



Blowin' in the Wind

The Electoral Effects of Wind Energy Expansion in Sweden

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Abstract: Abstract The construction of wind farms is politically contested, yet crucial for the green transition. Wind energy expansion has influenced electoral behavior by decreasing support for incumbents. This is mostly explained by not-in-my-backyard (NIMBY) arguments. However, how the establishment of wind farms shapes electoral behavior in proportional systems with concurrent elections and how the ideological position of parties shapes voters' electoral responses have not been fully considered. By using fixed-effects and difference-in-differences analyses with electoral data, this study explores the electoral ramifications of wind energy expansion in Sweden, a country with both high commitments to the green transition and large sparsely populated areas that are ideal for wind energy extraction. This study shows that the establishment of wind farms is politically costly, but only for the Social Democratic and agrarian parties, who hold positive views on wind energy. Additionally, parties at the national level are punished more than those at the local level, despite municipalities having veto rights over building permits for wind turbines. This could be explained by blurred accountability, where voters punish parties without knowing who is responsible. Wind farm expansion thus results in democratic problems and can contribute to substantial vote switching across different levels of government.

Keywords: wind energy, electoral behaviour, NIMBY, green transition



Introduction

With the increasing salience of environmental and energy issues in European politics, the spatial dimension of energy systems has become increasingly salient among the electorate. Recent scholarship has highlighted this by analyzing how different energy systems influence both voter choice and public opinion (Bayulgen, Atkinson-Palombo, Buchanan, & Scruggs, 2021; Edwards, Schweitzer, Shakespeare-Finch, Byrne, & Gordon-King, 2019; Enevoldsen & Sovacool, 2016; Fast et al., 2016; Sherren, Parkins, Owen, & Terashima, 2019; Walker, Stephenson, & Baxter, 2018). In this literature, the expansion of wind energy has been of particular interest. Research has shown that the construction of wind turbines can both hurt incumbents or contribute to an indirect increase in support for pro-renewable parties (Stokes, 2016; Urpelainen & Zhang, 2022). This is not surprising. Wind turbines fundamentally change the scenery and contribute to constant noise and light (Bell, Gray, & Haggett, 2005; Ogilvie & Rootes, 2015). That voters react to this changing reality is to be expected.

However, previous studies have predominantly focused on majoritarian electoral systems, where accountability is more easily attributed to incumbents. They have also mostly examined federations. Whether the electoral ramifications of wind energy expansion are the same in unitary systems with proportional and concurrent elections is not self-evident. Recent studies have therefore expanded these analyses to countries with proportional systems and have shown that wind turbine expansion hurts incumbents, but that this is heavily contextual (Larsen, Uhre, & Lægreid; Otteni & Weisskircher, 2021).

Even in these cases, are the electoral effects equivalent across countries? This has both geographical and political components. Voters in countries with large sparsely populated areas are likely less affected by wind energy expansion than those in densely populated regions. This conclusion, that spatial proximities condition the electoral effects, is closely associated with the core mechanism that explains the electoral backlash from wind energy expansion—not-in-my-backyard (NIMBY) arguments; people support the green transition but do not want to have the tools for it located close to them (Bell, Gray, Haggett, & Swaffield, 2013; Umit & Schaffer, 2022; Wolsink, 2007; Wüstenhagen, Wolsink, & Bürer, 2007).

However, if voters are against a measure, they must know who to punish electorally. Previous research has argued that voters are aware and show their dissatisfaction with the correct level of government, that is, if national parties are responsible, they are punished (Stokes, 2016). However, it cannot be expected that voters will know the level at which decisions are made. The responsibility for granting building permits for wind farms is often decided at the local level, while parties at the national level often promote the expansion of wind energy. This obstructs voters' perceptions of accountability and has been an important consideration in the context of economic voting in federal systems (León & Orriols, 2016).

Decentralization is an important instrument for giving voters closer access to parties, but it can also contribute to unclear responsibility pathways where voters do not know who to blame for what (León,

2012). This *blurred accountability* is common in multilevel political systems with concurrent elections. Voters in these systems often abstain when not knowing who to blame (Park, Frantzeskakis, & Shin, 2019). If they vote, they should split their tickets by showing dissatisfaction at one level of government but not at the other. However, although split tickets across different levels of government have become more common, voters often choose the same party in concurrent election (S. Persson, 2020). This indicates that voters simply do not know who to blame or reward for policies across different levels of government.

The absence of split-ticket voting and blurred accountability are highly relevant in the context of energy politics, as the *direction* is debated at the national level while the *decision* is local. So, how do voters respond to wind farm placement when accountability is blurred? Are voters able to direct their dissatisfaction toward the correct level of government? This question provides good reasons why previous studies on wind energy should be expanded. Electoral accountability varies depending on the system and on who carries responsibility for wind farm expansion.

It is also highly possible that ideological variations influence the prospects for electoral punishment. If parties accept construction but are seen as the biggest opponents of wind energy, why would they be punished in the ballot? This was at the core of Urpelainen and Zhang's (2022) study, which found that wind farm expansion only increased support for parties that were proponents of renewables, that is, the Democrats. Parties associated with certain issues, so-called *issue owners*, can receive praise or punishment when "their" issues become increasingly salient. This is apparent in Germany, where the biggest opponents of wind energy, the radical right, and the biggest proponents of wind energy, the Greens, were both rewarded when turbines were built (Otteni & Weisskircher, 2021). It is thus not obvious that only the incumbent is affected, as the support for other parties changes depending on the ideological preconditions and how they argue for—and against—wind power.

