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# Green parties and their effect on policy

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## **Abstract**

This paper examines the effect of green parties on environmental policy in Norway. Environmental policy is measured through the share of bike roads, number of charging stations for electric vehicles per capita, and environmental score given by an impartial organization for each municipality.

The paper uses a regression discontinuity design on municipal data in Norway to answer the research question. It takes advantage of high-quality political data from the Local Government Dataset (Fiva et al., 2020) and publicly available data from SSB on environmental variables.

The paper also investigates if there exists an incumbency effect on local and national elections from winning a local municipal election for the Green party. It uses the methods presented in Folke (2014) for estimating the threshold for winning a seat. A descriptive analysis is implemented for the outcome variables to extend on their relevance as measurement of environmental quality.

The treatment group is municipalities where the Green party wins exactly one seat in the local council. The control group is the municipalities where the Green party wins no seats when they run for election.

The paper concludes that green parties has no or little significant effect on local environmental policy. I also find no evidence to support the existence of an incumbency effect in future local or national elections for the Green party.

## 1.0 Introduction

### 1.1 Introduction to the topic

Preventing climate change and improving environmental policy was one of the critical topics of discussion in the Norwegian 2021 election. The issue of climate change remains one of the main issues yet to be solved in global politics. The severity of the problem was to some extent highlighted by the UN, who released the first part of their climate report leading up to the election. It stated that governments around the world are not doing enough to reach the goals set by the Paris agreement. The main goal of the Paris-agreement is to limit overheating of the globe to no more than 1,5 degrees Celsius (Leigland, 2021).

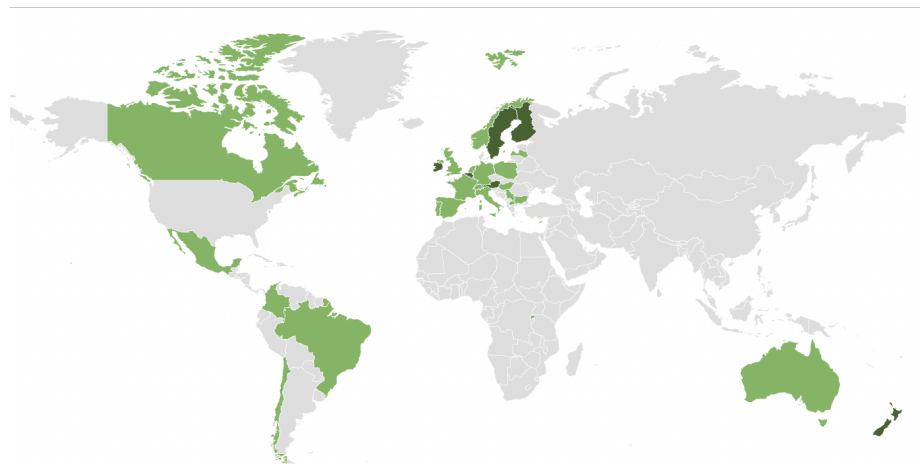
As a result, most political parties in Norway have increased their focus on green policies. Parties that mainly focus on solving environmental issues, for which we use the terminology, Green Parties, have become highly influential in global politics, especially in Europe. They were a part of the social movement in the sixties and were, for the first time, a part of electoral politics, in the early seventies, in Australia and the UK (McBride, 2022).

Green parties increased their vote share in 13 European countries in the most recent elections. They share power in a coalition government in Sweden, Luxembourg, Austria, Belgium, Finland, and Ireland (Nevett, 2021).

The degree of which smaller parties, such as green parties, can succeed depends on the electoral setting. Countries, such as the US, where there is a two-party system, is less suited for these parties. Norwegian and European political settings is generally more suited for small parties to obtain influential positions. This is because the power is fragmented between more parties. Fig. 1 illustrates where green parties have gained political power in recent years.

Environmental issues have become an essential subcategory of economic and political policy. I will examine the effect green political parties has on the implementation of environmental policy, by using a natural experiment in local municipal elections in Norway.

**Fig. 1:** Illustrative map of where green parties has gained political influence.



*Note: Light green are countries where Green parties are represented in national legislature. Dark green are countries where Green parties are part of governing coalitions (McBride, 2022).*

## 1.2 Research question

This paper will analyze how green parties affect environmental policy. The main analysis study the municipal elections in 2015 and 2019. I take advantage of the discontinuity in seat shares by comparing the municipalities where the Green party just got borderline elected to the municipalities where they were borderline defeated.

The research question relies on an extensive set of political data, for which I use an extension of the local government dataset (Fiva et al., 2018). During the last decade, there have been several municipal reforms. In my dataset, I have classified each municipality as it was after the municipal reform of 2020.

For outcome variables, I have created a set of green policies. This includes bicycle roads as a fraction of all streets, charging stations for electric cars, and an overall environmental ranking of municipalities conducted by an impartial ecological organization. I will also investigate if green parties receive an incumbency effect in the national and local election when they gain a seat in the previous municipal election.

