

# Wind Turbines, Public Acceptance, and Electoral Outcomes

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## Abstract

Despite a widespread public support for wind energy in general, wind turbine proposals attract a considerable amount of public opposition. At a time of political commitments to building more wind turbines for climate risk mitigation, we study the potential causes of this opposition and its electoral effects. Our analysis draws on a survey experiment in Switzerland, where the number of wind turbines will grow from a couple of dozens to many hundreds in the next three decades. We find that exposure to wind turbines increases public acceptance, but this affect does not translate into electoral turnout or vote choice. Moreover, locality or politicisation does not seem to have an effect at all—neither on acceptance nor on electoral outcomes. Our results suggest that voters do not reward or punish political parties for their positions on wind energy, even when turbines might soon be rising in their local area.

## Zusammenfassung

Trotz breiter öffentlicher Zustimmung für Windenergie sind konkrete Vorschläge für den Bau von Windrädern oftmals umstritten. Dennoch erfahren Windräder als Instrument zur Abmilderung der Klimakrise unter Politiker:innen eine steigende Beliebtheit. In der Schweiz soll beispielsweise die Anzahl der Windkraftanlagen in den nächsten drei Jahrzehnten von einigen Dutzend auf

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mehrere Hundert anwachsen. Wir untersuchen mögliche Ursachen von Opposition gegenüber Windrädern und ihre Auswirkung auf Wahlen. Unsere Analyse stützt sich auf ein Umfrageexperiment in der Schweiz. Wir finden heraus, dass die öffentliche Akzeptanz des Windenergieausbaus höher ist, wenn Personen einem visuellen Windradszenario ausgesetzt waren. Dieser Effekt wirkt sich jedoch nicht auf die Wahlbeteiligung oder -entscheidung aus. Darüber hinaus scheinen sowohl Ort des Windkraftausbaus sowie die Politisierung keinerlei Einfluss zu haben — weder auf die öffentliche Akzeptanz noch auf das Wahlergebnis. Unsere Ergebnisse deuten darauf hin, dass Wähler politische Parteien für ihre Positionen zur Windenergie weder belohnen noch bestrafen, selbst wenn in ihrer Gegend bald Turbinen errichtet werden könnten.

### Résumé

Malgré un vaste soutien du public pour l'énergie éolienne en général, les propositions d'éoliennes suscitent une opposition considérable de la part du public. A l'heure où les politiques s'engagent à construire davantage d'éoliennes pour atténuer les risques climatiques, nous étudions les causes potentielles de cette opposition et leurs effets électoraux. Notre analyse s'appuie sur une enquête expérimentale menée en Suisse, où le nombre d'éoliennes passera de quelques dizaines à plusieurs centaines au cours des trois prochaines décennies. Nous constatons que l'exposition aux éoliennes augmente l'acceptation du public, mais cet effet ne se traduit pas par une participation électorale ou un choix de vote. En outre, la localité ou la politisation ne semble pas avoir d'effet du tout—ni sur l'acceptation ni sur les résultats électoraux. Nos résultats suggèrent que les électeurs ne récompensent ou ne punissent pas les partis politiques pour leurs positions sur l'énergie éolienne, même lorsque des turbines pourraient bientôt être érigées dans leur région.

### KEYWORDS

Elections, environmental politics, energy transition, survey experiments, Switzerland

## INTRODUCTION

The fight against climate change counts on producing more energy from wind in the future. Indeed, many countries are under national and international commitments to drastically increase the share of their renewable electricity production with new wind turbines. For example, if Switzerland, a country with only 37 turbines at the beginning of 2020, is to meet its greenhouse reduction targets, hundreds more turbines need to be built in the next three decades.<sup>1</sup> There are signs that others will follow suit—the countries producing wind energy have recently outnumbered those that do not, with new wind turbines being erected in every region of the world (REN21, 2019).

Successful deployment of wind energy depends on public attitudes that have long puzzled social scientists. On the one hand, there is a widespread public support for *wind energy in general*. For example, over 70% of Canadians (Sherren et al., 2019) and more than 80% of Americans (Klick & Smith, 2010) are in favour of this energy source. On the other hand, *wind turbine proposals* attract a considerable amount of public opposition (Firestone & Kempton, 2007; Pasqualetti et al., 2002). This opposition not only risks increasing the cost of wind turbine projects or delaying the benefits of transition to renewable energy. It also calls the political feasibility of energy transition into question as politicians might be reluctant to pursue such unpopular climate change policies in the first place (Gärling, 2007).

We know relatively little about the political consequences of wind energy deployment. Energy issues (Jeong & Lowry, 2021; Kuzemko, 2016), and particularly the siting of wind turbines (Bues & Gailing, 2016), have remained largely depoliticised until recently. However, there are signs of change. Jeong and Lowry (2021), for example, show that energy policy is becoming an increasingly politicised issue in the U.S. Congress. Efforts to de- and re-politicise energy issues suggest that policy positions on related policy instruments, such as wind turbines, might have electoral consequences. Indeed, Stokes (2016) shows that there are such consequences at the aggregate level, in terms of electoral turnout and vote shares.