These considerations are addressed in this article by exploring the real electoral effects of the presence of wind turbines across different levels of government and among different parties. This has several political implications. First, it tests whether the population knows at which level issues of wind farm expansion are located, and second, it explores if ideological positions condition electoral punishment or reward in multilevel systems, and third, it expands the literature to include Sweden.

Sweden is interesting for several reasons. The population holds large, supportive positions on the green transition, and the country has sparsely populated areas that are ideal for the placement of wind farms. Some have claimed that NIMBY arguments against wind farms are not widespread in Sweden (Waldo, 2012). Thus, it can be considered the least likely case. If the placement of wind farms has an impact in a country with a high commitment to energy transition and large, sparsely populated areas, it will likely have an effect in other countries. If no effects can be seen, this might indicate that previous studies on electoral punishment can be moderated if wind farms are located very far from populated places.

The country has attracted important investments in the green transition; battery and carbon-neutral

steel production, among others (Blom, Hillman, Zandén Kjellén, & Eriksson, 2020; Energimyndigheten, 2020). These investments are dependent on green energy. This should be seen in the context of the country's environmental strategy. Sweden has a goal of zero CO₂ emissions by 2040, and wind energy is a vital component of this plan (Energimyndigheten, 2021a). Without it, these green investments will face obstacles.

Swedish municipalities have veto rights over the construction of wind farms, and not surprisingly, 78% of all wind farm expansions are blocked by the municipalities (Zachrisson Winberg & Burström, 2022). The reason for this is usually protests and, potentially, the fear of electoral punishment. This halted transition has led to a government inquiry that seeks to change the legal capacity of municipalities to block development (Liljesköld, 2020). The expansion of wind energy thus increases conflicts between different levels of government (Vestberg, 2022). This notion is important, as a revocation of the municipal veto has been proposed, but it is simultaneously up for discussion in Norway, where municipalities only informally can veto against the construction of wind turbines (Gulbrandsen, Inderberg, & Jevnaker, 2021).

If establishing wind farms is costly for the responsible politicians, it is reasonable to consider whether political parties would risk their electoral success for the green transition. Parties are, above everything else, committed to winning elections. If a certain policy decreases their likelihood of winning, they are unlikely to continue to pursue the policy (Fenno, 1973; Mayhew, 2004; Strøm, 1997).

This study, therefore, has both policy and electoral implications, as it clarifies whether parties gain or lose support by establishing new wind farms, and it captures how affected populations react to the issues of wind farm expansion in a new setting with different conditions than in previous studies. This is explored under the overarching research question: What are the electoral effects of the establishment of wind farms in Sweden?

To answer this question, a unique dataset on all wind turbines in Sweden, matched to the precincts, was used. The percentage of a precinct that is within a 3-, 10-, and 19-km radius from a wind turbine was then used to capture cross-municipal and cross-precinct treatments. This is an ideal case of using a fixed-effect, difference-in-differences (DID) design, with the establishment of wind farms between 2010 and 2018 as a treatment condition. Not including an estimate before 2010 is reasonable, as the municipal veto was introduced in 2009. The effect was tested depending on the political leadership of the municipality. It is expected that the ideology of municipal politicians will influence electoral outcomes (Urpelainen & Zhang, 2022).

The paper will continue as follows. First, the background on the political effects of wind farm establishment will be covered. This is followed by a brief introduction to the Swedish case. I then explain the research design, followed by the results. I end this paper with a final discussion, where the policy implications are assessed, and where I point to viable areas for future research.

The Political Effects of Establishing Wind Farms

As negotiated CO₂ emission targets are accompanied by political action, they demand the establishment of new green energy sources, and political conflicts over wind energy expansion are likely to increase in strength (Anshelm & Simon, 2016). Energy and environmental politics thus have multilevel connotations, where decisions are made nationally, or globally, but where the affected populations are locally concentrated. This is apparent both as a result of global warming, where in flooded areas or areas affected by wildfires, support for incumbents increases (Bechtel & Hainmueller, 2011; Ramos & Sanz, 2020), and in the expansion of renewable energy, where incumbents are punished (Larsen et al.; Stokes, 2016). Local political conflict, therefore, becomes global, as the spatial dimensions of the green transition could challenge global environmental targets. These local conflicts thus have the potential to not only divide communities or countries but also continents, and to substantially halt the green transition (Enevoldsen & Sovacool, 2016).

Policies that substantially affect any community negatively mobilize voters, making a small, loud section of the electorate shape the development and distribution of public goods (Bell et al., 2005). This is at the core of the NIMBY argument: Locally concentrated policies are acceptable, but not if they are in close proximity to those affected by such policies. The NIMBY arguments are present, as numerous studies have argued that the visual impact of wind farms substantially lowers support for them (Wolsink, 2007). In a recent chapter about the perception of wind turbines close to homes in Sweden, the main argument was that the closer wind turbines were, the less prone people were to accepting them (Jönsson, 2022). The core argument that spatial proximity to turbines contributes to resentment toward wind energy is valid and confirmed in several studies (Stokes, 2016). Voters punish incumbents for negative policies that systematically damage the local community. This was most clearly shown by Stokes (2016). She showed that the incumbent lost between 4 and 10% of the vote when wind farms were established. This is at the core of the retrospective voting concept and is generally considered essential for all forms of democratic accountability (Key Jr, 2013). Voters vote against policies or exogenous events they dislike (Achen & Bartels, 2004).

