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# Lonely Hearts, Empty Booths? The Relationship between Loneliness, Reported Voting Behavior and Voting as Civic Duty

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*Objective.* The study investigates the relationship between perceived loneliness and the individuals' attitude whether voting is a civic duty. With that, it is the first study to shed light on the mechanism linking perceived loneliness to voting behavior. *Methods.* Two independent, cross-sectional, and representative datasets from Germany ( $n = 1641$ ) and the Netherlands ( $n = 1431$ ) are analyzed. *Results.* The regression results and effect decomposition techniques show that loneliness is associated with reduced intention to vote as well as a lower sense of duty to vote. The effect of loneliness on voting behavior is partially mediated through a reduced sense of duty. *Conclusion.* Loneliness is associated with political disengagement. The study provides empirical evidence that the relationship between loneliness and turnout is partially mediated through sense of duty. This showcases that lonely individuals tend to feel detached from society and are less likely to feel obligated to participate in the electoral process.

In the last few years, scientific insights and repeated media reports about concerning levels of loneliness in Western democracies has drawn attention to the question as to whether loneliness should be a more prominent topic for policymakers (Yang, 2019; Easton, 2018). While research concerned with the negative outcomes of prolonged loneliness is mostly focused on questions of public health (Holt-Lunstad, Smith, and Bradley Layton, 2010; Leigh-Hunt et al., 2017), other outcomes of societal interest such as its influence on policy compliance or political participation were mostly ignored. However, as many scientists suspect that loneliness is rising in modern societies, an eroding impact of loneliness on outcomes such as political participation might become increasingly relevant in the future.

This study builds on two theoretical perspectives. First, studies of subjective loneliness highlight that a sense of detachment from peers and society is a central aspect of the loneliness experience (Bower, Conroy, and Perz, 2018; Rokach, 2014; Stein, 2017). Second, political studies have established that perceived sense of duty to vote is a major predictor for voter turnout, which stems from feelings of loyalty and general attachment to the community (Blais and Galais, 2016). Combining both lines of research, this paper investigates whether loneliness is associated with a decrease in sense of duty to vote, a major predictor for voter turnout, as well as reported voting behavior.

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To that end, this paper is organized in five sections. The second reviews how loneliness differs from the well-established concept of social embeddedness. This debate briefly reviews what the notion of loneliness comprises, clarifies why loneliness is not included in contemporary turnout models, and pre-emptly common misconceptions that loneliness is a mere synonym for being alone or insufficiently socially embedded. The third section presents the reasoning why perceived loneliness is likely to exert influence on citizens' perceived duty to vote and, correspondingly, reported voting behavior. After deriving the hypothesis, this section also presents the datasets from Germany and the Netherlands as well as the operationalization. Empirically testing the argument, the fourth section analyzes the data and shows that loneliness is significantly associated with a lower sense of duty to vote and a lower probability of voting. Mediation analysis confirms that the relationship between loneliness and voting is partially mediated through sense of duty. Then, the final section discusses limitations and implications for upcoming research.

### **Loneliness in Political Science, Novel or Not?**

Fueled by the continuous decline in voter turnout in almost every Western democracy since World War II, one of the most frequently investigated questions in the social sciences is which mechanisms increase voter turnout. To review the manifold proposed mechanisms is beyond the scope of this paper. Briefly summarized, the body of research ranges from socioeconomic variables, such as income and education, to partisanship, social class, social capital, a variety of emotions, the electoral system, and even more exotic explanations such as rainfall and genetic variation (Harder and Krosnick, 2008; Lynggaard, 2019; Smets and Van Ham, 2013). Considering that the idea that social relationships exert influence on political attitudes and electoral participation is not new, it is important to clarify how loneliness is defined and how loneliness differs from other related predictors for political attitudes and behavior. To that end, this paper first considers how social influence is typically conceptualized in political science before turning to the question what loneliness is and how it exerts influence on the sense of duty to vote and voter turnout.

From a social embeddedness and social capital perspective, an individual's social relationships provide resources such as information, social support, or enforcement of social norms (Smets and Van Ham, 2013). These resources can be utilized in various ways. For instance, information can increase the motivation to vote or simply remind people when the election is and social support can help immobile people to overcome practical difficulties to vote (Harder and Krosnick, 2008; Bhandari and Yasunobu, 2009). Likewise, social norms, social comparison, and peer pressure reinforce voting and political attitudes through social pressure and social desirability (Blais, Galais, and Coulombe, 2019; Bond et al., 2012). Consequentially, peer networks, neighborhoods, romantic partnerships, and household composition are important concepts in the political mobilization literature and are typically strong predictors for political participation (Bhatti et al., 2017; Lazer et al., 2010; Levine et al., 2018). Typically, this is measured through network characteristics such as network type and size, individual traits such as reputation or position within the network, or the ability to coordinate collective actions (Jackson, 2019). Thus, the social capital and the social embeddedness perspective suggest that social relationships influence political attitudes and actions through *resources* that get channeled through social relations.

