Gone with the Wind?

Local Incumbents Lose in the Wake of Wind Power Developments

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Abstract

While there is broad public support in most countries for policies that lower CO2 emissions, concrete policy initiatives that lower emissions, such as the construction of wind turbines, tend to face opposition in communities where costs are imposed. If this opposition translates into electoral losses down the line, elected officials might think twice about pursuing such policies. This may in turn hamper mitigation efforts. Further, implementation of climate mitigation policies may lead to deficits of legitimacy if the popular opposition is systematically underestimated or ignored. In spite of this, only a few studies have examined the electoral ramifications of local mitigation policies. This study adds to this bourgeoning literature by connecting granular data on wind power developments with precinct-level election returns in Denmark. We show that the construction of wind turbines creates local electoral opposition to incumbents. These effects are small or non-existent at national elections, but large and meaningful at local elections. This asymmetry suggests that voters' in affected communities respond more where they have the most electoral leverage, which naturally amplifies their potential influence. Our findings have important implications for the politics of climate change mitigation, suggesting that the presence of locally elected veto players might slow the implementation of climate mitigation policies.

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Environmental and climate policies cause much frustration among citizens in Western countries. At least ten people died, and thousands were injured and arrested as the “yellow vests” protested an increase in French fuel taxes in 2019 (The Local FR 2019). The same year, four hundred protesters participated at a demonstration in Stavanger, Norway, against local congestion taxes (Fredriksen 2019), and thousands of farmers protested German environmental policies (Eriksen 2019). Yet we know little about how, if at all, these frustration with environmental policies carry over to voters’ electoral behaviour.

What happens when an area faces cost from a policy that seek to lower emissions? We know from the literature on local retrospective voting that if an area loses out economically, voters tend to punish incumbent politicians (de Benedictis-Kessner & Warshaw 2020, Larsen et al. 2019). Similarly, the literature on natural disasters suggests that if incumbents fail to help local areas facing adverse conditions, they do worse at the polls (Bechtel & Hainmueller 2011). Yet energy policy is different from negative local economic shocks or breakdowns in public services, in that the concentrated costs are accompanied by gains in the form of reduced emissions. While these gains are diffuse and at the societal level, we know that voters are often sociotropic (Kinder & Kiewiet, 1979; 1982), disregarding self-interest (e.g. Feldman 1982) and care more about whether society is on the right track than personal economic grievances.

This article examines this question empirically, studying whether energy policies that adversely affect voters’ communities, but which help reduce CO_2 emissions, lead them to punish local and national incumbents responsible for these policies. In particular, we explore whether the construction of wind turbines in Denmark have an effect on support for local and national incumbents.

Combining administrative data on the location and construction of wind turbines with precinct-level data on election returns, we are able to estimate a series of difference-in-difference models that estimate the effect of wind power development, at a very low level of aggregation, on support for both local and national incumbents. We find that citizens punish local incumbents for allowing turbines to be constructed in their precinct. This effect is particularly pronounced for the first wind turbine in the precinct. At the same time, we find no or a small negative effect for national incumbents. This discrepancy is interesting, as it suggests that that voters in affected communities respond more where they have the most electoral leverage, which naturally amplifies their potential influence. As we discuss further towards the end of the article, this has potentially important consequences for the political prospects of climate mitigation policies which concentrate burdens on a particular community.

Broadly speaking our findings are in line with Stokes (2016), the only other study of how voters respond to climate and energy policy with concentrated costs and diffuse benefits. Crucially, however, our study is the first to show disparate effects across different levels of government in a context where policy responsibility is shared, *and thus should be more or less uniform*. In this way, we contribute to the burgeoning on the electoral politics of energy policy (Hazlett & Mildenberger 2020) as well as the literature on accountability in multi-level governments (Lobo & Pannico 2020, Larsen 2019). Our study also adds to the growing literature suggesting that while self-interest rarely plays an important role in national politics (Feldman 1982), it can be a strong force in local politics (de Benedictis-Kessner & Hankinson 2020, Nall & Marble 2021). Finally, our study provides new insights into how the electoral incentives of national politicians might differ from those of local politicians.