Stokes' (2016) study was the first of its kind to use several measures to explore the electoral impact of wind turbine placement, using Ontario as a case. Ontario's wind energy development was marked by stark political conflicts, where local politicians did not have the right to block the construction of wind farms, which created an exogenous distribution of turbines. That similar effects could then be seen in Denmark speaks to the NIMBY argument (Larsen et al.). Voters in Nordic countries show very high levels of public commitment to the green transition (Bocca, Ashraf, & Jamison, 2021). If voters in Denmark show electoral behavior similar to those in Ontario, it is reasonable to believe that voters in Sweden will also punish incumbents for wind energy expansion.

However, the electoral effects are by no means self-evident. In Germany, the construction of wind farms increases support for their biggest opponents, the radical right, and their biggest proponents, the

Greens (Otteni & Weisskircher, 2021). Other studies have shown that wind farms do not have any electoral effect (Umit & Schaffer, 2022), or even that they increase the support for incumbents (Bayulgen et al., 2021). In a recent study by Urpelainen and Zhang (2022), the expansion of wind energy infrastructure increased the support for candidates who were proponents of wind energy, thus showing that partisan variations influence the electoral effects of wind energy expansion. It is thus not self-evident that the same mechanism can explain variations across countries, especially when different levels of government have different responsibilities.

Furthermore, some countries have comprehensive compensation systems, while others do not, and these likely condition the electoral outcomes of wind farm expansion, potentially explaining why the effect of the establishment of wind farms yields different results, with positive, negative, or no electoral effect in different countries at different times (Bayulgen et al., 2021; Otteni & Weisskircher, 2021; Stokes, 2016; Umit & Schaffer, 2022; Urpelainen & Zhang, 2022).

The role of different government actors is also likely to influence electoral outcomes. One of the main conclusions of Stokes' (2016) article was that voters knew at what level the decision to build wind turbines was taken. I question whether this assumption holds true across different countries. If government actors portray themselves, or their coalition partners, as green and environmentally friendly, with the increasing salience of wind energy at the national level, how could voters then know that the decision is made at the local level? This is especially true if elections are concurrent.

As an example, looking at the manifesto data for national parties in Sweden, the salience of wind energy and support for renewables varies greatly between parties. Wind energy was mentioned in 11 of the 24 latest electoral manifestos at the national level. In four of these, the expansion of wind energy was mostly portrayed as something negative. Renewables were mentioned in 15 out of 24 manifestos, where left-leaning parties in general, and the Green Party in particular, dedicated much of the text in their manifestos to these issues. A survey on the policy position on energy issues among the parties before the election of 2014 conducted by the Swedish Industrial Union also indicated great variation among the parties. Where the main left-leaning party, the Social Democrats, supported the expansion of wind energy, the main opposition party, and incumbent at the time, the Moderates, saw it as a complement (Wideberg, 2014). Some parties have also visually promoted wind energy in both television ads and posters at the national level. While not all parties did so, if some parties continuously promote local issues at the national level, it is likely that voters of all parties will not know at which level decisions are taken on these issues, thus creating *blurred accountability*.

This has implications for blame-avoidance strategies; if the responsible politicians can argue that any policy was decided at another level, they can avoid accountability. It is also possible that this could create an electoral backlash at the national level, while municipal parties could avoid this backlash. Comparing electoral outcomes at different levels of government across different political systems thus has important implications for how accountability for wind energy issues is perceived. It could be anticipated that voters will punish the local incumbent for wind farm expansion and that the incumbent

at the national level will be punished for local policies. This is the first hypothesis of this paper:

H1: Wind farm expansion decreases the support for the incumbent.

This perspective considers only that policies are costly across the board, but that is incorrect. Party politics is more complex than merely considering retrospective voting. The salience of different issues influences the support for parties associated with them (Bélanger & Meguid, 2008; Wagner & Meyer, 2014). In the United States, the polarization on renewable energy has increased over time, making the Democrats supporters and Republicans opponents. This consideration is fundamental, as it could also create a "positive reinforcement" where increasing support for the Democrats contributes to the expansion of renewable energy, which in turn continues to increase the support for these parties (Urpelainen & Zhang, 2022). On the other hand, voters' support for wind energy conditions their electoral behavior, and if they do not perceive parties as supporters of wind energy, there are few reasons to punish them in the ballot box.

While the polarization of renewable energy in the United States is clearly between Democrats and Republicans, such polarization in terms of environmental issues is visible in several countries. Otteni and Weisskircher (2021) showed that when wind turbines were built in Germany, the support for both green and radical right-wing parties increased, as they were the primary opponents vis-à-vis proponents of wind energy. Similar patterns are visible in Sweden, where voters on the left were more positive toward wind energy than voters on the right: 74% of voters who were clearly left-leaning supported the expansion of wind energy, while only 44% of voters on the opposite side of the spectrum showed similar support (Jönsson, 2021).

This combination of parties' and voters' variations in their support for wind energy should contribute to variations in how wind energy influences electoral behavior. If left-wing parties build wind farms, it would be logical for voters to decrease their support for these parties, as these parties are, in general, more supportive of wind energy. If right-wing parties show the same tendency, it would be illogical for voters to instead support left-wing parties, as they are also likely to continue building wind energy farms.

After the 2018 election, municipalities with a right-leaning incumbent almost fully stopped granting building permits for wind energy infrastructure. Thus, there is little reason for voters to decrease their support for right-wing parties if wind turbines are constructed; instead, only parties that are promoting wind energy should be punished. This partisan consideration challenges the blind retrospective voting theory. Voters know which parties promote wind energy and will punish only those while leaving the opponents unaffected. This leads to the second hypothesis:

H2: Wind farm expansion only decreases support for parties that support the expansion of wind energy.