My research question can be set up in the following way: The Green party is elected for local government in period  $t$ . How does this affect (1) Environmental policy within the municipality in period  $t+2$ , (2) The parties' success in the upcoming local election in period  $t+2$  And (3) The parties' success in the upcoming national election in period  $t+4$ ?

The first question directly researches the impact of green policy, but the second and third question is a broader discussion of political dynamics. A governing party should ideally be able to affect local policy and use that momentum to succeed in the upcoming elections.

### 1.3 Literature review

A convincing answer to my research question will rely on an extensive set of literature. I have collected a set of previous research articles and sources for historical data. In this part, I will present the most relevant literature and give some brief explanation to articles that will serve as relevant source material. I will use the key findings, theories, and arguments from existing literature to create a hypothesis and provide context for my findings.

*Shades of brown and green: Party effects in proportional election systems* by Folke uses RD to estimate the causal effect of party representation on immigration, environmental, and tax policy using data municipal data in Sweden. The article exploits the fact that seat allocation around the threshold is as good as randomly assigned. It finds that the effect on immigration and environmental policy is large, but that there is no significant effect on taxation (Folke, 2014).

This contradicts the findings of Potrafke and Wutricht. They examined how green governments influence environmental policy after the German state Baden-Wuerttemberg was the first state to gain a prime minister from the Green party. They found no evidence that green governments in Germany were able to reduce CO<sub>2</sub> emissions; in fact, they found evidence that supports a decline in the use of wind power (Potrafke & Wutricht, 2020).

I also note that Petterson-Lidblom looked at the effect of party affiliation on policy in the Swedish government and found that economic policy significantly



varied on where the governing party was on the left or right side of the political spectrum (Pettersen-Lidblom, 2008).

This paper will rely heavily on a recent paper by Fiva and Røhr. They use RD to find the effect of being an incumbent in party list systems. Their analysis finds an incumbency effect for candidates but does not find any significant effect at the party level. This paper will build on their original research design. (Fiva & Røhr, 2018)

*Divided government versus incumbency externality effect; quasi experimental evidence on multiple voting decision* by Ade and Freier answers the following questions: (1) Does the partisan identity of the mayor influence the voter's decision in subsequent town council elections? (2) Do voters condition their vote for the mayor on the result of the last council election?

They find that the party receives a positive incumbency effect, but the candidates that have won strongly in the last election suffers a negative incumbency effect. Their analysis is an empirical approach to test the theory of incumbency effect and divided government. Divided government states that if a sitting government is ideologically to the right, then voters will tend to vote further to the left in the next election to maintain a balanced government over time (Ade & Freier, 2013).

Previous research finds contradicting results. The expected results regarding environmental policy should lean closer towards the findings of Folke (2014). Local data from Norway and Sweden should be comparable and the applied research design have similarities. Since my estimation of incumbency effect at the party level for Green parties extend on the research from Fiva and Røhr (2018), I do not expect to find significant differences.

#### 1.4 Motivation

The main motivation behind this paper is to build on the understanding of the emergence of smaller parties. When voters vote for smaller parties, it is often to help the party proceed the threshold for representation in local or national government. Voters makes a trade-off between voting for an established party

with the possibility of forming a government and voting a smaller party in to representation.

It is of vital importance that there exists research that informs voters of the effect of representation. This paper is designed to help voters understand the effect voting a smaller party in to representation has on implemented policies that they get in return.

Green parties are an excellent tool to understand these effects. They are fighting to achieve representation in most municipalities, and they have a very specific and focused goal in terms of policy. The clear ideology of Green parties makes it possible to measure policy. The outcome variables gathered in this paper are highly related to environmental policy.

The research conducted by Fiva and Røhr (2018) already provides evidence on the incumbency effect parties receive from winning a local election. It is however interesting to examine the dynamics of an emerging green party. A poll conducted by Norstat found that voters living in Oslo were twice as likely to vote for the Green party during a local election, then during a national election (Slettholm, 2021).

One argument used by political commentator Andreas Slettholm is that voters want expansion of bike roads and car restrictions in local politics but consider it too drastic for national government (Slettholm, 2021). The intention of this paper is to see if Green parties are subject to different dynamics than the effects found by Fiva and Røhr, as a possible result of the mechanisms proposed by Slettholm.

## **2.0 Institutional setting**

### [2.1 Local government institutions in Norway](#)

The Norwegian government is divided into three levels of governance. It is divided into the municipal, regional, and national government. Each government sits for four years at a time. The national election is held two years apart from the regional and local election.

There is an ongoing debate in Norwegian politics about how large each municipality and region should be. Political parties, such as the Central party argues that centralization of power to larger and fewer municipal governments are sub-optimal (Senterpartiet, 2020). A view not shared by the previous governments.

This has resulted in several municipal and regional reforms over the last years. In 2017 the government issued a local government reform which was initiated in 2020. The existing 429 municipalities and 19 counties were reduced to 356 municipalities and 11 counties (Hansen, 2021). We can assume that the municipal reform has an impact on the data for this paper, since we use environmental data that is reported on the municipal level.

The number of representatives in each municipal council depends on population. Municipalities with less than 5000 inhabitants must have at least 11 representatives and municipalities with more than 100.000 must have at least 43 representatives. There is no upper threshold on number of representatives. This allows Oslo to have 59 representatives (Hansen, 2019).