In this article, we examine the causal effect of three factors—project *locality*, turbine *exposure*, and issue *politicisation*—on electoral turnout and vote choice as well as on public acceptance of wind turbines. The findings are at odds with much of the literature, and indeed with our expectations. Although we find that exposure to wind turbines increases public acceptance, there is no robust evidence of a relationship between the remaining factors and outcomes. Our analysis draws on an experiment, designed to test how people respond to proposals for new wind turbines. It is based on a random assignment of subjects to one of the eight versions of a vignette—a text with an image about proposals—in a 2 x 2 x 2, full-factorial design. This experiment was part of an online survey, conducted with a nationally representative sample of voting-age population in Switzerland, shortly before the 2019 Swiss federal election.

The contribution of this article is two-fold. First, much of what we know about the public acceptance of wind turbines originates from observational research, which is unable to establish causal links. With null results from our experimental tests, this study suggests that some of the most conventional findings in the literature, such as the negative attitudes towards *local* wind turbine proposals, might be spurious relationships. Second, our results might come as a relief to political actors looking to increase efforts to fight climate change. If they are to push for more wind turbines, our results from Switzerland suggest that there will not be electoral consequences, albeit with no rewards either, for their pro-environmental positions.

<sup>1</sup>Our own calculations. Switzerland produced about 121 GWh electricity with its 37 wind turbines in 2018 (SFOE, 2019), and it is planning to produce about 4,000 GWh per year by 2050 (ARE, 2017). Based on these statistics, meeting its targets would require Switzerland to build around 1,180 new turbines. However, the actual number is likely to be in the hundreds, depending on the expected increases in the efficiency of new wind turbines in the future.

## LITERATURE

There is a large literature on public attitudes towards energy technologies. Gaede and Rowlands (2018), for example, note that there were at least 857 academic publications in this area by 2015. Wind energy, and specifically wind turbines, are the focus of many of these publications, and systematic reviews of the related literature are available elsewhere (see, for example, Cashmore et al., 2019; Hevia-Koch & Ladenburg, 2019; Rand & Hoen, 2017). Here we discuss four aspects that feature prominently in this literature, which we incorporate into our study.

First, many explain the contrast between *support* for wind energy and *opposition* to wind turbines with reference to general against local preferences. Unlike the benefits of wind turbines, their costs and risks are geographically concentrated, in or around siting locations. As researchers are motivated to understand the local opposition towards wind turbines, much of what we know about public attitudes comes from around siting locations (Rand & Hoen, 2017). Early studies pointed at the ‘not-in-my backyard’ (NIMBY) syndrome (Dear, 1992)—that the locals simply do not want to live with turbines in their neighbourhood. Today the scholarly consensus is that there is more to local opposition than locals’ distance to wind turbines (Pasqualetti, 2011). For example, some argue that wind turbines damage the locals’ connection to geographical places and therefore pose a challenge to their ‘place identity’ (Devine-Wright, 2009; Wolsink, 2006). Even though some studies report that the local attitudes to wind turbines are in fact positive (Fergen & Jacquet, 2016; Firestone & Kirk, 2019; Hoen et al., 2019; Petrova, 2014), location remains a major aspect of research on public attitudes in this area.

Urban–rural divide is a second aspect. Some scholars view the attitudes towards wind turbine deployments as a conflict of interest, between the electricity-hungry urban residents and the suffering rural communities, where constructions like turbines do not belong to the landscape (Hirsh & Sovacool, 2013). In this sense, wind turbines are seen as an element of ‘rural environmental injustice’ (Kelly-Reif & Wing, 2016). Evidence from interviews confirms that this view resonates among many residents in rural areas—that they think wind turbines are deployed in rural areas for urban interests, by urban decision-makers (Walker, Mason, et al., 2018; Walker, Stephenson, et al., 2018). It stands to reason, then, if the urban–rural divide features prominently in the debate about public attitudes towards wind turbines (Rand & Hoen, 2017: 139).

Third, in terms of the process of wind turbine deployment, politicisation looms large as an important aspect. Evidence shows that, in the absence of political contestation, such as under ‘authoritarian environmentalism’, policy-makers find it easier to implement environmental policies in general (Gilley, 2012). With contestation, however, comes increased opposition (Bolsen et al., 2014; Walker, Stephenson, et al., 2018). Walker, Stephenson, et al. (2018) find that where political parties are divided over wind turbines, public opinion is less favourable, especially among people who identify with the party that opposes wind turbines. Accordingly, politicisation can lead to opposition in at least two ways (Walker, Stephenson, et al., 2018): (1) by cueing party followers who may otherwise be uninterested, undecided, or supportive, and (2) by signalling that it is acceptable to oppose renewable energy, which has otherwise strong normative connotations.