In contrast to this resource-based argument, loneliness is commonly understood as an individual emotional trait and refers to a perceived, undesirable lack in quality or quantity of social contacts. Psychological models highlight the role of cognition and evaluation in

the emergence of loneliness (Perlman and Peplau, 1981). Individuals do not necessarily feel lonely because they are alone, rather they feel lonely because they believe their contact to be insufficient in some way. Social psychological mechanisms such as social comparison or cultural norms heavily impact this evaluation. It is worth stressing that feeling lonely and being poorly embedded are conceptually distinct concepts and, as a result, empirically often just weakly correlated. Studies investigating how much objective and subjective isolation co-occur with each other highlight this difference. Russell and colleagues find that the correlation between several measures of social activity and close friends account for about 11 percent of the variation of loneliness (Russell et al., 2012). Other studies employing regression models or network analysis confirm the statistically significant, yet modest link between actual and perceived loneliness (Cacioppo, Fowler, and Christakis, 2009; Coyle and Dugan, 2012). Consequentially, consensus within literature over the past several decades has built around the idea that becoming lonely is not necessarily accompanied by changes in a person's social embeddedness (Gierveld et al., 2018). While objective network structure plays an important role in the development of loneliness, other factors such as cultural influences, comparison standards, and personal predisposition exert a major influence in this evaluation process (Swader, 2019; Gierveld et al., 2018). Studies investigating the relevance of social ties for loneliness over the life course further support the argument by showing that, depending on an individual's age and social setting, different types of social relationships are relevant for preventing loneliness and protecting personal well-being (Qualter et al., 2015). Therefore, loneliness must be considered conceptually and empirically distinct from social embeddedness and related concepts, such as social capital.<sup>1,2</sup> Rather, loneliness is the emotional expression of a perceived deprivation of some kind of social relationship, qualitatively or quantitatively. Ultimately, this means that common measures of social capital and embeddedness are unlikely to capture a potential effect of loneliness due to the weak statistical interrelation.

### **The Missing Link: Loneliness and the Sense of Duty to Vote**

Considering that loneliness is the emotional expression of a subjective lack of sufficient and meaningful social encounters, prolonged loneliness is logically associated with a feeling of not belonging and abandonment. As an inherently social species, feeling lonely serves the purpose to motivate humans to sustain reciprocal relationships that provide the security and resources vital for survival (Baumeister and Leary, 1995; Cacioppo and Patrick, 2008). Being deprived of such relationships leads to a painful emotional reaction that motivates people to sustain their existing relationships and build new ones if necessary (Qualter

<sup>1</sup>Two rare exceptions are the Netherlands and the United Kingdom. The British government recently established a government-wide workgroup and appointed a minister tasked with developing measures to fight loneliness (Yeginsu, 2018). Likewise, Ireland, the Netherlands, and the UK are currently experimenting with "social prescriptions." Beyond these policies, there are very few large-scale, systematic attempts to combat loneliness directly.

<sup>2</sup>Besides the concerns that loneliness is a mere proxy objective network characteristic, one may wonder whether it is just another expression for sadness or depressed mood given that there are studies have investigated the influence of depressed mood and subjective well-being (SWB) on political participation (Ojeda, 2015; Flavin and Keane, 2012; Liberini, et al., 2017). While loneliness and depressed mood certainly co-occur, early studies show that depression and loneliness scales measure distinct constructs (Cacioppo et al., 2006). However, I acknowledge that due to the strong relationship between satisfaction and loneliness it is not possible to disentangle the two constructs in a cross-sectional survey analysis. Future research should investigate this.

et al., 2015).<sup>3</sup> If attempts to resolve the aversive emotional situation fail and individuals feel lonely for a prolonged period of time, they suffer from several psychological biases that can cause self-defeating behavior, causing loneliness to become a chronic state (for an extended review, see Spithoven, Bijttebier, and Goossens, 2017). At this point, loneliness tends to become hypervigilant toward social threats and feeling emotionally disconnected (Cacioppo and Hawley, 2009; Satici, Uysal, and Deniz, 2016).

While empirical investigations linking loneliness to overall detachment from society are comparatively rare, studies that focus on marginalized groups and war veterans show that the feeling of detachment from society is a substantial part of their loneliness experience (Bower, Conroy, and Perz, 2018; Rokach, 2014; Stein, 2017). Likewise, qualitative research reports that lonely elderly in Hong Kong perceive a growing distance between themselves and overall society and show, in turn, a more passive lifestyle and overall negativity (Wong et al., 2017). Considering that the group solidarity and social identity literature suggests that attachment fosters participation, it is likely that the emotional disconnectedness from society reduces the perceived obligation to vote which, in turn, results in reduced motivation to participate in political activity overall (Miller et al., 1981; Abramowitz and Saunders, 2006). Following that line of argumentation, loneliness causes a general emotional disconnectedness from society, which expresses itself through a reduced sense of duty to participate in the political process.