Theoretical Background

Stokes' (2016) paper on the electoral ramifications of energy policy includes an excellent theoretical account, which we encourage the reader to consult. We will only reiterate and discuss what we regard to be her main arguments. Stokes puts forward that, although most people favour public policies that encourage emission reductions, the benefits of such policies are too diffuse to mobilize strong policy support. Meanwhile, the costs of emission-lowering policies are often heavily concentrated, and the affected minorities have strong incentives to mobilize and oppose such policies. Wind energy policies are examples of this, as the benefits are regional (electricity supply) and global (emission reductions if wind power substitutes fossil fuelled electricity supply), while the costs are mostly local (increased noise and decreased real estate prices in proximity to new wind turbines, alongside environmental, aesthetic, and perceived health impacts).[1] These policies are likely to expose governments to a democratic dilemma: should they be accountable to mobilized local opponents or the quiet but largely supportive public. The optimal solution to this dilemma is not obvious, but it is clear that in order to have an informed debate about this issue, scholars should clarify the extent to which the dilemma occurs. A precondition for the occurrence of the dilemma is that citizens who shoulder unproportionally high costs of policies vote against the government that implemented them. It is also relevant to know whether citizens continue to vote against the government that imposed unproportionally high costs on them in successive elections.

A few articles analyse causal effects of policies on voting, some of which may be regarded as policies with concentrated costs and diffuse benefits (Erikson and Stoker 2011; Karol and Miguel 2007; Stokes 2016), but the relevance of this research for energy and climate politics is questionable (with the exception of Stokes' analysis). As such, these articles consider casualties in war and draft lotteries as proxies for foreign policy, but the costs of being sent to war and losing a household member in battle are much higher than (or, at least, very different from) what we associate with energy and climate policies. The geographic concentration of costs associated with infrastructural energy projects are also much higher than the geographical concentration of draftees and related casualties, and this matters because proximity enables mobilization and political power within jurisdictions. While it is more important to gain power

[1] Wind power projects may also include economic costs, as in the case of Ontario's feed-in tariff, which are more diffuse than concentrated.

within granular jurisdictions in single-member district elections than in proportional representation elections, the geographic dimension may still contribute to explain why voters in municipalities with more costly policies (e.g., more extensive development of wind power) mobilize against incumbents.

Stokes' (2016) results suggest that the incumbent government lost 4-10 % of the vote share in precincts within 3 km of a proposed or newly operational wind turbine, which amounts to a total of around 6,050 votes. The incumbent government lost its majority by one seat in the first election after Ontario's wind power policies were implemented, and the policies that encouraged wind power development were soon rolled back. Meanwhile, opinion polls showed 90% support for wind power policies before the election and 85% support after the election, and it is therefore reasonable to argue that the new government sided with a vocal minority. Furthermore, Stokes interprets this as a case of "democratic accountability failure", but we do not necessarily agree with this interpretation. The supportive majority might be silent because their preferences regarding wind power are weak, and it is not obvious that the government would prioritize the weak preferences of the many over the strong preferences of the few. Additionally, pluralistic democracies with single member districts are designed to empower these districts, and the influence that Ontarian districts exerted over wind power policies is, in this regard, more symptomatic of functionality than of failure. A similar result in a system with proportional representation would be more indicative of failure, and this is one of the reasons why it is interesting that we look at such a case in our study.

The Consequences of Changing Contexts

We expect to find a weaker effect of wind power development on voting in Denmark than Stokes found in Ontario, as relatively small groups of spatially concentrated citizens have fewer incentives to mobilize in PR systems than in pluralist SMD systems. Other factors than election rules may also moderate the effect of wind power development on voting, such as compensation, ownership, cultural traits, and the availability of alternative energy sources.[2]

Beyond looking at a different electoral system, the main benefit of our study is that we examine a context where incumbents at both the national and local level jointly affect whether wind turbine developments are construct. This allows us to see whether voters direct their electoral punishment towards certain types of incumbents.[3] In particular, we look at both national and local incumbents. Understanding the multi-level dynamics of electoral retribution is important, as it provides insight into why local and national politicians might have different incentives when it comes to implementing energy policy (Sances 2017, Larsen 2019).

An additional benefit of our analysis is that we consider a relatively long time-period (2000-2019), which allows us to analyse the longevity of the effects. A political party might be willing to sacrifice one term in office for an important policy, especially if the implications are nearly irreversible - as with infrastructural development - and if re-election is unrealistic regardless. But long-term political support is a much bigger and arguably implausible sacrifice. Some previous research suggests that the actual experience of living near wind farms does change people's opinions over time (Krohn and Damborg 1999; Warren et al. 2005), and that local communities develop more favourable views towards wind farms after construction (Warren et al. 2005). Stokes (2016) also finds larger effects of proximity to new operational turbines than to planned turbines, which suggests that voters do not acclimatise immediately. As far as we know, however, the literature contains no causal analyses of long-term effects.

[2] It is also worth noting that Danish municipalities have authority over wind power development, whereas the state of Ontario possessed this authority before the 2011 election. This means that there is a selection bias among Danish *municipalities*, but importantly not among *precincts*, which is the unit of analysis both in ours and Stokes' analysis.