One of the benefits of using local electoral settings in Norway for examining political effects is that the local councils have a relatively large autonomy within their municipality. They decide for themselves which tasks the municipality is responsible for, as long as it is not lawfully under the jurisdiction of another governmental authority. The national government have in practice given the municipality responsibility of welfare issues, such as primary education, elderly care, healthcare, and social services. They also have economic autonomy to set their own budgets and local tax rates (Hansen, 2019).

The local government have substantial authority for environmental policy as well. The regional and local municipalities share responsibility for providing public transport, bicycle- and walking roads. A report from OECD claims Norwegian municipalities have been granted larger autonomy of environmental governance and area planning during the last ten years (Aarønøs, 2022).

Primary source of revenue for the municipalities are the income tax, which make up approximately 45% of the total revenue stream. The national government decides an upper and lower bound for possible tax rates. Fiva et al. (2018) found that all municipalities charged a tax rate equal to the upper bound.

The local governments are structured through either the chairmanship model (formannskapsmodellen) or parliamentarism. The chairmanship model is the most used. The chairmanship model lets the number of representatives a party has in different councils and committees reflect the vote share they obtained in the previous election. The chairmanship is the second highest order of government and are responsible for an economic plan, budgeting, and proposing tax alterations. They then present their plans to the local government for debate and final decisions.

Oslo and Bergen are the only two municipalities which uses parliamentarism. The coalition who obtains the majority of representatives in the local government create a city council, which serves the same function as the chairmanship. A parliamentary approach is often used to reduce fragmentation of power in local government and makes it easier for parties in power to implement policy (Hansen, 2019).

## 2.2 Seat allocation

Representatives are chosen through a party-list system with limited opportunity to change the list in favor of specific candidates. Allocation of mandates is done through a modified St. Lague's method of largest remainder. The method divides the received votes of the party that wins a seat by 1, then the next winning party by 3, then 5 and so on. Norway uses a modified version of this model where the first winning party divides by 1,4 instead of 1. Thereby increasing the threshold for smaller parties to gain representation (Berg, 2022).

## 2.3 The Green party

The Green party is the only significant party in Norwegian politics whose primary focus is improving environmental policy. It can be problematic to confidently position the Green party on the political spectrum, but it would be reasonable to assume they are a bit left of the center. The party itself consider them self as

neutral from left or right-side coalitions, but surveys suggests that their voters are more positive to left side coalitions (Barstad, 2017).

It was established in 1988 as the Norwegian equivalent of Die Grunen in Germany. They are a member of European Greens and Global Greens, which are international federations for environmental-oriented parties.

The local election of 2011 was an important milestone year for the party. It was the first election where they accomplished a vote share above 1% and managed to win seats in Norway's two largest cities, Oslo, and Bergen. The upcoming national election of 2013 was another milestone for the party when they got their first representative in national parliament. The party truly started to gain traction in 2015 by winning a seat for over 200 representatives in 165 municipalities. In the most recent election of 2021, the party received a vote share of 3,9% and is today considered a mainstream party in Norwegian politics (Miljøpartiet De Grønne, 2022).

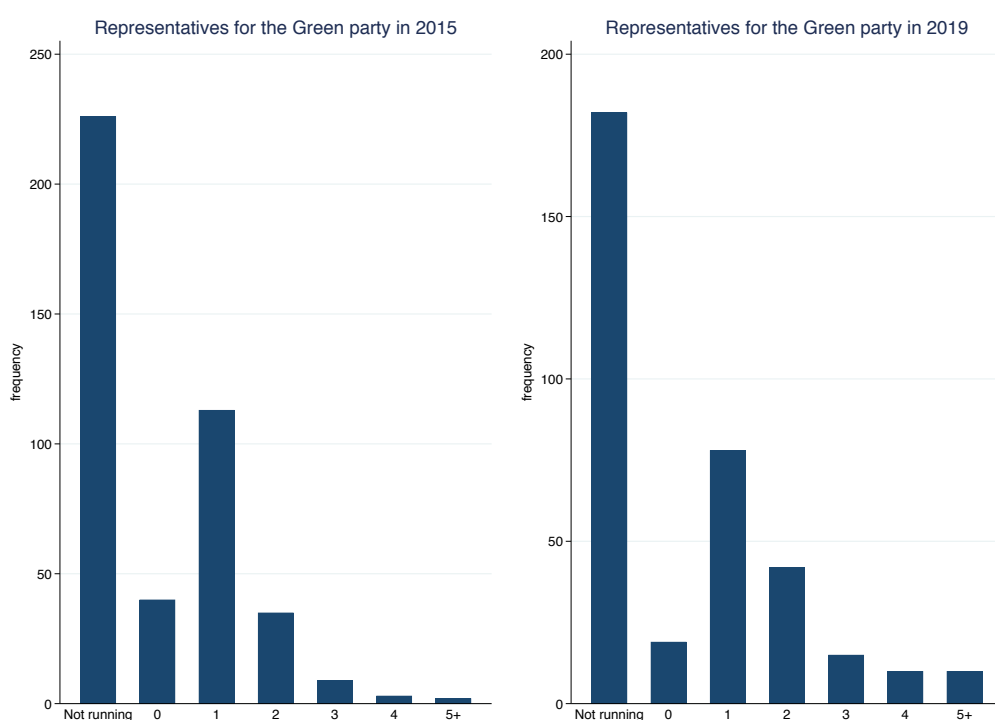
Most of the points listed in the Greens party program are related to improving environmental policy. Their agenda includes:

- Maintaining Norway's obligations to the Paris agreement.
- Reducing the pressure on agriculture areas and nature.
- Abolishing the petroleum industry by shifting over to green sustainable energy.
- Decreasing the pollution caused by transportation. They want to make it easier for people to choose alternative transportation, such as public transportation and bicycles as an alternative to cars. They also want to make people buy electric cars by implementing economic incentives and increasing the electric infrastructure in terms of accessibility to electric chargers.
- Decreasing the income gap by increasing taxes for the wealthy and introducing tax cuts for those with low and average wages (Miljøpartiet De Grønne, 2021).

The focus of this paper will be on environmental policy even though the party also has issues on their political agenda that is not directly linked to environmental policy. Environmental policy is a key foundation of the Greens political agenda and is a red line through their entire party program. A precise measurement of environmental policy will therefor serve as a solid measurement of the parties' political agenda.

Most other parties in Norwegian politics have a much more varied focus, which means it would require a much more extensive analysis to be able to measure policy that represent their political agenda. Bicycle roads, electric chargers and environmental ranking should serve as solid measurements of green policies.

**Fig. 2:** Frequency of Green representatives.



*Note: Frequency charts of received representatives for the Green party in local council during the 2015 and 2019 election. All municipalities are included in the sample. 356 observations are included for 2019 election and 428 observations are included in the 2015 election. 5+ is the number of parties that received 5 or more representatives and “Not running” are municipalities where the Green party did not run for election.*

Fig. 2 presents the frequency of green representatives in the 2015 and 2019 local election. The panel on the left is for 2015 and the panel on the right is for 2019. I find that the party does not run for election in over half of the municipalities in the sample period. These observations are disregarded in the primary analysis.

Differences between the two bar charts illustrates that the Green party grew significantly in size. The 2019 election has fewer examples of non-running municipalities and more examples of the party winning more than one seat.



#### 2.4 Debate on environmental policy

Norway is under obligation to the Paris agreement. Within 2030, the government wants to reduce the level of gas emissions by 50-55% compared 1990 (Regjeringen, 2021). Their most significant contribution to climate change is the oil and gas industry. The Green party wants, as previously mentioned, to abolish this industry and rely entirely on clean energy sources.

Most parties in the middle of the political spectrum, such as the conservatives and the labor party, want to evolve the oil-industry in a greener direction, instead of ending it. The most climate skeptical party is the progress party. It is on the right side of Norwegian politics and want Norway to open for more search of oil and gas (Fremskrittspartiet, 2021).

Previous governments have implemented incentives to encourage people to buy electric cars by removing VAT, reducing toll prices, and allowing electric vehicles to drive in the public transport lane. During the last government, there has been an increase in the number of toll stations to put the cost of road maintenance on car users instead of the general taxation.

**Fig. 3:** Ranking of each political party

 Rødt	 SV	 Ap	 Sp	 MDG	 Krf	 V	 H	 Frp
✓	✓	○	✗	✓	○	✓	✗	✗

*Note: Ranking of each political party's environmental policy. Red parties: 0-4 points. Yellow parties: 4-8 points. Green parties: 8-10 points (Christensen, 2021).*

*Fig. 3* is collected from the Norwegian society for the conservation of nature. In a survey conducted in 2021, they asked every significant party about their environmental policy and thereby ranked them into three separate categories. The Green, Red, Socialist Left, and Liberal party are all ranked in the green category. These are also the parties considered as the left side of Norwegian politics.

The questions asked in the survey are separated in four different categories. Climate- and oil politics, loss of biodiversity, juridical protection of nature, and environmentally friendly infrastructure. Questions regarding the first two categories are weighted heavier in the final score.

The survey concludes that the primary differences between the parties are issues regarding transportation and the petroleum industry (Christensen, 2021). Key variables in our analysis regards transportation. Validity of our analysis requires that the political parties have different opinions regarding the outcome variables.

### **3.0 Methodology**

#### **3.1 Data collection**

The primary dataset for gathering information on previous elections is the already existing local government dataset (Fiva et al., 2020). The dataset includes information on the election results of each significant party, government spending on subcategories such as education, transportation, culture, and demographic details of the population, such as age and gender.

The Green party is joined into a cluster of small parties, labeled “Other”, in the dataset before 2019. I have therefore merged data on the Green party from the Norwegian center for research data (Norsk Senter for Forskningsdata, 2022).

My primary analysis will focus on the 2015 and 2019 elections for two reasons; The Green party had too few seats before 2015 to create a large sample, and available data on environmental policies before 2015 are deficient.