The perceived disconnection from society is central for the logical link between loneliness and the sense of duty to vote. As Blais and Achen argue, two of the strongest predictors for voter turnout is outcome preference, namely the personal feeling of how important the election outcome is, and the perceived sense that voting is a moral obligation (Blais and Achen, 2019). As they argue at length, citizens are motivated to vote either because they feel that the outcome of the election is relevant for them or because it is the right—or moral—thing to do. Furthermore, the literature suggests that citizens' sense of duty to vote stems from feelings of loyalty, patriotism, or general attachment to the community (Blais and Galais, 2016; Graham et al., 2011). Hence, if loneliness is associated with eroding attachment and connectedness to society and the moral obligation to vote, loneliness can be assumed to be negatively associated with a sense of duty to vote.

To summarize, the relationship between loneliness, emotional disconnection from society and the sense of duty to vote offer a theoretical link between loneliness and electoral turnout. If this argument holds true, loneliness should be statistically correlated with sense of duty to vote.

*H1: Lonely individuals are less likely to perceive voting as a civic duty.*

Assuming this holds true, loneliness should be associated with a lower probability of participation in elections as well.

*H2: Lonely individuals are less likely to participate in national elections.*

<sup>3</sup>Evolutionary theories of loneliness suggest that loneliness actually induces emotional pain comparable to physical suffering (Cacioppo and Cacioppo, 2018). The theory states that dependence on the support of social groups, group membership, and reciprocal social contacts were a key asset to survival in human evolution. Studies comparing neurological functions of physical pain and emotional pain indicate that both are processed in a comparable way (Eisenberger, Lieberman, and Williams, 2003). Socially induced pain is transmitted through similar neurological pathways as physical pain, showing how deeply loneliness is rooted in our cognitive function. "Because of the adaptive value of mammalian social bonds, the social attachment system [...] may have piggybacked onto the physical pain system to promote survival" (Eisenberger, Lieberman, and Williams, 2003, p. 291).

Implicit in this reasoning is that at least a part of the relationship between loneliness and voter turnout is mediated through sense of duty.

*H3: The relationship between loneliness and voter turnout is mediated by sense of duty to vote*

### **Data and Method: Two Settings**

The analysis was conducted in two different settings to increase its reliability. The next two sections present the Dutch and German datasets, followed by the operationalization in both datasets.

#### ***The Dutch Case***

The first considered dataset is based on cross-sectional modules of the “Longitudinal Internet Studies for the Social Sciences,” hereafter LISS, of the CentERdata Institute for Data Collection and Research. The institute is financed by the Dutch governmental organization for scientific research (NWO) and the data are openly available for the scientific community. The LISS is structured in various subsurveys focused on specific topics that are fielded with short time lags in between. The majority of variables used in this study are derived from the “Dutch National Elections for House of Representatives questionnaire” fielded in June 2010, immediately after Dutch national elections took place. Since the data were collected very close to the election, the reliability of the reported voting behavior is strong. The loneliness and social embeddedness measures used in this study were surveyed in the third wave of the “social integration and leisure time core questionnaire” in February 2010, several weeks before the election questionnaire was fielded. Considering that the loneliness measures predate the voting behavior measure, issues of reverse causality are unlikely. The LISS is a true probability sample and drawn from the registered population in the Netherlands. Participants without computer or Internet access were provided with such to participate in the panel. Although it is unlikely that the survey is truly representative, the method of questioning does not affect the representativeness of the sample, and the Internet sample includes infrequent or nonusers of the Internet as well. This is important because older age groups show the highest rates of loneliness and are more likely to lack Internet access (Singh and Misra, 2009; Loges and Jung, 2001). The final sample consists of 1431 individuals, all of whom are Dutch citizens and at least 18 years old.

#### ***The German Case***

The second analyzed sample is the German ALLBUS dataset from 2018, hereafter ALLBUS. The ALLBUS is a representative social survey conducted every second year by the research institute GESIS. Similar to the LISS, the GESIS is mostly funded by the German state and shares their data freely. In contrast to the LISS, the ALLBUS is not an Internet-based survey and uses personal interviews. The sampling strategies rely on a two-step, disproportionate weighted random sample. First, the survey selects communities in East and West Germany proportionate to the number of adult residents of each region in order to account for extant regional differences. Second, the citizens of these communities are randomly sampled. The 2018 survey was chosen because it was the first ALLBUS to include the shortened version of UCLA loneliness scale. The most recent national election

took place about six months prior the survey period, so the relationship between reported behavior and loneliness should be interpreted with more caution than in the LISS dataset. The final sample consists 1641 participants who are at least 18 years old.