Visual exposure to wind turbines is the fourth and final aspect from the literature that guides our study. Unlike many other sources of electricity generation, ‘wind turbines, by their very nature, require a highly dispersed and visible distribution, often in attractive and unspoiled areas’ (Hirsh & Sovacool, 2013: 724). Studies, old and new, show that concerns for the visual impact of wind turbines are one of the main reasons behind public opposition (Álvarez-Farizo & Hanley, 2002; Bishop & Miller, 2007; Bush & Hoagland, 2016; Gipe, 1993; Johansson & Laike, 2007; Schäffer et al., 2019). However, once wind turbines are built, public support recovers as people are exposed to the finished project (Wolsink, 2007). Research shows that, in

fact, a majority of people enjoy seeing wind turbines in their daily life (Mulvaney et al., 2013), and the acceptability of wind turbines is higher among those who are visually exposed to them than among those who are not (Baxter et al., 2013; Groothuis et al., 2008; Ladenburg et al., 2013).

Despite a large volume of social science studies on wind turbines, the literature also has its limitations. First, as Rand and Hoen (2017) suggest after their review, the literature suffers from selection issues: researchers select one or a small number of—often problematic—wind energy projects to study, using methods that depend on respondents' self-selection. Therefore, after decades of research and hundreds of studies, we are still largely unable to establish causal links. For example, Hoen et al. (2019) find that wind turbines lead to changes in demographics; people with positive attitudes move in to the areas around existing wind turbines while those with negative attitudes move away from them, putting a question mark over studies that report improvement of public attitudes towards wind turbines in time or with exposure. Second, the literature is based largely on studies of single factors, such as location or exposure. However, as Boudet (2019: 452) argues, understanding 'the reality of public perceptions and response requires examining how [various factors] interact'.

Finally, the literature is also lacking a political science perspective. Do the effects of wind turbine proposals spread to the political arena? To our knowledge, only two studies have so far assessed the political implications of wind turbine proposals. Walker, Stephenson, et al. (2018) provide evidence from a small number of people living in two provinces in Canada, suggesting that the parties supporting wind turbines suffer electoral losses in areas with turbines but only if the parties opposing these developments politicise the proposals. Similarly, Stokes (2016) shows that, again in Canada, electoral turnout increases and government vote share decreases in precincts with, or close to, a wind turbine. Our study will contribute to this emerging strand of scholarship, with an experiment designed to address the gaps in the literature.

## HYPOTHESES

A first set of our hypotheses relates to the public acceptance of wind turbine proposals, contributing to a large number of existing studies on this question with experimental tests of causality. Following the frequently reported relationships in the literature summarised in the previous section, we expect that public acceptance (a) decreases if wind turbines are proposed for one's own locality, (b) increases with visual exposure to wind turbines, and (c) decreases with issue politicisation.

Electoral outcomes are the focus of a second set of hypotheses. Do wind turbine proposals, and/or party positions on these proposals, affect electoral turnout or vote choice? Given the link between opposition to siting projects and increased political participation (Mansfield et al., 2001), we expect that the three factors above have the contrary effect on turnout—locality and politicisation should increase turnout while exposure should decrease it. In terms of vote choice, we hypothesise that if parties politicise wind turbine deployments, voters are less likely to be neutral towards them—irrespective of party positions on the issue. Whether parties are rewarded or punished, however, should depend not only on their positions but also on the remaining two factors (locality and exposure). For example, we expect that parties supporting wind turbines experience vote losses among voters living local to the proposed siting locations and/or those who have not been exposed to the proposed turbines yet.

Finally, we test whether the results differ from rural to urban populations. Here our overall hypothesis is that there are meaningful differences between these sub-groups such that the expected relationships above are stronger for the residents in rural populations than in intermediate and especially in urban populations.

## DATA AND DESIGN

Our pre-registered analysis is based on data from an online survey, conducted in Switzerland from 6 to 20 September 2019, with an experimental component. Switzerland, of September 2019, is a particularly advantageous setting for our study. Previously, Swiss citizens had backed the national energy strategy (Energy Strategy 2050) in a referendum, which foresees large increases in renewable energy. However, with only 37 large wind turbines installed at the time (SFOE, 2019),<sup>2</sup> Switzerland needs to erect hundreds more in the next three decades to meet the target in this strategy. This allows us to study how people react to wind turbine proposals where these structures are rare and few but their arrival is imminent. Second, our survey was in field during the campaign period for the 2019 Swiss federal election, until two days before the first postal votes were cast. This allows us to study the effect of wind turbine proposals on electoral outcomes at a time when these outcomes are about to emerge. Put together, the case selection contributes to the validity of our analysis.