### 3.2 Presenting the model

Municipalities, where the Green party has been able to gain a seat are the treatment group, while municipalities where they ran for election without winning any seats are the control group. The election periods used in the analysis will vary on the outcome variables. Estimated baseline results will rely on the following linear regression:

**Equation 1:** Local linear regression model

$$Y_{it} = D_{it} + \delta_1 V_{it} + \delta_2 D_{it} V_{it} + \epsilon_{it}$$

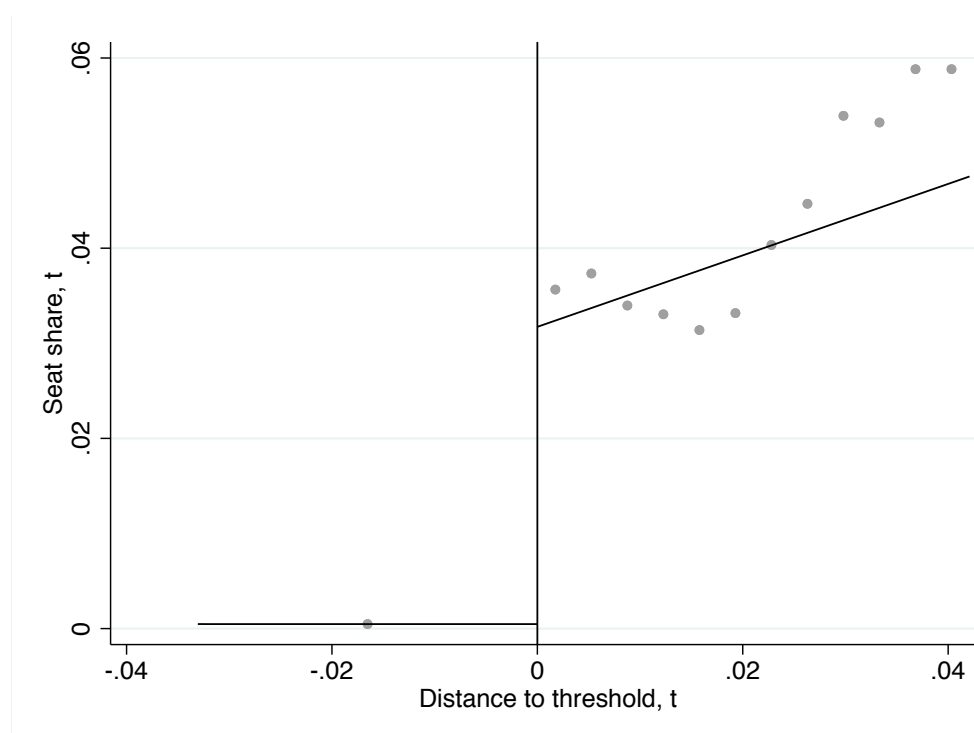
$Y$  is the dependent variable, representing environmental policy of municipal  $i$  at time  $t$ .  $D_{it}$  is a dummy variable equal to one in municipalities where the Green party earns a seat in the local council and zero when they run for election and get no seats.  $V_{it}$  is the distance to the threshold of winning a seat in the local government.  $\epsilon$  is the error term representing what the model is not able to capture. I will rely on the RD design constructed by Calonico et al. (2017) for the estimation.

The baseline specification of the model is a local linear control function. The forcing variable is the distance to threshold in election at time  $t$ , and the standard errors are clustered at the municipal level. The distance to threshold variable  $V_{it}$  will be interchangeably referred to as the distance to threshold variable and the forcing variable throughout the paper.

### 3.3 Reduced form

Our analysis takes advantage of the discontinuity in shares of seats in the local council. Precise estimation of the distance to threshold variable allows us to see how far a party is from gaining a seat. When a party crosses the threshold, they obtain four percent of the seats on average. The seat share increases relatively linearly the further a party crosses the threshold. We therefore know that the party's influence in the council increases with the forcing variable as it surpasses the discontinuity. 0.04 equals 1/25. We can therefore assume that the average number of representatives in local councils are 25.

**Fig. 4:** Local seat share discontinuity around the cut-off.



*Note: RD-plot. The y-axis is the seat share in local council for the Green party at time  $t$ . The x-axis is the distance to threshold variable at time  $t$ . The vertical line represents the zero win margin for the Green party. Full bandwidth is applied. Estimation includes 298 observations. The 2011, 2015 and 2019 election is included in the sample..*

The reduced form in Fig. 4 presents the effect of the forcing variable on seat share for the Green party. When we perform the regression in equation 1, we use the forcing variable to define the discontinuity in our regression discontinuity design. It is the jump around the cut-off that allows represented parties to influence policy.