### ***Operationalization***

Both samples were prepared as similarly as possible to increase comparability in the analysis.

*Loneliness:* The ALLBUS included a shortened version of the UCLA loneliness scale (Cronbach's  $\alpha = 0.82$ ), while the LISS includes a six-item version of the Gierveld loneliness scale (Cronbach's  $\alpha = 0.81$ ). Wording and detailed information of the items are reported in the supplementary Table 1.

*Reported voting behavior:* In both samples, the participants were asked whether they voted in the most recent national election. In the Dutch case, this refers to the House of Representatives election that took place just before the survey period. In the German case, this refers to the last federal elections six months prior to the survey period.<sup>4</sup>

*Duty to vote:* Both samples include a variable measuring whether a citizen perceives voting as a civic duty, but the questions differ in detail. The LISS asked the participants whether they perceive voting as a civic duty or a free choice. The question is a dummy and the participants were asked to choose one option. In contrast, the ALLBUS asked the participants to what extent they agree or disagree with the statement that voting is a civic duty. Participants rated their agreement on a 1–4 scale. To avoid varying estimation methods between the samples, the variable was recorded into a dummy. As about 75 percent of the people completely agreed with the statement and just 407 people chose one of the remaining options, these categories were grouped into one. Hence, the German dataset compares full agreement versus people who fully disagree, partially disagree and somewhat agree. Repeating the analysis with the original coding of the variable and an ordered logit model leads to the same results. Likewise, choosing a different cut point and comparing disagreement and partially disagreement versus full and partial agreement leads to the same conclusions.

*Control variables:* As summarized by Smets and Van Ham in a comprehensive literature review, there is no consensus as to what control variables should be included in electoral turnout models and the applied operationalizations vary heavily between studies (Smets and Van Ham, 2013). In light of their findings, this analysis controls for the following variables.

To ascertain that the observed pattern is no mere expression of objective embeddedness, dummy variables to measure membership in social organizations, frequency of meeting with friends, and the number of persons living with the respondent in a shared household are included. Relationship status was also considered as a control, but omitted from the analysis because it was not included in the LISS and, in the German case, is highly intercorrelated with household size. Including relationship status instead of household size in the German case also does not change the conclusions. Furthermore, studies show that

<sup>4</sup>Arguably, reported voting behaviour does not necessarily reflect actual voting behavior. Scholars use public voting records to validate survey data. Unfortunately, public voting records are not available for Germany or the Netherlands. While the survey data commonly over-report voting, Achen and Blais (2015, p. 206) compare predictors of intention to vote, reported vote, and validated vote, and conclude that all three outcomes are influenced by the same variables and that "...their relational proportions are usually unchanged", which gives additional confidence in the validity of the dependent variable.

TABLE 1  
Descriptive Statistics

	ALLBUS (N = 1,641)			LISS (N = 1,431)		
	Mean	SD	Range	Mean	SD	Range
<b>Key variables of interest</b>						
Reported to vote	0.87	–	0–1	0.91	–	0–1
Sense of duty	0.75	–	0–1	0.54	–	0–1
Loneliness	2.48	2.11	1–13	2.80	2.38	1–13
<b>Control variables</b>						
Age	51.78	17.38	18–92	48.17	16.20	18–92
Being female	0.48	–	0–1	0.51	–	0–1
Frequency meeting friends	2.46	0.89	1–5	3.83	1.45	1–7
General health	3.69	1.01	1–5	3.17	0.75	1–5
Household size	2.39	1.14	1–10	2.63	1.29	1–8
Membership in clubs	0.45	–	0–1	0.71	–	0–1
Educational degree			0–3			0–3
Primary level or less	0.24	–	0–1	0.09	–	0–1
Intermediate level	0.35	–	0–1	0.47	–	0–1
College or university degree	0.41	–	0–1	0.44	–	0–1

Values are rounded to the second decimal place.

poor health is associated with loneliness as well as a lower probability of voting due to limited mobility (Mattila et al., 2013; Holwerda et al., 2016; Stockemer and Rapp, 2019). Both samples contain a question that measures self-rated health, which is included to account for the confounding effect of poor mental and physical health. Furthermore, several sociodemographic variables are considered as standard controls for turnout as well. Age and age squared are both associated with voting and loneliness (Dassonneville, 2016; Luhmann and Hawkey, 2016). A dummy variable asking whether the respondents are male or female is included to account for the most common sociodemographic variables included in turnout models identified by Smets and Van Ham. Although the concept of gender and biological sex encompasses more dimensions, the questionnaires do not cover them so they cannot be accounted for. As both samples measure educational degree differently, the original coding is clustered into primary educational level or below, intermediary level, and higher degree. Finally, for the German case, a dummy is added that accounts for the east-west divide in Germany.