We obtained 4,151 respondents from *respondi* ([www.respondi.com](http://www.respondi.com)), aiming at a sample that is representative of the Swiss voting-age population in terms of age, gender, and region. In the end, the respondents came from all 26 cantons in Switzerland. Yet, compared to the Swiss voting-age population, our sample was slightly younger (46 years, in comparison with 49). Similarly, the share of females was higher in our sample (54%) than in the population (51%). However, because we are interested in establishing cause and effect relationships rather than estimating causal effects for the Swiss population, such differences are less of a concern for our study. For the same reason, for example, we intentionally over-sampled respondents from outside urban areas—to increase the precision of our sub-group estimates for the urban–rural divide. We provide detailed comparisons between our sample and the voting-age Swiss population in the Appendix.

The survey started with a series of questions to measure pre-treatment covariates with regard to demographics (canton, years lived in that canton, commune, gender, birth year, education) and attitudes (worries about climate change, interest in politics, and left–right self placement). We used the canton of residence to create the locality factor, as explained below. All remaining covariates were used to adjust our estimates. To do so, we first re-coded (a) the commune variable as rural, intermediate, or urban according to the classification from the Swiss Federal Statistical Office and (b) the birth year variable in terms of age in 2019.

After the experimental component and outcome measures, we placed an income question at the end of the survey, which also included additional questions for a separate study. The questionnaire and descriptive statistics are in the Appendix.

### Experimental component

To be able to test the effect of three factors (locality, exposure, and politicisation) in a single study, we used a factorial survey experiment (Auspurg & Hinz, 2014). The experimental component was based on a random assignment of subjects to one of the eight versions of a vignette, resulting from crossing three factors, each with two levels. We provide the vignette structure below, with a screenshot available in the Appendix.

To increase the amount of electricity generated from renewable sources of energy, there are proposals to place wind turbines in the canton of [*Locality: own / different canton*], in landscapes similar to the one pictured below.

<sup>2</sup>This number (37) had not changed since 2017 when, in comparison, there were 1,260 wind turbines in Austria, 29,844 in Germany, 6,734 in Italy (IEA, 2019).



**FIGURE 1** Two versions of a landscape in the canton of Lucerne, Switzerland. On the left, the original photograph of a wind turbine in the commune of Entlebuch. On the right, the digitally altered version without the turbine

[*Exposure: photograph with / without a wind turbine*]

There has been a mixed reaction to these proposals. Some [*Politicisation: 'people' / 'political parties, such as the Social Democratic Party of Switzerland,'*] support these proposals while other [*'people' / 'political parties, such as the Swiss People's Party,'*] oppose them.

With *Locality*, we varied whether the vignette mentioned the name of (a) the respondents' own canton or (b) a different canton as the location of proposed wind turbines. The latter was chosen randomly, among the remaining 25 cantons, after respondents' own canton was excluded.

The vignette did not only have a text but also a photograph. Accordingly, *Exposure* varied whether there was a wind turbine in the photograph or not, as shown in [Figure 1](#). The photograph with the wind turbine is the original, taken in the canton of Lucerne in Switzerland. We have digitally removed the turbine from this landscape, and the resulting photograph is the one on the right in [Figure 1](#).

Finally, with *Politicisation*, we varied whether the vignette mentioned that there was a disagreement among (a) the people or (b) political parties about wind turbine proposals. This follows the experimental design in Boudreau and MacKenzie (2014). We used the two mainstream parties with clear positions on wind energy: the Social Democratic Party of Switzerland, which supports wind turbine proposals, and the Swiss People's Party, which opposes them. They had been the largest two parties in Switzerland at least since 1999, and this did not change in the 2019 election that followed our experiment.

As a factual manipulation check on respondent attentiveness to the experimental component (Kane & Barabas, 2019), the survey included one question, the subject of which was randomly varied: (a) the number of turbines in the photograph, (b) proposed location of the turbines, and (c) the actors mentioned as having disagreements over the proposals. With one correct answer category among four choices, including a category for 'Don't know', this is a relatively challenging manipulation check. Nevertheless, on average, 70% of respondents answered their question correctly, suggesting that most respondents read and understood their vignette.<sup>3</sup>