### 3.4 Validity of regression discontinuity design

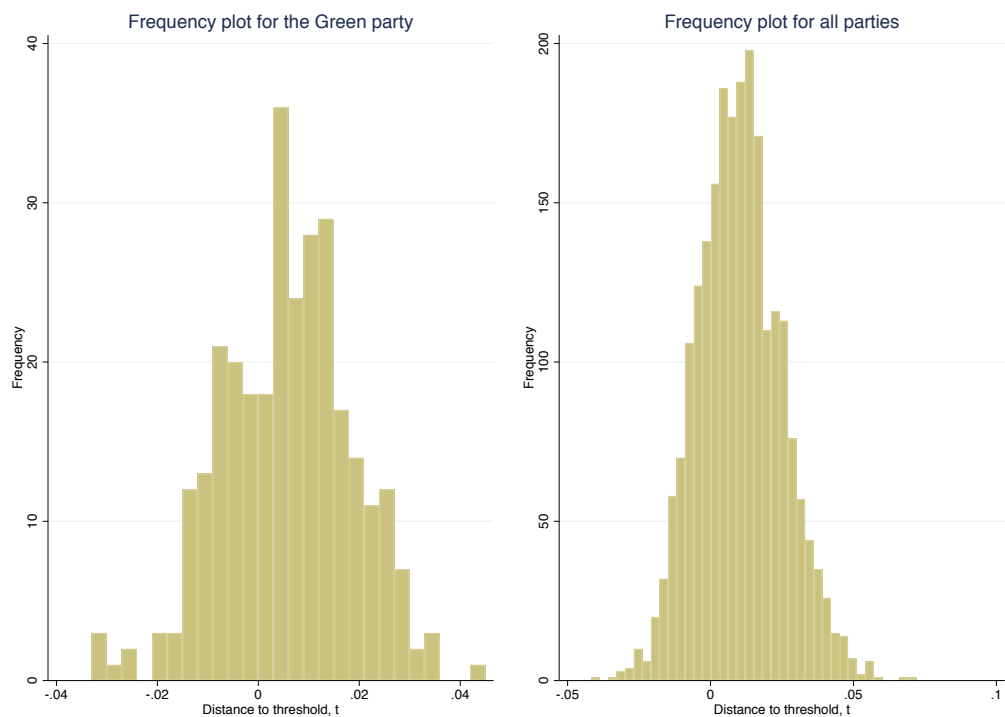
A common problem that could arise when estimating political effects through linear regression is the identification problem. Party representation could be correlated with the error term because voters' preferences could directly affect policy. Voters in left-leaning municipalities will, for example, give a more significant vote-share to parties on the left side of the political-ideological

spectrum. We solve this by using RD, because only comparing those sufficiently close to the threshold of gaining a seat can be characterized as randomly assigned. Thus, removing the bias (Folke. 2014).

RD is only applicable for unbiased results if individuals are unable to precisely manipulate the forcing variable. Precisely being a key word. Even though individuals have a limited influence on placing the forcing variable near the threshold, the forcing variable will be as good as randomly assigned as long as individuals are unable to precisely place the continuous forcing variable on the treatment or non-treatment side of the threshold (Lee & Lemieux, 2010).

The RD approach is widely used in political science. Evidence from 40.000 close electoral races implies that the validity requirements of regression discontinuity are likely to be met in a wide variety of electoral settings (Eggers et al., 2014). The analysis will use a sharp regression discontinuity design as it examines observations on the left and right side of winning exactly one seat. The probability of getting assigned treatment goes from zero to one when crossing the cut-off.

**Fig. 5:** Frequency chart of the distance to threshold variable



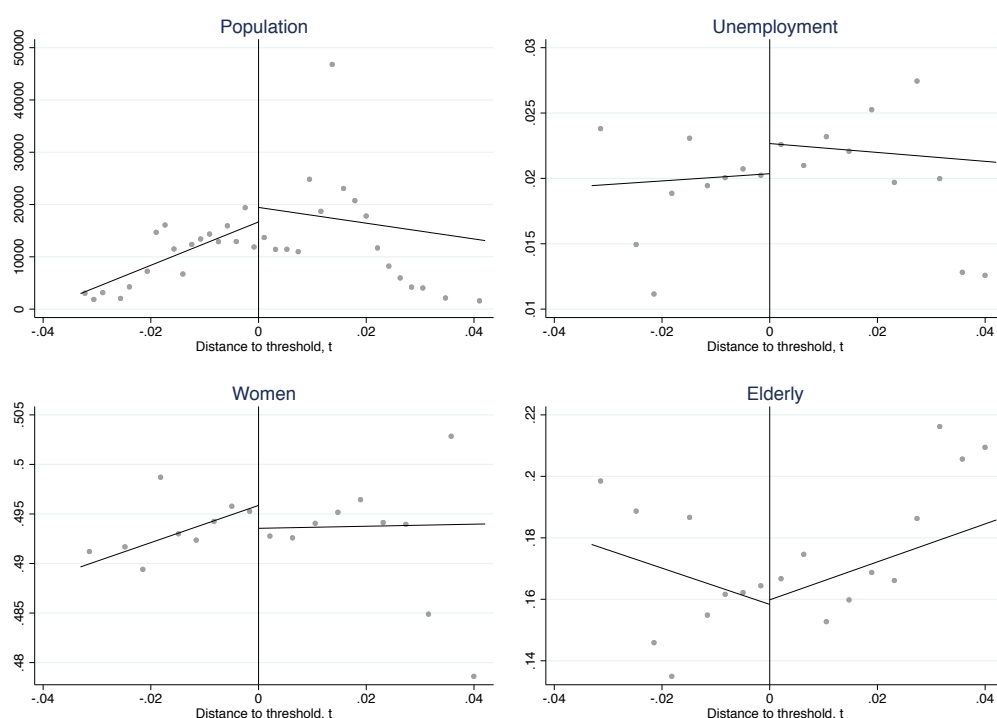
*Note: Frequency chart of the forcing variable. Showing how far each observation is from the threshold of winning a seat. The panel on the left illustrates observations for all parties (N = 2273). The panel on the right illustrates observations for the Green party (N=298). The 2011, 2015 and 2019 election is included in the sample.*