[3] Stokes' paper also identify disparate affects across local and national incumbents, but in a context where the national incumbents had no role in affecting the scope or nature of local wind turbine developments. As such, she interprets her findings as the voters' attributing responsibility correctly.

Empirical Context

We study the effect of wind turbine development on the electoral support for local and national incumbents in Denmark. Below, we present some important contextual information on wind power development in Denmark and on how we define local and national incumbents in the Danish context.

Wind Power Development in Denmark

One of the first wind turbines for electricity generation was invented by a Danish physicist, Poul la Cour, in 1891. La Cour's model included several innovations and his apprentice, Johannes Juul, would later design a turbine that was highly advanced for his time. More recently, a series of policies have further stimulated the development of wind power in Denmark. From the 1970s onwards, the government subsidized a large share of the investment costs and enabled tax deductions for income related to onshore wind turbines which were owned by local cooperatives. Individual owners, especially farmers (due to the availability of land), entered the market as the technology became more advanced and cost efficient, and as government subsidies and tax deductions were phased out in the 1990's. Since then the scale of wind power developments have risen, making them too high for most local farmers and cooperatives to bear, and new wind farms therefore tend to have non-local corporate owners. As a reaction to this, the Danish Government established a law in 2009 which obliges project developers to offer at least 20% of the ownership to citizens living within a radius of 4.5 km from turbines.[4] Yet, local citizens can not necessarily afford to purchase shares from wind power projects, and even if they do; 20% ownership does not ensure local control over the

[4] Compensation schemes have to our knowledge not been applied to wind power development projects in Denmark. The law also set new standards regarding distances between turbines and residential housing, as well as the size and noise levels of turbines that are located near residential houses – and new procedures were established for stakeholder involvement.

project. Scholars have attributed increased protest activities concerning wind power in Denmark to this weakening of local ownership (Hvelplund, Østergaard, and Meyer 2017), yet no study has looked systematically at how local communities respond politically to wind turbines (Ladenburg 2008, Ladenburg & Dahlgaard 2012, Gorrono-Albizu et al. 2019).[5]

Defining National and Local Incumbents

We examine whether voters in affected communities punish national and local incumbents. We define national incumbents as the parties who are part of the national government, and local incumbents as the parties who control the mayoralty and chair the environmental and planning committee in the municipality.

We focus on parties which are part of the national governments, because they have executive responsibility over energy policy, and because national governments are typically held responsible for local policy outcomes (Larsen et al. 2019, Kessner & Warshaw 2020). Denmark is a constitutional monarchy, and the national government is therefore nominally appointed by the monarch. However, in reality it is formed based on negations among parties in the national legislature. In the period we study, all governments are based on parties which only have a minority of seats in the legislature, but which are backed by a parliamentary majority. Elections for the legislature needs to happen once every four years, but the prime minister has the ability to call early elections with proportional representation.

At the local level, we single out the mayoral party because the mayor runs the local public administration, and is therefore seen as the main executive in the municipality (Kjær 2015). We also include the chair of the environmental and planning committee as they are responsible for local zoning, and have to authorize all construction in the municipality – including the construction of wind turbines (Naturstyrelsen 2015). The mayor and the chair of

[5] More recently, Denmark has built a lot of offshore wind turbines. We do not analyze these in the article, but discuss the shift towards off shore wind turbines in the conclusion.

the environmental and planning committee are appointed by the city council. If a single party has a majority, then that party usually hold both posts, but when there is no single party majority the two posts are often held by two different parties (e.g., the largest and second-largest party in the ruling coalition). The city council is elected at four-year fixed term elections with proportional representation with each municipality consisting of one multi-member district. The party system in the municipalities typically reflect the party system at the national level.

Time period

In our study we only focus on elections after 2000. There are three reasons for this. First, we have not been able to collect precinct-level election returns at the local level before 2001, which makes the key comparison between the local and national level impossible for this period. Second, as laid out above the nature of wind power developments changed markedly after 2000, and as such it is not clear to what extent it makes sense to estimate an average effect across these disparate contexts. Third, data on our control variables only have limited coverage from before 2000. Even so, for those who might be interest, we analyze the data at the national level before 2000 in Appendix D.

Data and Research Design

To evaluate the electoral ramifications of local wind turbine developments on support for local and national incumbents in Denmark, we built a panel dataset of election returns and local wind turbine developments at the precinct level. This dataset contains very granular local data over a long period of time (2000-2019), which combined with a strong research design, allows us to estimate the causal effect of wind power developments with a great deal of precision.