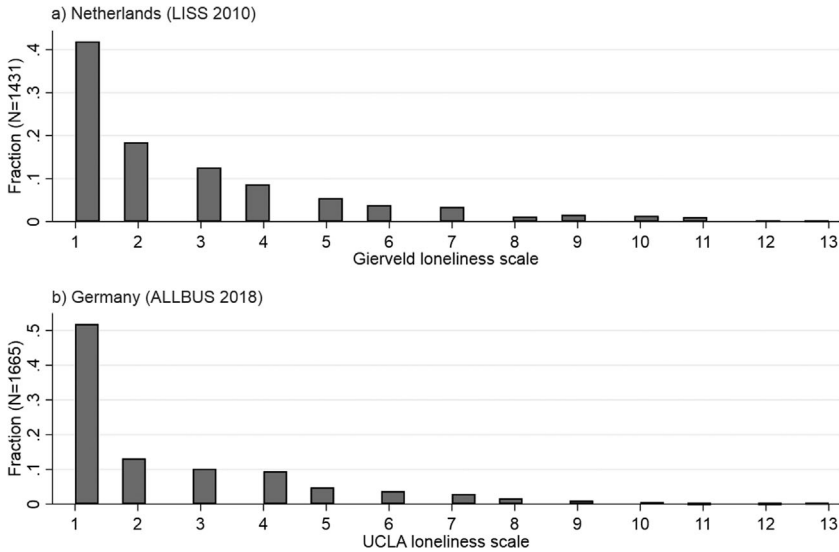
Table 1 provides a comprehensive overview of the variables and corresponding descriptive statistics. The composition of both samples is quite similar with regard to gender, age, and average health and the only notable deviation between the samples is the small number of individuals without higher education in the Netherlands.

## Analysis and Results

The analysis and corresponding results are presented in four steps. First, a preliminary analysis contains important regression diagnostics for the following analysis. This is followed by the multivariate regression analysis. Third, the observed relationship between loneliness and reported voting behavior is divided into a direct path and a mediated relationship through sense of duty to vote. Finally, the results of robustness tests are reported, which can be found in the supplementary material.



FIGURE 1  
Distribution of loneliness



### *Preliminary Analysis*

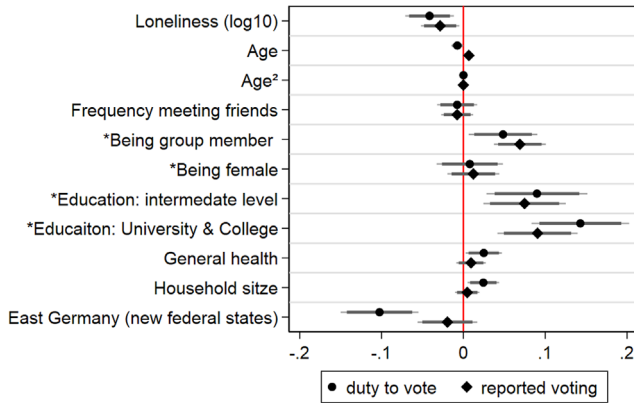
Prior to multivariate regression analysis, the distribution of the loneliness scales in both samples reveals two important aspects. First, as displayed in Figure 1, both distributions are strongly left-skewed, which can cause issues with assumptions of the applied regression models, most notably the presence of outliers. To account for the skewed distribution, the loneliness scales are transformed to  $\log_{(10)}$  scales. Second, any conclusions drawn about high loneliness scores are based on very few cases. Therefore, inference about the relationship of extreme loneliness and the outcome variables should be interpreted in light of the limited cases and viewed with caution.

### *Results*

Because both outcome variables are binary, multivariate probit models are applied. All regression results are based on Hubert/White robust standard errors to avoid issues with heteroscedasticity. For improved interpretability, Figures 2 and 3 display the average marginal effects per standard deviation separated by outcome variable. The corresponding regression coefficients are reported in Table 2.