Fig. 5 presents a histogram of how far each observation is from the threshold in all municipalities. The panel on the left is for all parties and uses 2273 observations. The panel on the right is for the Green party only and uses 298 observations. The observations on the left side of the cut-off got no seats, and the observations on the right side of the cut-off got precisely one seat. The sample is the 2011, 2015 and 2019 election, as these are the relevant elections for our analysis.

The histogram does not present any significant bunching around the cut-off. Implying that political parties are not able to precisely manipulate the forcing variable. This provides support for the validity of our RD design. Eggers et al. (2014) and Fiva et al. (2018) argues that there are no convincing reasons to believe that there exist systematic differences between close winners and losers in either large- og small-scale electoral settings.

The forcing variable has a mean of 0.01, minimum value of -0.04 and maximum value of 0.07 for all running parties. For the Green party, the forcing variable has a mean of 0.005, minimum value of -0.033 and maximum value of 0.042.

**Fig. 6:** RD-plots of predetermined covariates



*Note: RD plot of covariates. Full bandwidth is applied. The 2011, 2015 and 2019 election are included in the sample. Only used municipalities where the Green party ran for election. Outcome variables are population ( $N=298$ ), share of women ( $N = 221$ ), share of elderly ( $N = 221$ ), and unemployment rate in the municipality ( $N = 221$ ). The vertical line is the point of a zero win margin for the Green party. The data is collected from the Local Government Dataset (Fiva et al., 2019)*

Fig. 6 presents regression discontinuity plots of covariates. Since our model requires that parties are unable to precisely manipulate the forcing variable, it follows that there should not be any systematic differences in predetermined variables around the cut-off. It is therefore unnecessary to include covariates in the model presented in equation 1 to control for municipal characteristics. We can instead use predetermined characteristics to evaluate the validity of our analysis (Fiva & Røhr, 2018).

The categorical variables included in Fig. 6 is the population of inhabitants, share of women, share of inhabitants above the age of 66, and the unemployment rate in

the municipality. There are no significant differences around the cut-off for share of elderly or women. There is a relatively small effect of a jump at 3 percentage points for unemployment rate and an increase in approximately 3.000 inhabitants for population. It doesn't appear to be any systematic differences around the cut-off. Large differences in population could have meant that our model was sensitive to population effects.

### 3.6 Descriptive analysis of outcome variables

Precisely measuring environmental policy can be challenging, especially finding variables that is sensible to assume that the local government can have an actual impact on. We also want the variables to have a degree of variability in them. Both in the sense of changing over time, and by varying across municipalities.

A logical choice for an outcome variable for this topic could, for example, have been the level of a carbon tax for corporations. It is, however, decided by the national government. I will instead use the same methodology as in Folke (2014), by applying an environmental ranking to my regression discontinuity design.

The ranking is conducted by the organization Sabima. It is an ecological umbrella organization for the biological organizations in Norway. They rank each municipality based on their government's ability to preserve nature and biodiversity within the municipality. In the Greens party program, it says that they want to protect 30% of Norway's total area from harmful interventions of nature, which complies with the international recommended level. The received score depends on how well the municipality score on 13 different criteria.

Among the requirements is the amount of investment in environmental competence, regulation of nature, permissions given to urbanization, and if the local government has a forward-thinking plan to protect biodiversity. It also factors in gross operating expenditure used per capita on nature and outdoor activities. Each municipality gets a score for protection of nature, investment in nature, and a total ranking that combines both scores (Sabima, 2021). These variables are labeled Protection of nature, Investment in nature, and Total score in this paper.

Investment in nature score is measured by the municipality's investment in environmental competence, their willingness to gather knowledge, and if they have goals for protection of nature. Protection of nature score is measured through dispensations given by the municipality to build cottages, build down natural areas, and how much of natural areas that is protected through conservation.

The Green party also states in their party program that they want to reposition road areas to be used as bicycle roads. They propose to award municipalities with an active climate and environmental policy with governmental aid, to help finance the expansion of bicycle-oriented infrastructure (Miljøpartiet De Grønne, 2021). I have therefore gathered data on bicycle roads as a fraction of the main roads in each municipality. Using bicycle roads as a fraction of all roads should normalize the observations across population differences.

There is a significant growth in the market for electric cars in Norway. 65% of all new vehicles in 2021 were solely run on an electric engine, and sixteen percent of all vehicles are electric (Statistisk sentralbyrå, 2022). Improving the infrastructure for electric vehicles is considered a vital necessity if Norway will reduce its climate emissions by 50% within 2030.