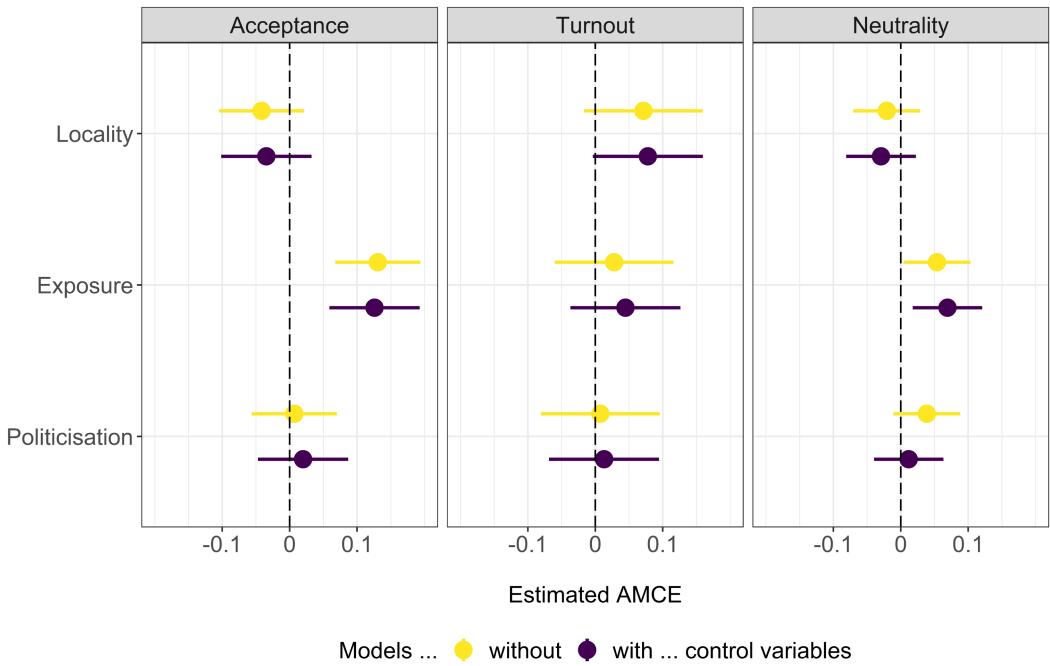
[Table 1](#) lists the post-treatment measures that we analyse as dependent variables. For *Acceptance*, *Turnout*, *Supporting Vote*, and *Opposing Vote*, we recode the 'Don't know' answers

<sup>3</sup>Those who failed the check are included in the analyses below. The results are robust to excluding them. See [Table A8](#) in the Appendix.

TABLE 1 Outcome Measures

Outcome	Question(s)	Range	Detail
Acceptance	Do you support or oppose these wind turbine proposals?	[1, 5]	Recode ' <i>Don't know</i> ' as missing
Turnout	The Swiss federal election is being held on 20 October 2019. How likely is that you will vote?	[1, 5]	Recode ' <i>Don't know</i> ' as missing
Neutrality	How likely is it that you will vote for ... (1) the Social Democratic Party of Switzerland? ... (2) the Swiss People's Party?	[0, 2]	Count the number of questions answered as ' <i>Neither ...</i> ' or ' <i>Don't know</i> '
Supporting Vote	How likely is it that you will vote for the Social Democratic Party of Switzerland?	[1, 5]	Recode ' <i>Don't know</i> ' as missing
Opposing Vote	How likely is it that you will vote for the Swiss People's Party?	[1, 5]	Recode ' <i>Don't know</i> ' as missing





**FIGURE 2** Average marginal component effects. *Note:* The factors are coded as own = 1 vs. different = 0 canton (*Locality*), photographs with = 1 vs. without = 0 a wind turbine (*Exposure*), and politicised = 1 vs. unpoliticised = 0 arguments (*Politicisation*)

as missing, otherwise keeping the coding scheme of the related survey questions provided in the Appendix. For *Neutrality*, our coding scheme is the number of questions that subjects answer as ‘Neither likely not unlikely’ or ‘Don’t know’. We limit the analysis of the post-treatment measures of electoral outcomes—*Turnout*, *Supporting Vote*, *Opposing Vote*, and *Neutrality*—to those subjects who are eligible to vote in the 2019 Swiss federal elections.

## RESULTS

Our analysis is based on three estimates of interest: (1) average marginal component effects (AMCEs), (2) conditional marginal means (CMMs), and (3) average component interaction effects (ACIEs).

In a factorial survey experiment such as ours, one causal quantity of interest is AMCEs (Auspurg & Hinz, 2014; Hainmueller et al., 2014). These measure the effect of a given level of a factor (e.g., *Locality*: own canton) on an outcome (e.g., *Acceptance*), compared to a baseline level of that factor (i.e., *Locality*: different canton), averaged across all other factors (e.g., *Exposure*, but also, where available, covariates) and across all respondents. Here in the main body of the text, we summarise the results from ordinary least square (OLS) regressions in Figure 2, from models with or without covariates. The results remain the same if we use ordered logistic (for *Acceptance* and *Turnout*) or Poisson (for *Neutrality*) regressions. We report these alternative specifications as well as the complete OLS results in the Appendix.

Overall, the effects are substantively small and statistically insignificant in most cases. Here are some example point estimates from models that include control variables, with 95% confidence intervals in square brackets. We find that if wind turbines are proposed for respondents’ own canton, this leads to a 0.03 point decrease [−0.1, 0.03] in *Acceptance*, over a five-point scale, in comparison with proposals for any other canton. On the same scale, these local proposals

increase *Turnout* by 0.08 points  $[-0.004, 0.16]$  while decreasing *Neutrality* by 0.03 points  $[-0.08, 0.02]$ . However, none of these effects are statistically significant. For *Politicisation*, all three estimates are positive, but the point estimates are even smaller, and the 95% confidence intervals around these estimates include zero as well. These results suggest that, contrary to our expectations, local or politicised wind turbine proposals do not have meaningful effects on public acceptance or electoral outcomes.