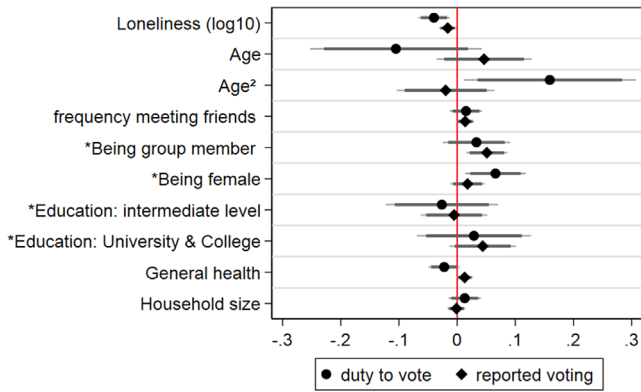
Starting with the German case, the regression model reveals that high levels of loneliness are associated with a lower perceived sense of duty to vote. With every additional standard deviation, the probability to perceive voting as a civic duty decreases by 3.9 percent ( $p = 0.007$ ). In contrast, group membership (6.9 percent;  $p = 0.024$ ) and household size (0.4 percent per standard deviation;  $p = 0.013$ ) are positively associated with the sense of duty. The frequency of meeting friends is the only social embeddedness variable that does not significantly correlate with the sense of duty to vote. Overall, this is in line with the expectations from the social embeddedness literature. That loneliness remains statistically

FIGURE 2  
Marginal effect plot-ALLBUS 2018



NOTE: Confidence intervals displayed at 95 percent and 90 percent effect per standard deviation (\*dummies are not standardized) reference level or education = primary level or less.

FIGURE 3  
Marginal effect plot-LISS 2000



NOTE: Confidence intervals displayed at 95 percent and 90 percent effect per standard deviation (\*dummies are not standardized) reference level or education = primary level or less.

significant despite controlling for group membership, friendships and household compositions supports the idea that loneliness exerts influence on political attitudes alongside objective social embeddedness. As Bernardi and colleagues highlight, statistical significance is just one part in evaluating a variable’s predictive value and discussing the substantial effect sizes is important for determining a predictor’s substantial relevance (Bernardi, Chakhaia, and Leopold, 2017). Considering the metric scale of the loneliness measure, its association exceeds the impact of group membership on sense of duty to vote over the full range of the scale. Thus, the relationship can be considered significant in substantial terms as well.

This is in line with the second outcome of the analysis. Lonely participants are significantly less likely to report that they voted in the last election. With every additional

TABLE 2  
Probit Models by Country

	ALLBUS ( <i>N</i> = 1641)		LISS ( <i>N</i> = 1431)	
	Sense of Duty	Voting Behavior	Sense of Duty	Voting Behavior
<b>Key variables of interest</b>				
Loneliness ( $\log_{10}$ )	-0.101**	-0.104*	-0.103**	-0.140*
<b>Control variables</b>				
Age	-0.431*	0.59*	-0.271	0.296
Age squared	0.663***	-0.267	0.411*	-0.126
Being female	0.013	0.031	0.17*	0.057
Frequency meeting friends	-0.023	-0.034	0.039	0.088
General health	0.084*	0.031	-0.058	0.082
Household size	0.082* (0.094)	0.027	0.034	-0.008
Being a group member	0.162* (0.081)	0.179***	0.039*	0.138**
Educational degree				
Primary level or less	-			
Intermediate level	0.131**	0.161***	-0.034	-0.015
College or university degree	0.227***	0.209***	0.037	0.147
New states	-0.153***	-0.045	-	-
Constant	0.299***	-0.615***	0.265	-0.119

\* $p \geq 0.05$ ; \*\* $p > 0.01$ ; \*\*\* $p \geq 0.001$ .

Effects are reported for x-standardized coefficients. Dummy variables are not standardized.

standard deviation in loneliness, individuals become 4.1 percent less likely to vote ( $p = 0.006$ ). Likewise, every additional standard deviation in household size increases the probability of voting by 2.7 percent, which is approximately as large as the relationship of feeling lonely and voting. As family and peers are an important factor in the political mobilization literature, this relationship is significantly large (Bhatti et al., 2017). These results provide strong evidence in favor of the two proposed hypotheses. Hence, the German data suggest that the associations between loneliness, voting behavior, and perceived sense of duty are not just statistically significant. Rather, the relationships have a significant size from a substantial perspective as well.

Arguably, there are some limitations to finding this pattern in the ALLBUS data, such as the circumstance that the reported voting behavior took place before the loneliness measurement. To ensure the robustness of the relationship, the analysis was repeated with the LISS dataset that does measure loneliness prior to the election. The results from the Netherlands validate the conclusions from the German case. Lonely individuals are less likely to report that voting is a civic duty (-3.9 percent per standard deviation). Likewise, loneliness is negatively related to the probability to have voted in the election (coef. = -0.140;  $p = 0.036$ ). Comparing the substantial effect size of loneliness with other predictors suggests that the relationship is somewhat weaker compared to the German case, but still substantial. Every additional standard deviation in loneliness reduces the probability to vote by 1.7 percent. For comparison, the impact of being a member in a social organization is 5.1 percent. Interestingly, contact to friends and household size seems to exert no influence in this specific sample. Yet, considering that just 133 individuals, roughly 9.4 percent of the sample, reported having not voted in the election, this may be due to the limited number of observations.