Wind Energy in Sweden

Wind power is a key component in the Swedish green transition, yet wind farms are, as in all other countries, visible, exposing citizens to constant noise and blinking lights. To overcome possible resentment against them, politicians seek to place them as far from densely populated areas as possible, leading them to be placed in rural communities. This has been described as the exploitation of rural populations by the urban establishment. While green movements are more popular in urban areas, the tools for the green transition are usually placed in rural communities. The costs for the green transition are thus placed in locations where the strongest proponents do not live. These urban–rural polarization aspects of wind farm expansion have been shown in several previous studies in other countries (Hatakka & Välimäki, 2019; Walker et al., 2018).

The differences between rural and urban support for wind farms are also apparent when looking at the survey results. A survey with over 15,000 respondents in northern Sweden showed that the support was equally as strong as the opposition to the establishment of wind farms. While the majority of the urban population was positive, the rural population was more negative (Suneson, 2021). This has also been confirmed by other studies showing that the support for wind farms was substantially more popular in rural areas in the early 2000s, and that the opinions shifted and the proponents are now located in urban areas (Larsson, Hedberg, & Holmberg, 2020).

It is understandable why this shift has taken place. In 2020, 17% of all energy in Sweden was from wind power, compared to only 0.2% in early 2000 (Energimyndigheten, 2021b). Even though a large part of this increase can be attributed to increased capacity in the already established system, the production of new wind farms has been substantial. In 2000, 527 turbines were in use; this increased to 1658 in 2010 and reached 4286 in 2020 (Energimyndigheten, 2021c). Wind power has resulted in the biggest increase in energy production in Sweden in the last 20 years.

While wind power was predominantly located in the southern parts of the country and in coastal areas, the expansion of wind farms soon became directed to the north (IVA, 2016). These vast, sparsely populated landscapes were considered ideal, as the wind farms would be located as far from citizens as possible. It is true that these areas are sparsely populated, but it is equally the case that they have the most pristine nature, and the establishment of wind farms has left substantial marks on the landscape. This could potentially be one of the reasons why opinions on wind farms have shifted. In early 2000, the establishment of wind farms was seen as job-providing, while it later became considered damaging to the local landscape and as a creator of noise disturbances (J. Persson & Fernqvist, 2016).

The establishment of wind farms thus leads to conflicts in communities, between politicians and voters, environmentalists, and skeptics, and between urban and rural populations, often leading to no expansion at all (Anshelm & Simon, 2016). Previous research has shown that over a quarter of projects encountering protests have been canceled, suspended, or delayed (Temper et al., 2020). Rural populations consider the increasing presence of wind farms as a violation by the urban population.

While the urban population emphasizes the importance of combating climate change, they are not the ones who see their scenery disturbed by the green transition (Bergek, 2010).

Grants have occasionally been provided to local communities to compensate for the establishment of wind farms. However, these grants have been considered bribes, as they can—never—compensate for the loss of nature (Gradén, 2016). The negative electoral fallout of CO₂ mitigation policies has previously been shown to be limited by welfare policies, and it is therefore understandable why the Swedish government is considering comprehensive compensation schemes (Kono, 2020). However, these grants are neither fully in place nor uncontroversial (Gradén, 2016).

The question also concerns political issues that directly influence Indigenous people. The Sami community in northern Sweden has concluded that the establishment of wind farms threatens the Sami way of life and reindeer herding. Several Sami villages have argued that their lands cannot handle any further wind farms (Sametinget, 2009).

The establishment of wind farms in Sweden is thereby politically potent, contributing to conflicts as it stretches across communities, between environmentalists, and those that want to secure access to nature. It strains the relationship between urban and rural voters and the relationship between Indigenous people and the state. The conflict surrounding wind farms is thus not only between those who are calling for climate change initiatives, but also between different ideas regarding the placement of the tools for the green transition. Although wind farms are necessary for the green transition and are actively located in rural areas, they have the potential to create resentment against those responsible for developing them.

In Sweden, parties on what is seen as the left-leaning side have, in recent years, been clear proponents of wind farms: the Social Democrats (S), Greens (MP), the Left (V), and the Center Party (C). The Greens were in government with the Social Democrats (S) during the treatment period. The Center Party, a Nordic agrarian party, pursues policies of liberalism and environmental protection, and has strong support in rural communities. This strong support is often the result of the party's agrarian roots and its inclusion of farms and landowners in the decision-making process. The Social Democrats and the Center Party are often seen as the main electoral contenders in rural areas, and they often lead the municipal board together in a bipartisan setting. A vast majority of all wind farm permits have been provided by either of these parties.

On the other side of the political spectrum are the Moderates (M), Christian Democrats (KD), Sweden Democrats (SD), and the Liberals (L). These parties were substantially more positive about the expansion and protection of nuclear energy (Holmberg, 2022), while the Social Democrats and the Center Party were already pushing toward increasing wind energy. That there is a partisan variation in the role of being the incumbent and a supporter of wind energy is evident, and this likely influences the electoral effects of wind energy expansion.

