead power line through your immediate vicinity. Your community will be compensated with a yearly payment of [100, 250 or 500] Euro per residential household, which your community has to use for nature conservation and landscape preservation measures. In a referendum, residents are asked to vote on this construction. How would you personally vote in this referendum?

(i) I would vote in favor of constructing the new power line

(ii) I would vote against constructing the new power line

(iii) I would abstain from voting

(iv) I do not know

Question 1c for household treatment group:

A crucial part of the energy transition is grid expansion. Please assume that - following the advice of expert net planners - it is intended to build a new overhead power line through your immediate vicinity. Every residential household will be compensated with a yearly payment of [100, 250 or 500] Euro. In a referendum, residents are asked

to vote on this construction. How would you personally vote in this referendum?
(i) I would vote in favor of constructing the new power line
(ii) I would vote against constructing the new power line
(iii) I would abstain from voting
(iv) I do not know

Question 2 for respondents who indicated to vote either in favor or against construction (all groups):
How sure are you that you would really vote [in favor of or against] construction in the referendum?
(i) Very sure
(ii) Not so sure
(iii) I do not know

Question 3a for respondents who indicated to vote against construction in community treatment group:
Why would you vote against the construction of the new power line? Which of the following reasons apply for you?
(i) I personally do not benefit from the compensation
(ii) The offered compensation is too low
(iii) The offered compensation points on negative consequences of the construction
(iv) I do not want the landscape to be derogated
(v) A different reason
(vI) I do not know

Question 3b for respondents who indicated to vote against construction in household treatment group:
Why would you vote against the construction of the new power line? Which of the following reasons apply for you?

(i) The offered compensation is too low

(ii) The offered compensation points on negative consequences of the construction

(iii) I do not want the landscape to be derogated

(iv) A different reason

(v) I do not know

Appendix B: Robustness checks

Table B1: Probit estimation on pro power line votes: Alternative Specification

Variable	Coefficient		Marginal effect	
Community treatment	-0.073	(0.051)	-0.026	(0.018)
Household treatment	-0.154***	(0.052)	-0.055	(0.019)
Offered amount (in 100EUR)	0.016	(0.012)	0.006	(0.004)
Further controls	YES		YES	
N	6,568		6,568	

*Note: Marginal effects averaged over observations. Robust standard errors in parentheses. ***,**,* denote statistical significance at the 1 %, 5 % and 10 % level, respectively.*

Table B2: OLS and logit estimation on pro power line votes

	logit Marginal Effects		OLS Coefficients	
Community 100EUR	-0.017	(0.019)	-0.017	(0.020)
Community 250EUR	-0.018	(0.020)	-0.018	(0.020)
Community 500EUR	0.008	(0.020)	-0.007	(0.020)
Household 100EUR	-0.042**	(0.020)	-0.042**	(0.021)
Household 250EUR	-0.054***	(0.020)	-0.050**	(0.021)
Household 500EUR	-0.021	(0.020)	-0.022	(0.020)
male	0.141***	(0.012)	0.146***	(0.013)
age	0.001	(0.001)	0.001	(0.001)
homeowner	-0.097***	(0.013)	-0.096***	(0.013)
children	-0.041**	(0.018)	-0.043**	(0.019)
employed	-0.027*	(0.015)	-0.027*	(0.015)
college	0.013	(0.013)	0.013	(0.013)
east	0.012	(0.015)	0.012	(0.015)
intermediate	-0.013	(0.017)	-0.013	(0.018)
urban	0.018	(0.020)	0.018	(0.020)
income	-0.001	(0.001)	-0.001	(0.001)
ppi	0.011*	(0.006)	0.011*	(0.007)
green	0.089***	(0.020)	0.087***	(0.018)
powertowers	0.015	(0.016)	0.014	(0.016)
renewables	-0.023*	(0.013)	-0.022*	(0.013)
fossils	0.027	(0.022)	0.026	(0.021)
N	6,568		6,568	

*Note: Marginal effects averaged over observations. Robust standard errors in parentheses. ***,**,* denote statistical significance at the 1 %, 5 % and 10 % level, respectively. Statistical inference for the logit estimation is inferred from estimation coefficients (not depicted) (cf. Greene, 2007: E18-E23, 2010:292).*

Table B3: Probit estimation on pro power line votes: Coefficients of robustness checks

	(1) Excluding urban respondents		(2) Just sure respondents		(3) Recoding unsure "No" to "Yes" votes	
Community 100EUR	0.019	(0.067)	-0.075	(0.062)	-0.049	(0.057)
Community 250EUR	-0.113*	(0.069)	-0.102	(0.064)	-0.032	(0.058)
Community 500EUR	0.040	(0.071)	0.010	(0.065)	0.014	(0.060)
Household 100EUR	-0.071	(0.072)	-0.135**	(0.065)	-0.110*	(0.059)
Household 250EUR	-0.107	(0.069)	-0.177***	(0.063)	-0.168***	(0.058)
Household 500EUR	0.041	(0.068)	-0.109*	(0.064)	-0.073	(0.058)
male	0.383***	(0.043)	0.459***	(0.040)	0.301***	(0.036)
age	0.005**	(0.002)	0.002	(0.002)	-0.000	(0.002)
homeowner	-0.286***	(0.049)	-0.323***	(0.043)	-0.276***	(0.039)
children	-0.056	(0.064)	-0.129**	(0.059)	-0.081	(0.053)
employed	-0.045	(0.054)	-0.086*	(0.048)	-0.113**	(0.044)
college	-0.030	(0.044)	0.019	(0.040)	0.029	(0.037)
east	0.035	(0.049)	0.021	(0.047)	0.005	(0.043)
intermediate	-0.034	(0.050)	-0.006	(0.055)	0.029	(0.050)
urban	–		0.094	(0.062)	0.108*	(0.057)
income	-0.003	(0.003)	-0.002	(0.003)	-0.002	(0.002)
ppi	0.031	(0.020)	0.031	(0.020)	0.018	(0.018)
green	0.181***	(0.070)	0.284***	(0.062)	0.226***	(0.057)
powertowers	0.131*	(0.068)	0.038	(0.051)	0.052	(0.047)
renewables	-0.054	(0.044)	-0.059	(0.041)	-0.089**	(0.038)
fossils	-0.038	(0.077)	0.075	(0.068)	0.050	(0.063)
N	4,186		5,119		6,568	

*Note: Robust standard errors in parentheses. ***,**,* denote statistical significance at the 1 %, 5 % and 10 % level, respectively.*

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