TABLE 3

## Decomposition of the Relationship Between Loneliness and Voting Behavior

Loneliness	ALLBUS 2018		LISS 2010	
	Coefficient	<i>p</i> -value	Coefficient	<i>p</i> -value
Full effect	-0.263	0.017	-0.160	0.024
Direct effect	-0.206	0.063	-0.107	0.130
Indirect effect	-0.057	0.006	-0.053	0.006

Model type: Probit; predictor: loneliness(log<sub>10</sub>); mediator = sense of duty to vote; control variables same as in Table 2; all values are rounded to the third decimal place.

To conclude, both samples show that loneliness is a substantial predictor for electoral participation and for the perceived sense of duty to vote.

### Mediation Analysis

Although the results point to a robust relationship between loneliness and the two outcome variables, the analysis has thus far not tested the proposed mediation directly. While there are well-documented limitations inherent in testing mediation with cross-sectional data with regard to causality and direction of the effect, decomposing the mediation effect in cross-sectional datasets presents an initial impression of the magnitude of the potential mediation (Preacher, 2015). To account for the binary nature of the outcome variable, this study uses the same model specifications as described in the previous regression analysis within the KHB method, a decomposition technique capable of decomposing direct and indirect effects for binary dependent variables proposed by Kohler, Karlson, and Holm (2011).<sup>5</sup> Table 3 displays the results. The first row reports the relationship between loneliness and voting without accounting for sense of duty, and the next two rows decompose the full relationship: The second row summarizes the remaining effect of loneliness after accounting for the indirect effect through sense of duty and the third row displays the indirect of loneliness mediated through sense of duty.

In substantial terms, the analysis shows that loneliness is associated with reduced log odds of voting by  $-0.263$  ( $p = 0.017$ ). Controlling for the proposed mediation of sense of duty to vote reduces the log odds to  $0.206$  and pushed the remaining direct effect above the 5 percent significance threshold into statistical insignificance ( $p = 0.063$ ). This leaves a significant indirect effect of  $-0.057$  ( $p = 0.006$ ) and provides two insides. First, there is an empirical, indirect relationship between loneliness and voting behavior mediated by sense of duty. However, the share of sense of duty of the overall relationship is

<sup>5</sup>While mediation analysis is well established in the linear case, the same methodology cannot be used in a nonlinear situation (Kohler et al., 2011). As reviewed by Kohler and colleagues, the key issue in comparing nested nonlinear models is the rescaling of probability models whenever new variables are added. Substantially, this alters the main effect of the variable of interest (X) on the outcome (Y) whenever a mediator variable (Z) is included, regardless of whether Z actually relates to X or not. Briefly summarized, the KHB method solves this issue by comparing a model that includes the X and Z coefficients with a model that includes X and a residualized version of Z with respect to X (Breen et al., 2018). This leads to uncorrelated Z and X, which, in turn, allows the coefficients of the independent variables to be compared across models free of rescaling or attenuation bias. Alternatively, applying generalized structural equation models to solve this issue leads to the same conclusion.

approximately 22 percent, indicating that the relationship between loneliness and voting behavior is subject to more mediation mechanisms than sense of duty.

Repeating this analysis with the LISS data confirms the pattern. Loneliness is associated with reduced log odds of voting by 0.254 ( $p = 0.024$ ). The mediation reduces the log odds of the direct relationship to  $-0.193$  ( $p = 0.087$ ). Once more, this leaves a significant indirect relationship of loneliness mediated by sense of duty that constitutes about 23.8 percent of the direct effect ( $p = 0.006$ ). The similar magnitude of the indirect effect in both samples is reassuring. Overall, the mediation analysis should be interpreted with caution due to the cross-sectional nature of the data. However, assuming that the proposed direction of the effect is correct, it indicates that sense of duty indeed plays a substantial role in the relationship between loneliness and voting behavior. Also, the direct effect remains fairly close to the 5 percent threshold under control of sense of duty. Considering the few nonvoters (ALLBUS: 214 of 1641 participants; LISS: 133 of 1431), this may indicate that loneliness relates to voting behavior through other mechanisms not considered here and that the effect may retain its statistical significance in larger sample sizes.