Denmark had 5,058 operational onshore wind turbines per December 2019 (Energistyrelsen 2021). These were distributed across 706 of the country's 1,379 electoral precincts, called *valgsteder*. The Danish Energy Agency publishes extensive data on these turbines, including their exact location via GPS coordinates and the year of construction. We used the mapping software QGIS to connect each turbine with an electoral district. Subsequently, we used data from Statistics Denmark's Election Database to extract precinct-level voting data for local and national elections in Denmark from 2000 to 2019. Precincts are the lowest level at which voting returns are tabulated in Denmark, with each precinct corresponding to a polling place. Precincts vary in size but have an average of approx. 2,500 eligible voters in each and a median of 2,000 voters. Electoral precincts and their boundaries change over time, but the election database converts election data to fixed geographic units, creating a perfectly balanced precinct-level dataset. To make sure our "control" group of precincts who experience no wind power developments is more comparable to the "treatment" group that experience wind power developments, we omit municipalities which have no wind turbines built across the entire study period. Our final dataset contains 8,932 precinct by election year observations at the national level and 6,096 precinct by election year observations at the local level.

The main independent variable in our analysis is an indicator variable that measures whether one or more wind turbine was constructed in precinct i in the election period preceding election t (WT). Our main dependent variable is changes in incumbent support ($\Delta Support$). At the local level this is change in percent votes cast in a precinct for the mayor's party and for the chair of the planning and environmental committee's party at a local city council election. At the national level, this is percent votes cast for the parties in the national government at a national parliamentary election. We analyse the local and national level separately.

To estimate the effect of wind turbine developments on incumbent support we estimate a series of panel models, as described in this equation

$$\Delta Support_{it} = \theta WT_{it} + \Delta \boldsymbol{X}'\boldsymbol{\beta} + \pi_i + \rho_t + \mu_{ij.}\,. \quad (1)$$

Our main quantity of interest is θ, which represent the effect of a wind turbine development in the preceding election period on changes in incumbent support. In some models, we also include a vector of controls ($\boldsymbol{X}$). These controls are drawn from the Danish national population registries. See Appendix A for a detailed description of these variables.

Given that our outcome is first-differenced, the precinct-fixed effects (π_i) is controlling for long term trend in support for incumbents, and the election period fixed effect (ρ) is controlling for shocks that affect all precincts propensity to support incumbents and construct wind turbines over time (i.e., national economic conditions or the national political environment). As such, our model can be said to be a generalized difference in difference model, which allows for arbitrary linear precinct-specific trends in incumbent support. The key identifying assumption in this model is that deviations from the trend in incumbent support in precincts where wind turbines were constructed, would have followed deviations from the trend in precincts where wind turbines weren't constructed, if no turbines were constructed. We try to probe this identifying assumption below.

Results for Local Incumbents

What is the impact of wind power development on support for local incumbents? Table 1 presents our initial answer by showing estimates from a series of panel models with different sets of controls. Across all specifications, we estimate an effect on wind turbine construction of roughly -3.5, meaning that if one or more wind turbines are constructed during an election period, then the incumbent parties will lose 3.5 percentage points in electoral support at the subsequent election. Notably, this estimate remains the same after controlling for the average age, gender and ethnic composition of the precinct, and after controlling for the economic well-being of the precinct. As such, there is no sign that our findings are driven by local incumbents placing wind turbines in economically declining areas that are less likely to vote for incumbents (e.g., Dahlberg et al. 2021).

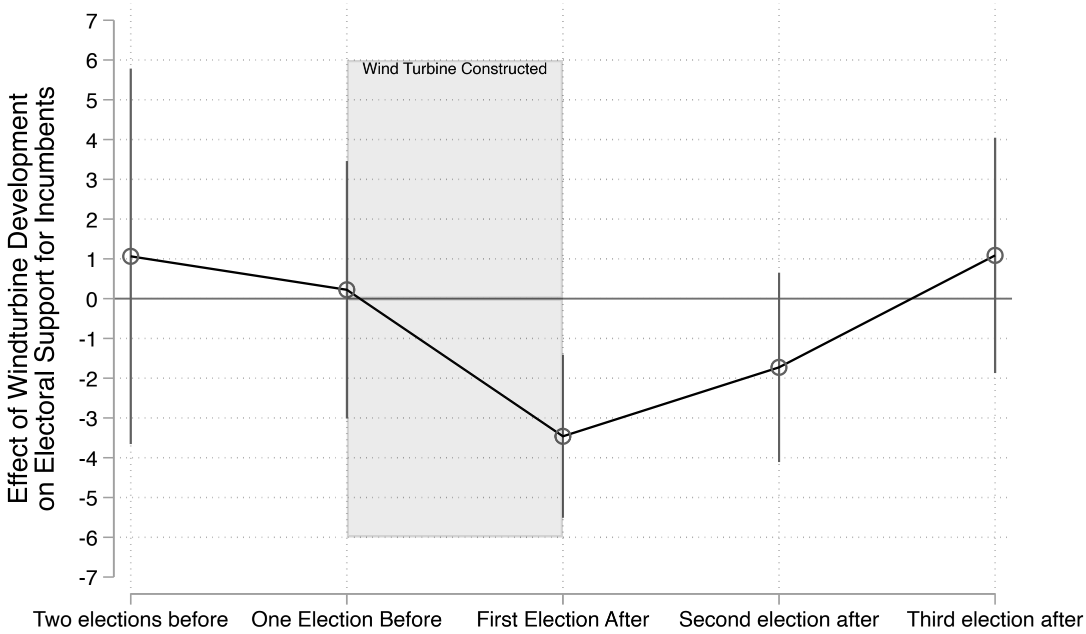
Table 1. Effect of Wind Turbine Development on Change in Support for *Local* Incumbents