The results are different for *Exposure*. In comparison to the one *without* the wind turbine, we find that the photograph *with* the turbine increased *Acceptance* and *Neutrality* in the experiment. We observe a statistically significant, 0.13 point change  $[0.06, 0.19]$  in *Acceptance* as a direct result of variation in the photograph. While there was no comparable effect on *Turnout*, *Exposure* increased *Neutrality* as well—by 0.07 points  $[0.02, 0.12]$  over a three-point scale. This is in line with the existing evidence on the positive effects of visual exposure to wind turbines.

## Sub-group analysis

To test the claim that attitudes to wind turbines differ between rural and urban populations, we conduct a sub-group analysis for respondents from three classes of Swiss communes: rural, intermediate, and urban. Here we will follow Leeper et al. (2020), and conduct our analysis over CMMS, which measure the differences in AMCEs between subgroups of respondents. Our overall hypothesis is that there are meaningful differences between these sub-groups such that the effects are larger for the residents of rural communes than of intermediate and especially of urban communes.

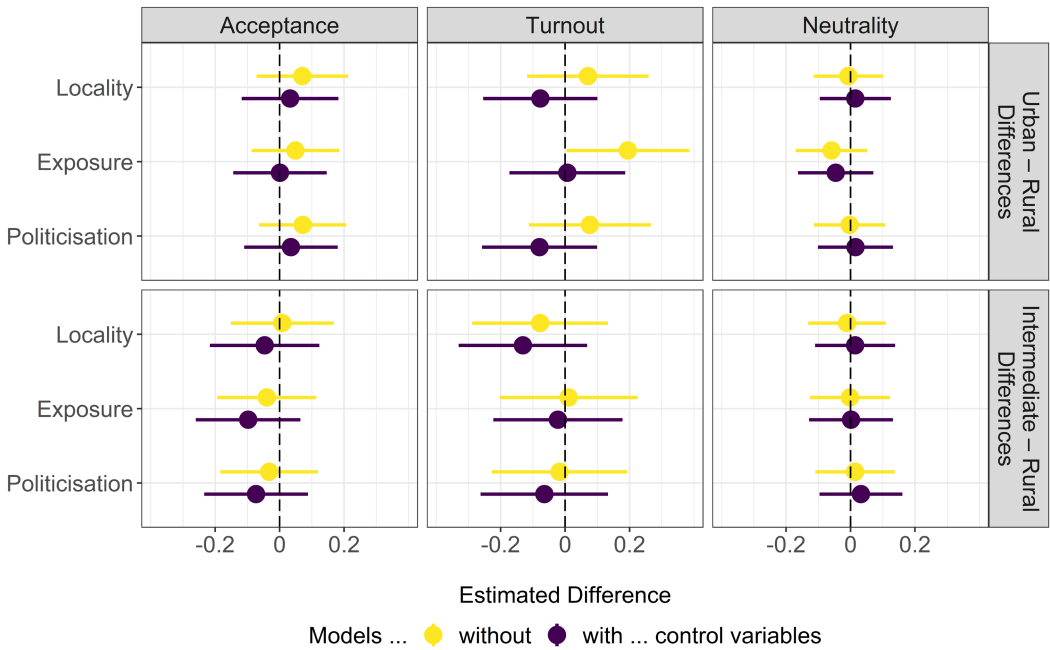
Figure 3 visualises the differences between the preferences of respondents. If urban respondents were significantly more likely to accept wind turbines in their own canton than rural respondents, we would see positive estimates for *Locality* in the upper left facet in the figure. We do not find such differences between the subgroups: again, the estimated differences are small and the confidence intervals include zero. The only exception is the positive estimate for the difference between urban and rural areas, for the effect of *Exposure* on *Turnout*. However, this difference appears only if we do not control for covariates, and once we do, it disappears.