### ***Robustness Tests***

As briefly mentioned in the operationalization, the results are robust for several ways of treating the sense of duty variable in the German case. As an additional robustness test, a dummy variable was considered for whether a person feels adherent to a party as a proxy for outcome preference. Alongside sense of duty, Blais and Achen propose outcome preference as one of the most important predictors for turnout (Blais and Achen, 2019). They argue that citizens see voting as an expressive act. If individuals lack a strong outcome preference and do not view casting their vote as a valuable expressive act, some may participate because of a feeling of moral obligation. If loneliness simply causes a depressed mood and a general indifference about the election outcome instead of alienation and decreased moral obligation, the relationship should turn insignificant after controlling for outcome preference. Including adherence to the model results in an additional 725 missing cases out of 1431 observations in the Dutch sample, which prohibits a reliable test of the model. However, testing this with the ALLBUS is less problematic (16 additional missing cases) and the results are robust under control of feeling adherent to a party in the German case. Furthermore, a series of placebo tests reveals that there is possibly nothing unique about loneliness as a predictor for sense of duty or reported turnout. Instead, loneliness may, for some reason, simply relate to every variable related to political engagement. This is not the case, however. The relationship between loneliness and (1) feeling adherent to a party and (2) being politically interested is statistically insignificant under the same model specifications. Corresponding regression tables are reported in the supplementary material.

### **Limitations and Conclusion**

This paper argues that loneliness is a potent, yet so far overlooked predictor for individuals' motivation to participate in the electoral process. The proposed driving mechanism is its impact on the individuals' social belonging and the perceived obligations to society. Consequentially, this study tests the hypotheses that loneliness should be negatively associated with sense of duty to vote and reported voting behavior. The regression and mediation analysis support this idea. Furthermore, the decomposition of the relationship

reveals that the participants' sense of duty accounts for roughly 20 percent of the relationship of loneliness and voting behavior. That the controls do not account for about 80 percent of the relationship indicate that other relevant mechanisms contribute to the relationship between loneliness and political participation. At this point, those mechanisms are subject to speculation and should be examined closer in future studies. To ascertain the validity and reliability of the proposed relationships, this study adheres to the common strategy of using nationally representative samples to ensure external validity, replicating results in additional independent samples to avoid overspecification, and applying a variety of robustness tests. The results exemplify that the impact of loneliness on socially relevant outcomes, such as political participation, is an interesting new field of research. These findings relate to a core debate in political science around the theoretical relevance of perceived and objective social relationships for political action, encapsulated by prominent theoretical approaches such as the political mobilization models and social capital theory, as well as the literature concerned with social well-being and political action. This study posits that while having social interactions and social capital are undoubtedly important, simply having them is not enough—individuals must feel them as well.

Although two independent datasets exhibit this pattern and the results are robust for several model specifications, this analysis offers a first step toward answering the question and the results have limitations. First and foremost, correlation does not imply causation and the study cannot rule out the influence of unobserved confounders. Given that prolonged loneliness is notoriously difficult to manipulate, better longitudinal data are needed to account for self-selection and time-constant confounding. Although longitudinal data would increase the reliability of the analysis, to the best of my knowledge, no longitudinal, national representative surveys capture a validated loneliness scale as well as sense of duty. Such data would improve the mediation analysis as well and allow stronger empirical basis for causal inference. Furthermore, in light of the cross-sectional data, questions about the issue of reverse causality or bi-directionality of the effect may arise. Several arguments speak against those concerns. First, randomized experiments designed to induce loneliness with vignettes and hypnosis show that manipulating loneliness increases anxiety, feelings of insecurity, and fear of negative evaluation (Cacioppo et al., 2006; Rotenberg et al., 2010). This speaks in favor of the theorized direction of the relationship. Furthermore, the LISS data measured loneliness prior to the voting behavior, making the reverse relationship between loneliness and voting unreasonable. On the theoretical level, this study focuses on one specific political action. To what extent this negative association can be generalized to other forms of political participation is up for debate. As social connection is a central motive in human decision making (Qualter et al. 2015; Spithoven, Bijttebier, and Goossens, 2017), it is possible that lonely individuals become more likely to participate in collective political actions while remain absent from individualistic actions such as voting.

Despite these limitations, the findings are promising and point toward several interesting questions for upcoming studies. On a theoretical level, further studies should investigate how subdimensions of loneliness influence political participation differently. The differentiation between social and emotional loneliness offers a promising framework for such investigations (Weiss, 1973). Furthermore, future research should validate the results in other samples and with alternative operationalization. Furthermore, while this study argues that loneliness must be considered distinct from objective social embeddedness, upcoming studies should investigate the interplay between both constructs. Other mediation variables might offer another promising field of investigation. Finally, the question of whether and how loneliness relates to other forms of political participation such as demonstrations or signing petitions is open for investigation as well.

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## Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

**Supplementary Material:** *Lonely hearts, empty booths? The relationship between loneliness, reported voting behavior and voting as civic duty.*

**Supplementary Material Table 2:** item cross-correlation (LISS Data)

**Supplementary Material Table 3:** item cross-correlation (Allbus Data)

**Supplementary Material Table 4:** Robustness tests

**Supplementary Material Table 5:** Placebo tests