	(1)	(2)	(3)
Wind Turbine	-3.52	-3.53	-3.46
	(1.05)	(1.05)	(1.05)
Avg. Age		-0.09	-0.06
		(0.34)	(0.36)
Female (%)		-0.17	-0.01
		(0.34)	(0.27)
Immigrants (%)		-0.60	-0.59
		(0.22)	(0.22)
Log(Population size)		1.02	1.92
		(2.84)	(3.12)
Log(Avg. Income)			-6.85
			(6.51)
Log(Avg. Wealth)			1.62
			(2.09)
Log(Avg. House Prices)			-0.67
			(0.55)
Precint FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
RMSE	11.34	11.34	11.29
Observations	4019	4009	3996

Precinct clustered standard errors in parentheses.

Figure 1 takes advantage of our rich panel data, presenting the effect estimate of the model presented in column 3 of Table 1 as well as the effect estimated when lagging and leading the dependent variable one and two periods. This analysis provides us with several interesting findings. For one, we can see that precincts that experience future wind turbine development are no different than precincts that do not with respect to the trend in local incumbent support. This is reassuring, as the identifying assumption in our model rests on trends in electoral support being parallel in the absence of wind turbine development.

Figure 1. Estimated effect of wind turbine developments on change in support for *local* incumbents before and after turbine is constructed.



As expected, we can also see from Figure 2 that the effect of wind turbine developments on incumbent support is largest in the first election after the wind power development is completed. There is, however, no sign of a strong "reversion to the mean", as voters get used to the wind development. In fact, support for incumbents decreases further two elections after the wind turbine is constructed, but this effect is not statistically significant. This suggests that local incumbents do not readily make up what they lose when constructing wind turbines.

Table 2 examines various heterogeneities and robustness checks. All models use the full set of time varying controls, and is estimated in the same way as the models presented in Table 1. In the first column, we swap our dichotomous independent variable with a continuous version, which records the number of wind turbines built in the precinct in the previous election period. We find a negative, statistically significant effect here of approximately -.5. That is, the average effect of constructing a wind turbine is roughly -.5 percentage points. It makes sense that the effect of a *single* wind turbine is smaller than the effect of *one or more wind turbines*.

Yet it is worth noting that the effect of our dichotomous treatment variable was *seven* times larger than the effect of our continuous measure. The average wind development project includes four turbines, and as such, if the marginal effect of wind turbines was the same as the average effect, we should only expect a four-fold difference. The much larger difference instead suggest that the marginal electoral effect of extra turbines is declining, with the first turbine exacting a larger electoral cost than additional turbines. This might not be that surprising, but it is still notable.

To further substantiate the notion that there is a diminishing marginal effect of wind turbine construction, we estimate the effect of initial wind development projects in column two of Table 2. Here, we create a new dataset, where precincts drop out the period after they are treated with a wind development project, and exclude all precincts which already had a registered wind turbine when our study period began. Analyzing this revised dataset, we find that the effect of the first wind turbine project in a district is 9 percentage points – a three-fold increase from the effect identified in Table 1. In column 3, we analyse the effect of subsequent wind turbine projects. The effect here is -1.6 and not statistically significant.

Taken together, these results clearly show that there is a declining marginal effect of wind turbine projects, so that the first turbine built in a precinct have much larger effects than adding a sixth turbine to a new wind power development in a place that already has turbines installed.