## Interaction effects

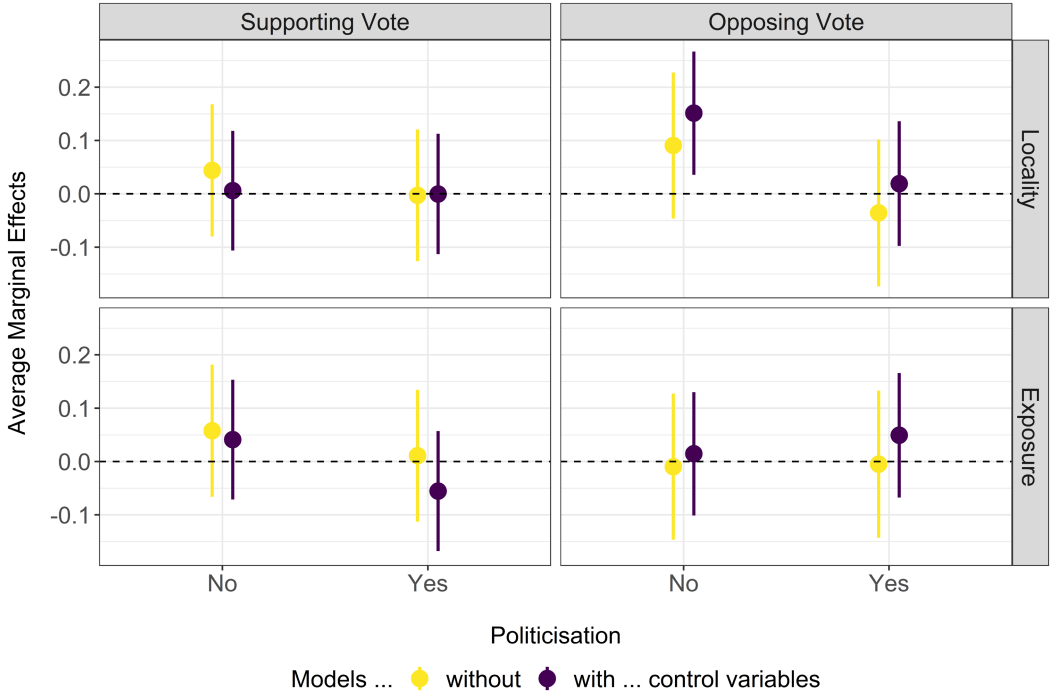
The effect of a given level of a factor on an outcome could depend on the levels of another factor. For example, if there is an effect of *Locality* or *Exposure* on vote choice, this should depend on whether and how parties politicise the issue of wind turbines. This is why we estimated ACIEs (Auspurg & Hinz, 2014; Hainmueller et al., 2014) for parties that support or oppose wind turbines in our vignette, with interactions between *Locality* and *Politicisation* as well as between *Exposure* and *Politicisation*. We report the results in Table A3 in the Appendix, which shows that these interactions are substantively small and statistically insignificant.

Figure 4 visualises the average marginal effects of *Locality* and *Exposure* on vote choice for parties that support (Social Democratic Party of Switzerland) or oppose (Swiss People's Party) wind turbines, depending on whether our treatments informed respondents about their issue positions. It shows that, even when our treatments supplied respondents with party positions on wind turbines (*Politicisation* = *Yes*), there is no meaningful effect of location or exposure on vote choice for or against these parties. Point estimates are very close to zero, which is within confidence intervals.<sup>4</sup>

<sup>4</sup>One concern is that our design is likely to be underpowered to detect meaningful interaction effects. However, even with higher statistical power, our conclusions might not be different. The confidence intervals are narrow about the null values, especially considering that the outcome variables are on a five-point scale.



**FIGURE 3** Differences in Conditional Marginal Means. *Note:* The factors are coded as own = 1 vs. different = 0 canton (*Locality*), photographs with = 1 vs. without = 0 a wind turbine (*Exposure*), and politicised = 1 vs. unpoliticised = 0 arguments (*Politicisation*)



**FIGURE 4** Average marginal effects, following regression models with interactions between factors (ACIEs). *Note:* The factors are coded as own = 1 vs. different = 0 canton (*Locality*), photographs with = 1 vs. without = 0 a wind turbine (*Exposure*), and politicised = 1 vs. unpoliticised = 0 arguments (*Politicisation*)

## DISCUSSION

These results should be extrapolated beyond the context of our study with caution. External validity is a typical concern in survey experiments (Barabas & Jerit, 2010), and our study is not an exception. Would the results reported above hold if we were to use a different vignette and/or conduct our study in another country? In this section, we discuss the potential limitations of our study over this question.

The choice of parties for the politicisation factor is a good example. In choosing parties to be included in the vignette, we had three criteria in mind—that they should (1) be on the opposite sides of the centre of the left–right dimension, (2) have a clear and opposing position towards building more wind turbines in Switzerland, and (3) be mainstream, large, and somewhat comparable in size. While the combination of the Social Democratic Party of Switzerland and the Swiss People's Party fits these criteria very well, our vignette excluded the other parties in the election. Particularly, referring to a Green party instead could have made a difference in terms of effects on vote choice, due to Green parties' ownership of environmental issues. Experimental designs that accommodate references to multiple parties, or ones that can introduce politicisation without any such explicit reference, could offer solutions to this limitation of our study.

A similar caveat applies to the photograph used in the experiment. We chose a photograph that displays a (1) conventional, (2) single turbine in a (3) natural landscape with (4) high aesthetic appeal. Our choices, we believe, reflect what many would imagine a wind turbine to look like in Switzerland—as they are built 'often in attractive and unspoiled areas' (Hirsh & Sovacool, 2013: 724). Yet, the photograph does include potentially moderating—at least these four—factors, and we need further studies to understand whether a different choice would change the results. For example, a variation in the number of turbines displayed could be informative. Existing studies suggest that exposure improves attitudes through adjusting people's estimation of how much a proposed turbine would in fact spoil the landscape. However, it could also be that, once the landscape is spoiled with one or more turbines, exposure adjusts the estimation of the aesthetic appeal of the landscape instead. Indeed, the survey respondents who received the photograph with the turbine might have thought that the new turbines would be built next to the existing one. Experimental designs that vary the number of turbines displayed could help us understand the mechanisms through which exposure affects public acceptance and electoral outcomes.