Data and the Empirical Strategy

The main dependent variable is the electoral results at the precinct level. One party included in the analysis was the Sweden Democrats (SD). First, this party is included as the support for the radical right substantially increased in Germany when wind farms were established (Otteni & Weisskircher, 2021). There are good reasons to believe that Sweden could experience a similar outcome, as the supporters of the Sweden Democrats are the most reluctant about wind energy, and the party is the strongest opponent against the expansion of renewables, as seen in their electoral manifestos. Second, data for the Social Democrats will be analyzed. The party held the incumbency at the state level during part of the treatment period, making it a likely target for dissatisfied voters. It also holds largely supportive positions on wind energy and seeks to override the municipal veto. Third, the electoral outcomes for the liberal-conservative Moderates are included. This is the main opposition party at the national level. It is thus likely that voters who reject the Social Democrats will turn to them. Fourth, the Center Party, a rural-oriented liberal party, has disproportionately strong support in areas where wind farms are established. The Center Party is also considered the green alternative among the right-leaning parties, holding the Ministry of Environment seat in the right-wing government between 2006 and 2014. The party has also actively used wind energy in its political communications at the national level. It is thus reasonable for voters to react to wind farms by changing their votes for this party. Finally, the Greens (MP) are included in the analysis. The party is undoubtedly the strongest supporter of wind farms. There is also good reason to believe that it is the primary target for voters who do not support more wind farms, because it has a stronghold in cities, making rural voters see it as the exploitative actor in urban regions. It could also be possible that wind energy expansion could increase support for the party, as it makes environmental politics more salient, similar to the development in the United States and Germany (Otteni & Weisskircher, 2021; Urpelainen & Zhang, 2022).

To explore this topic, electoral outcomes will be measured at the precinct level. The electoral precinct is the smallest political unit there is. It captures longitudinal variations in support for parties. Each precinct has roughly between 1000-2000 voters. The data on precincts were collected from the Swedish Election Authority. They provided the GIS files that have been merged using coordinates from the Swedish Energy Agency.

When precincts changed in size and structure between 2014 and 2018, they were weighted to be comparable over time. This weighting procedure was carried out using the agency-provided conversion table. The table shows how much overlap there is between precincts over time and can therefore be used to calculate the value of different variables over the treatment period. No such conversion tables are available for the 2010–2014 period. Only observations that could be followed across the entire treatment period were used. Starting the analytical period in 2010 is reasonable, as the municipal veto was introduced in 2009 (Darpö, 2020). The control variables are also unavailable for the period before 2010.

The main independent variable is wind farm establishment. Data from the Swedish Energy Agency

were used to create a dataset on all permits for wind turbines in Sweden, with a focus on the period from 2010–2018. The dataset includes permits given and rejected, the number of turbines, coordinates, and so on. It also includes wind farms that were built before the treatment period. Sea based wind turbines are not included in the analyses as it, occasionally, are decided at the government level, and it is not possible to link them to any specific electoral precinct.

To estimate the impact of turbines, several empirical strategies were used. First, each wind turbine was merged with a precinct. This effectively captures how the construction of wind farms influences parties' electoral fortunes by using fixed-effects panel regressions, similar to Otteni and Weisskircher (2021). Regressions included the available control variables collected from *Statistics Sweden*. These were the level of education, measured as the percentage with a 3-year university education or more, and mean income, measured as the mean income in Swedish crowns. The natural logarithm was used for the latter. The demographic variables used were the percentage of residents with an immigrant background and population density. Population density was measured as the number of available voters per square kilometer. The proposed compensation could be an important control variable, but local communities are currently rarely compensated (Carlén, 2012). Future analyses should take possible future compensation into account, but it is beyond the scope of this study to do so. All the regressions included yearly fixed effects, and the standard errors were clustered by precinct.

Second, a DID strategy was applied. DID is one of the most commonly used methods to measure the local impact of any policy. The method is based on a combination of before and after treatments between a control and treatment group, making it ideal for a study that seeks to understand what happens to electoral support after wind farms have been established. By comparing a control and treatment group over time, we can explore how the construction of a wind farm influenced electoral outcomes, as was used by Stokes (2016). In these estimates, precincts that experienced wind turbine construction between 2014 and 2018 were used, and all observations that had any wind turbines before this period were excluded. It is likely that they would otherwise influence how people would react toward the construction of a wind farm. There were only 39 precincts that got at least one extra turbine during this period, but the estimates still show whether this wind farm construction contributed to any electoral changes.

Third, I calculate the percentage of a precincts covered inside a 3-, 10-, and 19-km buffer zone from a wind turbine. This means, that if a higher percentage of the precinct is inside these buffers, it is likely that more people are affected, i.e live close to the turbine. This is similar to previous studies, but instead of using the cumulative number of wind turbines, this study uses the percentage of a precinct that is covered by a the buffer zones around the turbines (Otteni & Weisskircher, 2021). The reason for this is that there is likely a nonlinear relationship; when one wind turbine is built, the effect is stronger than when the next turbine in a farm is installed, and using the percentage of the precinct covered inside these buffer zones compensates for this.

This also overcomes stable unit treatment value assumption violations. Areas on the other side of

the precinct are likely affected by the built wind turbines. By using the percentage of the precincts existing within the 3-, 10-, and 19-km buffer zones from wind farms, neighboring precincts were also captured. Precincts are political borders and are only used for measuring electoral outcomes; it is not self-evident that people know which precincts they belong to, and thus neighboring precincts can be treated. The sample was then divided to explore municipal leadership. As the municipal veto gives municipal politicians the final say in establishing wind farms, only those responsible are likely to be affected by establishing such farms.