The final two columns of Table 2 redefine our measure of wind power developments. Above we defined a precinct as treated with a wind power development if one or more wind turbines are constructed within the borders of the precinct in the prior election period. Yet the boundaries of polling places are not theoretically meaningful entities, and sometimes a wind turbine built in another district will still be within view and earshot of other districts. This could lead one to worry about the modifiable areal unit problem (MAUP): that the shape and size of the geographical unit studied can affect results from statistical analysis of geographically aggregated data. To address this problem, we reconstruct our treatment variable, counting a precinct as treated if a new turbine is constructed within 3 kilometres of the precinct's polling place. The polling place is where all people in the precinct go to vote, and it is thus located near the population centre of the precinct. We use this new independent variable in Column 4 of Table 2, identifying an effect that is statistically indistinguishable from the one in our main analyses. In light of the MAUP, it is reassuring that this different geographic definition of the treatment does not qualitatively or qualitative change the conclusions. We also try to cast a wider net, defining all precincts within 6 kilometres as treated. Here, the effect remains negative, statistically significant, yet it also somewhat smaller. This makes sense in that we now define roughly twice as many precincts as treated as in our original definition.

Table 2. Robustness Checks for Analysis of Local Elections

	(1) Cont. IV	(2) First turbine in district	(3) Additional turbines	(4) Turbine <3km	(5) Turbine<6km
Wind Turbine	-0.48	-9.23	-1.69	-3.10	-1.81
	(0.20)	(2.91)	(1.49)	(0.88)	(0.57)
Time Varying Controls	Yes	Yes	Yes	Yes	Yes
Precint FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
RMSE	11.30	9.48	12.28	11.28	11.29
Observations	3996	1966	1631	3996	3996

Precinct clustered standard errors in parentheses.

With these aggregate data it can be hard to know whether the change in support for local incumbents is driven by (1) mobilization of new voters, (2) by prior supporters of the incumbent being persuaded to vote for someone else, or (3) by prior voters of the incumbent deciding to abstain. In Appendix C, we show that wind energy development projects have no net effect on turnout, suggesting that if mobilization is driving our results, there needs to be a concurrent mobilization of anti-incumbent voters and demobilization of incumbent voters.

How large is the effect?

Overall, we find that local incumbents are punished for constructing new wind turbines by voters who live close to this turbine. The effects seem long lasting, as the parties apparently do not make up what they lose at subsequent elections. As might be expected, we find that the marginal effect of constructing new turbines is decreasing, and that the effect of building the first turbine in a district is much larger than building an extra turbine. How large are these effects? Stokes (2016) finds that operational turbines decrease support for Ontario incumbents by -10 percentage points. We identify effects which are roughly a third of that size. This difference can be explained by Stokes' examining a set of elections where wind power was high on the political agenda (2016, 962), in a context where wind turbines had just recently become a part of the political and geographic landscape, and in an electoral system that encourages localized mobilization. However, when we examine the effect of the building the first set of wind turbines in a precinct it is -9.5 percentage points. Very close to Stokes' estimate for Ontario. This is striking because of the proportional electoral system, because wind power was not a particularly salient issue in the elections studied here (Elklit et al. 2017), and because one might think that Danish voters had grown used to the prospects of wind turbines in their back yard, having seen them shoot up through the 1980s and 1990s. Instead, Danish voters seem to respond in the same way as those in North America: by punishing local incumbents quite harshly for setting up new wind turbines.

Another way to think about the size of the effects is from the point of view of local politicians considering whether to approve or obstruct a new wind energy project. Here the -3.5 percentage points in a *single* precinct might not seem like a strong electoral disincentive to support the construction of a wind development project. The median city council in Denmark oversees 9 precincts, and therefore they might only risk losing half a percentage point in support. At the same time, elections are often close, and as we saw above the electoral penalty is considerable larger if it is a precinct's first wind development project. Also, the upside for local politicians is less clear, as they are not responsible for providing a sustainable energy mix. That is instead up to the national government, and it is to them our analyses now turn.

Results for National Incumbents

What is the impact of wind power development on support for local incumbents? Table 3 presents estimates of this effect using specifications similar to those used for the local level. As for the local incumbents the effects are negative, however, they are only statistically significant in the model with the full set of controls, and they are much smaller – around -0.2. The implication being that if one or more wind turbines are constructed during an election period in a precinct, then the governing parties will lose -0.2 percentage points in electoral support in that precinct at the subsequent election. The effect is less than one tenth of what we found at the local level.

Figure 3 examines the dynamics of this effect, lagging and leading the dependent variable. This analysis cast doubt on whether the small negative effect is well-identified. As such, wind turbine construction seems to (weakly) predict past differences in support for national incumbents. However, when comparing Figure 3, which analyses the national level, to Figure 2, which analysed the local level, the main thing which stands out is simply that the effect seems much smaller at the national level.