The use of cantons as location cues might also have an effect on how well the results here apply to other settings. Here our choice follows from the ideas that (1) the local opposition is more about place identity than distance to turbines (Wolsink, 2006) and (2) there is a strong sense of cantonal identity in Switzerland (Kriesi & Trechsel, 2008: 10–16). Besides, the Swiss cantons are geographically large enough to accommodate the related claims in the vignette that there are (3) proposals to place wind turbines and (4) landscapes similar to the one displayed in each canton. Unlike the other alternatives, such as communes, cantons meet these criteria well. However, cantons might be too large a location to have a significant effect on respondents' attitudes towards wind turbines or on their intended electoral behaviour. Experimental designs that use the closest suitable location to each respondent—irrespective of the corresponding subdivision of these locations—could offer improvements over our design.

Finally, we conducted our study in Switzerland—a country with a number of distinctive features such as consociationalism, cantonal autonomy, and direct democracy (Kriesi & Trechsel, 2008). As a result, Swiss voters have multiple veto points, and even if they were sensitive to wind turbine proposals, federal elections may not necessarily be where their sensitivity reveals itself. Among others, the support for or opposition against wind turbines can also be organised at a local (cantonal or communal) level and/or through referenda. Having said that, such multiple electoral arenas are often intertwined in general (Golder

et al., 2017) as formal divisions are ignored by voters (Johns, 2011), members of parliaments (Umit, 2017), and parties (Stecker, 2015) in electoral competition. Specifically, the electoral competition in Switzerland has become less and less distinct over time (Bühlmann et al., 2006). As elsewhere, Swiss parties take increasingly polarising positions in federal elections (Bühlmann et al., 2006), and voters react to these positions predictably at the ballot box (Christin & Schulz, 2006; Nicolet & Sciarini, 2006). In our single-country study, we used two such party positions immediately before a federal election, and further studies in unitary systems would be a test for the external validity of our results related to electoral outcomes.

## CONCLUSION

Does project locality, turbine exposure, or issue politicisation affect attitudes towards wind turbines or behaviour in elections? Following the conventional wisdom, one would expect to find several causal links within this setting. On the one hand, existing studies repeatedly show that opposition to wind turbines is particularly high among the local residents, but also that this opposition declines with exposure to turbines. Similarly, there are also reports that local wind turbines increase turnout and affect vote choice. On the other hand, political parties increasingly make their views heard on energy policy, including the transition to renewables through wind turbines, suggesting that they expect there are votes to be won and lost over this issue (Lüth & Schaffer, 2022).

To test whether these relationships are causal or not, we surveyed over 4,000 respondents, representative of the Swiss voting-age population, shortly before the 2019 Swiss federal elections. All respondents read a short text about wind turbines with a systematic randomisation with regard to (a) whether they were told that turbines were proposed for their own or another canton, (b) whether they were shown a landscape photograph with or without a turbine, and (c) whether they were told there was a disagreement over wind turbines between people or political parties. We then estimated the effect of each factor on respondents' attitude towards wind turbines and their intended political behaviour in the upcoming election.

The results do not support our expectations or the existing literature. We find that local or politicised wind turbine projects do not make respondents more or less likely to accept wind turbines in Switzerland. Neither do these factors affect—be it on their own, or in combination with one another—voters' electoral behaviour, in terms of turnout and vote choice. The sole exception seems to be the exposure to wind turbines, but only when it comes to public acceptance. Here we find that respondents' support for wind turbines increased as a direct result of seeing the landscape picture with a completed wind turbine, in comparison to seeing the same landscape without one. Then again, there were no meaningful differences between these two groups in terms of electoral behaviour. Likewise, when we compare the sub-groups along the urban–rural divide, we find no notable differences, substantively or statistically. These null findings, nevertheless, can be considered as good news for political parties pushing for more wind turbines in their country. Our results suggest that the electorate may not punish them for their position on wind turbines, even in areas where these turbines will be located. However, our results also suggest that there may be no electoral reward for parties taking the lead in fighting climate change either.

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## OPEN RESEARCH BADGES



This article has earned Open Data and Open Materials badges for making publicly available the digitally-shareable data necessary to reproduce the reported results. The data and replication materials are available at <https://doi.org/10.7910/DVN/B6NVRM>. The pre-registration is available at <https://osf.io/mtn3b>.

## DATA AVAILABILITY STATEMENT

This study was pre-registered, before data collection, at EGAP Registry (20190903AA). The pre-registration is available at <https://osf.io/mtn3b>. The data and replication materials are openly available in Harvard Dataverse, at <https://doi.org/10.7910/DVN/B6NVRM>.

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