Previous studies have argued that wind energy potential—that is, wind velocity—could be used in an instrumental variable setting. This assumption does not necessarily hold across different countries, and not in Sweden. Municipal politicians in Sweden have been shown to relocate "public bads" from their precinct of residence (Folke, Martén, Rickne, & Dahlberg, 2021). Thus, the consideration of where to place wind turbines is not based solely on wind velocity, but also on political considerations. This notion distorts the instrumental variable approach. To fully explore the politician considerations surrounding the placement of wind turbines, that is, where politicians live and the number of swing vis-à-vis core voters (Taghizadeh, 2016), is beyond the scope of this study, but it is an important area for future research.

Results

Table 1: Electoral outcomes: All observations

	(1) S	(2) C	(3) SD	(4) MP	(5) M
Municipal elections:					
Wind turbines	-.1*** (.028)	.009 (.019)	.034 (.017)	.017* (.007)	.042** (.014)
Observations	15508	15502	15508	15502	15508
R-squared	.356	.176	.751	.547	.479
General elections:					
Wind turbines	-.1*** (.006)	-.04*** (.006)	.085*** (.005)	.02*** (.001)	.042** (.002)
Observations	15508	15508	15508	15508	15508
R-squared	.297	.391	.855	.616	.785
Year dummies	Yes	Yes	Yes	Yes	Yes
Municipal and precinct SE clustering	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes

Standard errors are in parentheses. *** $p < .001$, ** $p < .01$, * $p < .05$. S=The Social Democrats, C=The Center Party, SD=The Sweden Democrats, MP=the Greens, M=the Moderates.

Looking at Table 1, it becomes evident that establishing and expanding wind energy has a potent effect on the support for different parties, but there is also substantial variation between different levels

of government, where the support for parties in the municipal election was influenced by the Moderates, the Greens, and the Social Democrats. All estimates for the general election show strongly significant results, and the results are well in line with previous research.

For every extra turbine, the support for the Social Democrats decreased by 0.1 percentage points, and for the Center Party it was 0.04. However, it increased for the Sweden Democrats, the Greens, and the Moderates. This has important implications for our understanding of how the ideological positioning of parties influences the electoral effects of wind turbine construction.

The main contenders in rural areas, the Social Democrats and the Center Party, lose when building wind farms, while the support for the main contender at the national level, the Moderates, increases. It could be interpreted as voters moving from between these three parties, and as the Moderates are weaker proponents of wind energy, they gain due to the construction by attracting dissatisfied voters. This is in line with Hypothesis 2.

It is also clearly shown that the same effect that was visible in Germany is also present in Sweden. Support for the Greens and the Sweden Democrats increased. These parties are, also in the Swedish context, indisputably the parties that have the strongest opinions on wind energy. With the Greens being the most supportive, and the Sweden Democrats most clearly against. We can thus see how the expansion of wind energy increases the salience of environmental issues, which in turn increases support for parties on each side of the political spectrum. That polarization also only occurs at the national level might indicate that people are listening to the electoral message that the parties express at the national level. The Greens (Sweden Democrats) have been particularly pronounced in their support (rejection) of wind energy.

It is also striking that most of the effects are not pronounced in municipal elections, even though the municipalities have veto rights on the construction of wind farms. This indicates that there are substantial problems with accountability. Voters might not be aware that the municipal veto exists, and that it is reasonable to show disappointment in these elections rather than in the national ones. This might also explain why the Social Democrats were punished, even though it is unclear whether they were the municipal incumbent. Voters might believe that the Social Democrats were responsible because they were the incumbent at the national level between 2014 and 2018.

There are very small differences when looking at the output for different municipal leaderships, indicating that the key factor for explaining changing support for parties is not the actual response. Instead, voters voted against parties that were unrelated to those who had veto rights. This indicates that the blurred accountability theory has leverage.