Table 4 runs through various additional analyses of national incumbent support. These mirror the extra analyses we did for the local level, but the overall picture for the national level is murkier. We do find a significant negative effect of the continuous independent variable, but we do not identify marked differences between the first and subsequent wind power development projects, nor do we find differences between defining the treatment precincts as those within 3 or 5 kilometres.

Overall, we find very small or null effects at the national level, suggesting that while voters will punish local incumbents if a wind turbine is set up in their community, they will tend not to punish national incumbents – or at least punish them much less severely. In the next section, we discuss this discrepancy.

Table 3. Effect of Wind Turbine Development on Change in Support for *National* Incumbents

	(1)	(2)	(3)
Wind Turbine	-0.20	-0.13	-0.26
	(0.11)	(0.11)	(0.13)
Avg. Age		-0.03	-0.03
		(0.10)	(0.09)
Female (%)		0.03	0.07
		(0.10)	(0.07)
Immigrants (%)		-0.12	-0.04
		(0.05)	(0.05)
Log(Population size)		4.51	4.66
		(1.80)	(1.43)
Log(Avg. Income)			6.42
			(1.36)
Log(Avg. Wealth)			-4.37
			(0.44)
Log(Avg. House Prices)			0.02
			(0.11)
Precint FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
RMSE	2.83	2.82	2.65
Observations	8932	7606	6323

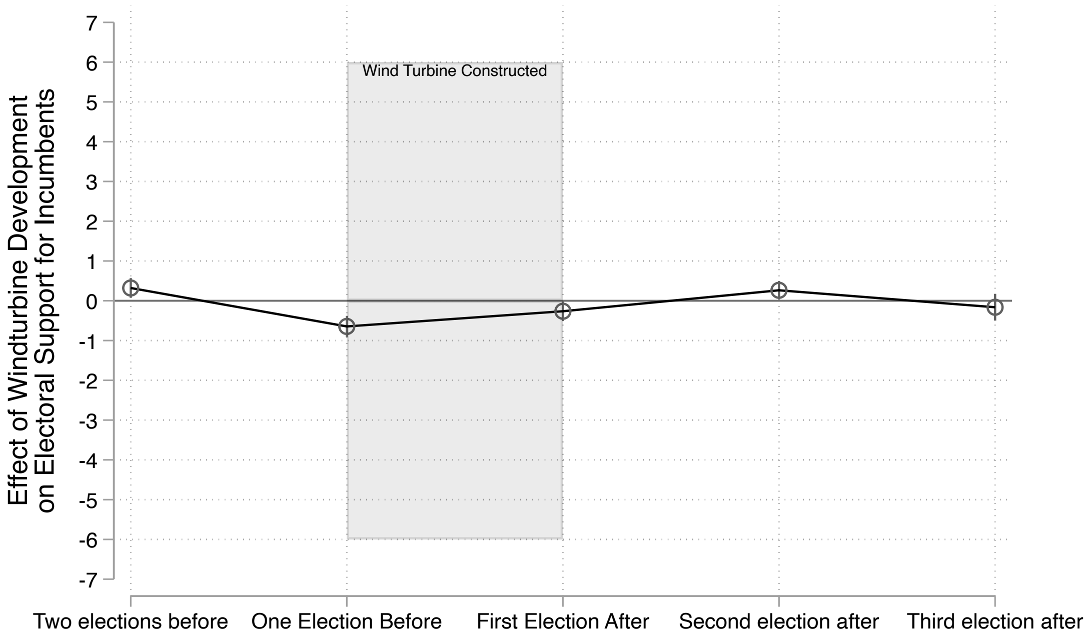
Precinct clustered standard errors in parentheses.

Table 4. Robustness Checks for Analyses of National Elections

	(1)	(2)	(3)	(4)	(5)
	Cont. IV	First turbine in district	Additional turbines	Turbine <3km	Turbine<6km
Wind Turbine	-0.03	-0.43	-0.28	-0.33	-0.44
	(0.02)	(0.35)	(0.22)	(0.12)	(0.10)
Time Varying Controls	Yes	Yes	Yes	Yes	Yes
Precint FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
RMSE	2.65	2.70	2.64	2.65	2.64
Observations	6323	3278	2104	6323	6323

Precinct clustered standard errors in parentheses.

Figure 2. Estimated effect of wind turbine developments on change in support for *natial* incumbents before and after turbine is constructe



Conclusion and Discussion

This article used detailed administrative data on wind power developments and election returns to identify the impact of wind power development on support for local and national incumbents. It found that whereas voters punished local incumbents electorally for construction of new wind turbines, national incumbents were hardly punished at all. This difference in electoral punishment translates into an even larger difference in electoral incentives, because (1) local incumbents re-election chances are much more adversely affected by a single precinct turning against them (2) the political upside of wind turbine development are accrued at the national level.

The implications of our findings for the politics of climate policy are clear: national incumbents should be free to advance ambitious climate policy, whereas these local jurisdictions should try to delay and obstruct national politicians' plans, fearing swift electoral retribution for their voters. Actual policy outcomes will then depend on how authority is shared between the local and the national level. It is beyond the scope of this article, to delineate whether these implications are borne out in reality, but it does seem to describe the dynamics of climate politics in some places (e.g., Mussel and Kuik 2011). The Danish national government, meanwhile, has found a way to sidestep local resistance. As such, over the past 10 years they have decided to pursue *offshore* instead of onshore wind turbines, which are outside the purview of local governments. In fact, the Danish government is currently in the process of building several new "energy islands" off the Danish coasts. We might expect other national governments to take a page out of this book to avoid resistance from local authorities.

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ONLINE APPENDIX

A. Variable Description

Voter behavior: We use precinct-level data from the Danish Election Database for all local elections and parliamentary elections from after 2000. See main text for additional description on how we define and measure support for incumbents. We also construct a measure of precinct-level turnout from this datasource.

Wind Turbines: The Danish Energy Agency publishes extensive data on wind turbines, including their exact location via GPS coordinates and the year of construction. We used the mapping software QGIS to geolocate each turbine in an electoral district. We then construct three different types of variables. The first is an indicator variable of whether a new turbine has been constructed in the prior election period. The second is a continuous measure of the number of new turbines constructed in the prior election period. The third indicates whether a new turbine was constructed in the prior election period within X kilometres of the precinct's polling place.

Remaining zip code controls: The other variables for Denmark is drawn from the Danish population based registries. We have privileged access to these because we are affiliated with an accredited Danish research institutions. This also means that the statistics used here cannot be found in any public database, however the data used for our analysis will be made public upon publication. For more information we refer to Statistics Denmark. Details on how we created the variables below:

- Population size: Number of inhabitants in the precinct (population registry: BEF).
- Female (%): Percent of inhabitants in the precinct who were registered as female at birth (population registry: BEF).

- Immigrants: Percent of inhabitants in the precinct that were not born in Denmark (population registry: BEF).
- Income: Log median income for adults in the precinct (population registry: IND)
- Wealth: Log average wealth for adults in the precinct (population registry: IND)
- House prices: Log average sales price of a privately owned home in the precinct (population registry: EJSA)

B. Descriptive statistics

IN PROGRESS

C. Mobilization Effects

Table C1. Effect of Wind Turbine Developments on Turnout in Local Elections

	(1)	(2)	(3)
Wind Turbine	-0.03	-0.03	0.01
	(0.03)	(0.03)	(0.02)
Avg. Age		0.07	0.03
		(0.07)	(0.06)
Female (%)		-0.06	-0.03
		(0.06)	(0.05)
Immigrants (%)		-0.21	-0.21
		(0.21)	(0.21)
Log(Population size)		1.58	3.90
		(1.58)	(3.87)
Log(Avg. Income)			1.08
			(1.46)
Log(Avg. Wealth)			16.50
			(16.18)
Log(Avg. House Prices)			-0.20
			(0.21)
Precint FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
RMSE	18.63	18.66	18.62
Observations	4658	4648	4635

Precinct clustered standard errors in parentheses.

Table C2. Effect of Wind Turbine Developments on Turnout In National Elections

	(1)	(2)	(3)
Wind Turbine	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)
Avg. Age		0.00	-0.00
		(0.00)	(0.00)
Female (%)		-0.00	-0.00
		(0.00)	(0.00)
Immigrants (%)		0.00	-0.00
		(0.00)	(0.00)
Log(Population size)		-0.02	0.03
		(0.03)	(0.06)
Log(Avg. Income)			-0.00
			(0.03)
Log(Avg. Wealth)			0.01
			(0.02)
Log(Avg. House Prices)			-0.00
			(0.00)

Precint FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
RMSE	0.02	0.02	0.02
Observations	1203	1084	427

Precinct clustered standard errors in parentheses.

D. National level relationship before 2001

Table D1. Effect of Wind Turbine at the National Level

	(1)	(2)
	Studied period (>2000)	Whole Period (>1979)
Wind Turbine	-0.20	-0.31
	(0.11)	(0.09)
Precint FE	Yes	Yes
Year FE	Yes	Yes
RMSE	2.83	2.67
Observations	8932	16588

Precinct clustered standard errors in parentheses.