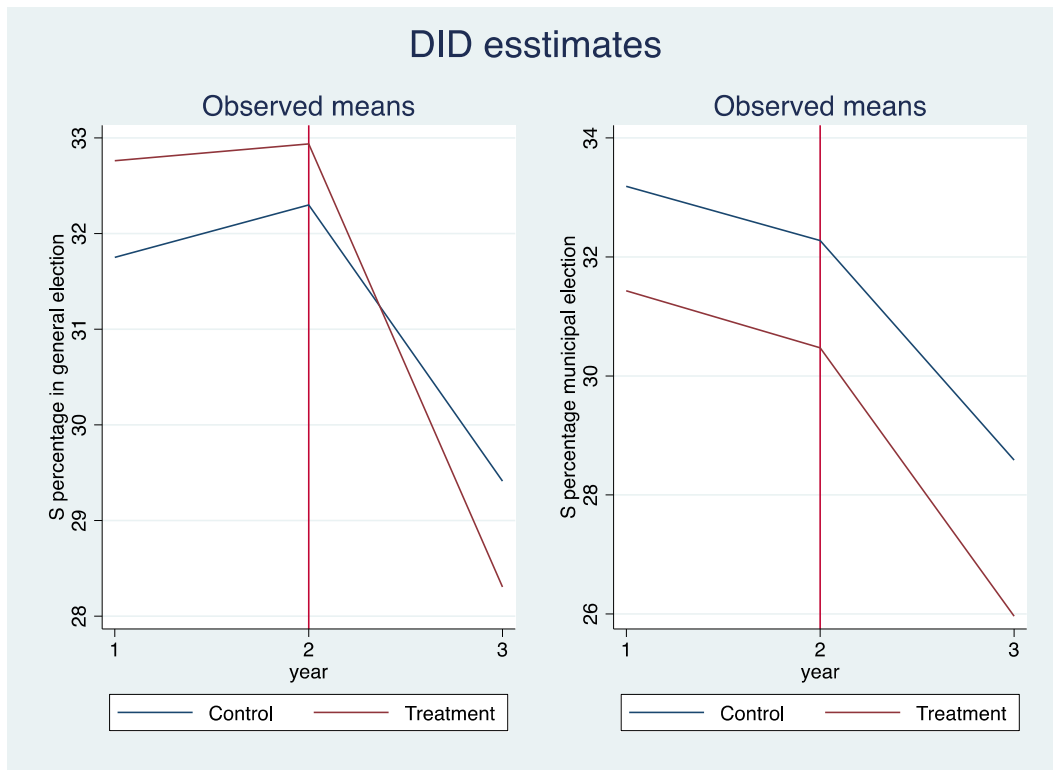


Figure 1: The electoral effects of wind turbine expansion for the Social Democrats.

To expand these conclusions, the DID estimates (see Figure 1) were tested with the support for the Social Democrats at both the municipal and national levels. These results confirm previous results. The Social Democrats were punished for wind farm development between 2014 and 2018, but only at the national level. It is notable that the municipal level showed parallel lines between the treatment and control groups. This indicates that there was already declining support for the Social Democrats in the affected precincts. This is different from the general election, where the treatment group initially showed stronger support for the Social Democrats than the control group, but after the construction of the turbines, the support collapsed, making the support for the party lower in the treatment group.

This effect cannot be seen for most of the other parties; instead, they tend to change their support before the actual treatment. The only difference is for the Center Party, where the party's support increased more among the precincts where no wind farms were built, but differences between the control and treated groups in terms of support for the party are substantial (Appendix graph 1). Nevertheless, it does follow the same estimates as the correlation between the number of wind turbines, and it is evident that wind farm expansion contributes to shifting support for parties, and that it hurts the main contenders in rural regions: the Center Party and the Social Democrats. While these observations capture only 39 precincts, they still indicate that there is blurred accountability. Public dissatisfaction with wind farm expansion is directed at national, and not local governments.

Table 2: Municipal elections

	(1) S	(2) C	(3) SD	(4) MP	(5) M
3-km distance	-.002 (.008)	-.017* (.007)	.032 (.018)	.002 (.004)	0 (.01)
10-km distance	-.005 (.006)	-.009* (.004)	.003 (.01)	.004 (.003)	.011 (.007)
19-km distance	-.015* (.007)	-.001 (.005)	.009* (.004)	-.002 (.003)	.008 (.009)
Yearly fixed effects	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes

Standard errors are in parentheses. The regression was repeated for each distance. The table shows the effect of using different distances as the dependent variable in the independent regressions. S=The Social Democrats, C=The Center Party, SD=The Sweden Democrats, MP=the Greens, M=the Moderates.

*** $p < .001$, ** $p < .01$, * $p < .05$

Table 3: General elections

	(1) S	(2) C	(3) SD	(4) MP	(5) M
3-km distance	.002 (.007)	-.014* (.005)	.044 (.024)	0 (.005)	-.03*** (.007)
10-km distance	-.002 (.007)	-.005 (.003)	.012 (.015)	.002 (.002)	-.01* (.005)
19-km distance	-.015** (.005)	-.002 (.003)	.022** (.007)	-.001 (.002)	.006 (.004)
Yearly fixed effects	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes

Standard errors are in parentheses. The regression was repeated for each distance. The table shows the effect of using different distances as dependent variables in the independent regressions. S=The Social Democrats, C=The Center Party, SD=The Sweden Democrats, MP=the Greens, M=the Moderates.

*** $p < .001$, ** $p < .01$, * $p < .05$

When continuing to explore the electoral implications of wind turbine development, the percentage of precincts that are covered by them at a 3-, 10-, and 19-km radius were analyzed (Tables 2 and 3). These estimates were repeated for each distance as independent regressions. The results are still in line with the previous ones, as the Social Democrats were punished, most clearly at the national level, while the Center Party's support decreased. For every percentage of a precinct that was covered at a radius of 19 km from a wind turbine, electoral support for the Social Democrats decreased by 0.015 percentage points in both the general and municipal elections, while the Center Party lost 0.014 percentage points for every increasing percentage of a precinct that was located inside a 3-km radius from a wind turbine, indicating that the effects for the party were more pronounced when wind farms were closer. Similar effects were also seen for the Moderates. There was also increasing support for the Sweden Democrats. For every increased percentage of a precinct that was under a 19-km radius from a wind turbine, the

support for the party increased by 0.02 percentage points.

To return to our original research question regarding what the electoral effects are of the establishment of wind farms in Sweden, these estimates not only confirm that there is a potent political backlash for the Social Democrats and the Center Party from building wind turbines, they also confirm that parties are punished at the national level for local-level policies. These results also show that spatial relations to wind farms have an impact. The percentage of a precinct that is close to a wind farm—and not only the actual construction—influences electoral behavior. The expansion of wind energy thereby has several electoral implications.

Concluding Remarks

Sweden, a country with generally high levels of commitment to environmental policies and with sparsely populated areas that are ideal for wind power, has committed to expanding this specific form of renewable energy. This expansion is a sensitive topic for residents living in the affected areas. That these communities will protest is expected. These forms of negative political decisions have been considered and are costly for Social Democratic incumbents and could potentially hinder the green transition. It might be possible that the party will instead increase its support for other energy sources that do not carry the same electoral reprisals. Rural voters are core voters for the Social Democrats and the Center Party, and to risk them for the green transition is not self-evident.

It is relevant to continue exploring the electorate's perception of who holds the responsibility for wind energy expansion. From these results, it is evident that parties at the national level are punished more than those at the local level. While this indicates that there are democratic problems caused by blurred accountability across different levels of government, it demands a closer investigation of voters' knowledge of environmental politics. If voters do not know where to direct their dissatisfaction, wind energy expansion will be incorrectly evaluated by voters, leading to vote switching at the incorrect electoral level.

The more wind farms that are established, the closer to populated areas they will be. This could increase the protests and potentially contribute to a similar development to the one in Germany. The polarization across spaces for environmental policies has important political connotations, as it is likely that it will continue to influence the idea that urban environmentalists are exploiting rural communities. This division between rural and urban voters has, in recent years, been heavily debated, and wind energy expansion could be seen in light of this discussion (Erlingsson, Öhrvall, Wallman Lundåsen, & Zerme, 2021).

Geographical aspects are also important. Almost every new wind farm in Sweden between 2014 and 2018 has been placed far up north in sparsely populated areas, possibly Disturbing the Indigenous way of life. If these results hold in more densely populated areas, they are therefore not self-evident. Future

studies should continue to use this approach, but continue to explore it over several time periods.

It is, however, still unclear whether increased compensation could moderate potential negative electoral outcomes, but future studies should explore this further, especially as these types of compensation have been described as bribes, and even though they are being proposed to be put in place across the whole country (Gradén, 2016).

Furthermore, if the increasing presence of wind farms could potentially increase protests, is this also true in areas that experience the catastrophic impacts of global warming? Could flooded areas build wind farms without the fear of electoral punishment? Are environmental policies more acceptable if one's backyard is already burning? This question is essential as the conflict between climate change mitigation and climate change will be a momentous issue in the following decades. While previous studies have explored the electoral effects of natural disasters (Bechtel & Hainmueller, 2011; Masiero & Santarossa, 2021; Ramos & Sanz, 2020), there are few such studies in the Nordic countries (Eriksson, 2016). This is an obvious area for future research, as it has been claimed that similar climate-related events produce similar electoral outcomes in Sweden (Eriksson, 2019).

On a final note, partisanship influences electoral behavior and the political position regarding wind energy. If there is clear opposition to the construction of wind farms among established parties, there are fewer reasons for increasing support for the political fringe. As conservative parties in Sweden have become more reluctant to develop wind farms, it might be possible that the shifting support for the radical right will, in the future, instead shift to the conservatives. Thus, future studies should continue to explore the political effects of wind farm expansion in Sweden after the election of 2022.

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Appendix:

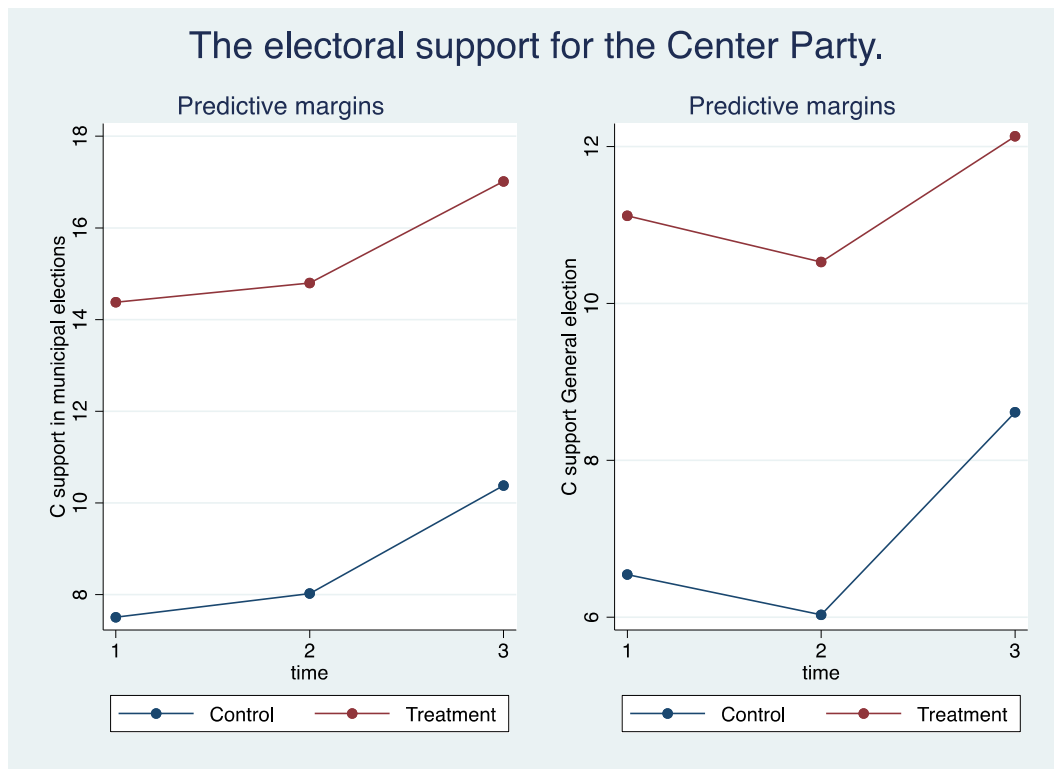


Figure 1: The electoral effects of wind turbine expansion for the Center Party.

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