Much of this responsibility lies in the municipal government. They must create strategies and adapt their regional planning to secure an evolving electric infrastructure. The growth of electric cars decides the demand for charging stations, and it is the local government's responsibility that the municipality can keep up with the demand. (Kommunal- og distrikts departementet, 2021). I have therefore collected number of charging stations in each municipality for my dataset. The data on the ratio of bicycle roads and number of electric chargers in each municipality are retrieved from the Norwegian statistics bureau (Statistisk sentralbyrå, 2022).

### 3.5 Empirical strategy

The first part of the empirical analysis is to calculate the forcing variable. In a PR-system, the number of seats a party wins are affected by the vote share of all other parties. Making it essentially impossible for a party to know where the seat

threshold will be (Fiva et al., 2018). I use the same research method as in Fiva & Røhr (2018) to calculate the win margin for each observation.

The baseline estimation consists of a linear control function using the model presented in equation 1. I will firstly estimate the effect on infrastructure, by providing an analytical and graphical RD-analysis of the effect on electric chargers, bike roads and environmental ranking. The choice of bandwidth is a tradeoff between precision and bias. Since our sample is quite small, I use a full bandwidth to maximize statical precision

All municipalities where the green party ran for office and got either one or zero representatives in the local council are included in the analysis. This is dependent on the existence of an outcome variable linked to the observation since the dataset has missing values.

A disadvantage facing the empirical analysis is the lack of extensive historical data. The green party is a relatively young and environmental data from publicly available sources going back further than 2015 is scarce. I therefore focus on the 2015 and 2019 election when estimating the effect on policy.

Ratio of bicycle roads and electric infrastructure has the benefit of varying over time and being reasonably correlated with actions of the local government. The environmental score lacks a time varying effect, as it only covers one specific year. It is however an impartial ranking conducted by biologists and serves as a good measurement of environmental quality.

The treatment effect estimated by a regression discontinuity design can often be sensitive to the choice of polynomial order (Pei et al., 2021). I will therefore estimate the effect on policy with both a linear and quadratic specification. I also use the optimal mean squared error bandwidth as in Calonico et al. (2017) to test the model with different bandwidths and evaluate the impact it has on my results.

Next part of the empirical analysis is to expand on the definition of green parties. I will utilize the previously mentioned survey by the Norwegian society for the conservation of nature to categorize parties into a green category. I will use the



same methodology and outcome variables as in the previous analysis, but I will also include data on SV, R and V. Allowing for more data in the analysis will increase the expected precision.

As the effect on policy is estimated, the next step is to estimate the incumbency effect on local and national elections. Fiva and Røhr (2018) examined the incumbency effect in electoral settings on party level in local elections for all political parties. I will expand on this research by examining the effect of winning a seat in the local election on the seat share in the next local election, their decision to run in the next election and vote share in the next national election. In my analysis I will only focus on the Green party.

### 3.8 Summary of key variables and data

Table 1.1 presents key characteristics on the outcome variables. The number of observations for each variable is primarily decided by the elections that are utilized in the analysis. The number of observations varies for two reasons. The elections used in the analysis are specified to connect with the outcome variables. There is for example not possible to look at seat share in the next municipal election from the 2019 election, since this research is conducted in 2022 and the next local election is in 2023. I have therefore added observation from the 2011 election to improve the sample size. The second reason for variation in number of observations are missing values of the outcome variables.

**Table 1:** Summary statistics of outcome variables in the analysis.

<b>Outcome</b>	<b>Obs.</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
National vote share, t+2	783	0.020	0.011	0	0.113
Local seat share, t+4	857	0.022	0.031	0	0.263
Running next, t+4	856	0.517	0.500	0	1
Total score, t+2	356	0.379	0.101	0.110	0.892
Protection of nature, t+2	356	0.516	0.173	0.07	0.892
Investing in nature, t+2	350	0.247	0.145	0.02	0.78

Electric chargers t+2	665	46.990	162.858	1	3254
Bicycle roads t+2	735	15.384	16.660	0	100

*Note:  $t+x$  is  $x$  years after the local election. Protection of nature, Investing in nature, and Total score uses municipalities in the 2019 election. National vote share, Electric chargers and Bicycle roads uses municipalities from the 2015 and 2019 election. Running next and Local seat share uses municipalities from the 2011 and 2015 election. All municipalities are included in the sample.*

## 4.0 Results

This section will provide empirical evidence to answer the research question. What is the effect of the Green party in local government on environmental policy and future elections?

The most interesting example of municipalities where the Green party has been able to influence policy is Oslo. They have among other initiatives, been a significant contributor of implementing a carless city center. Since 2016, they have removed 760 parking spots, to reduce traffic (Oslo Kommune, 2022). Election researcher Bernt Aardal claims Oslo has been a showcase municipality for the Green party. They have gained influence and received significant attention for their climate and environmental actions (Iversen & Kristiansen, 2021).

I will use the following analysis to examine if the results in Oslo is a general outcome when the Green party achieves representation in local government.

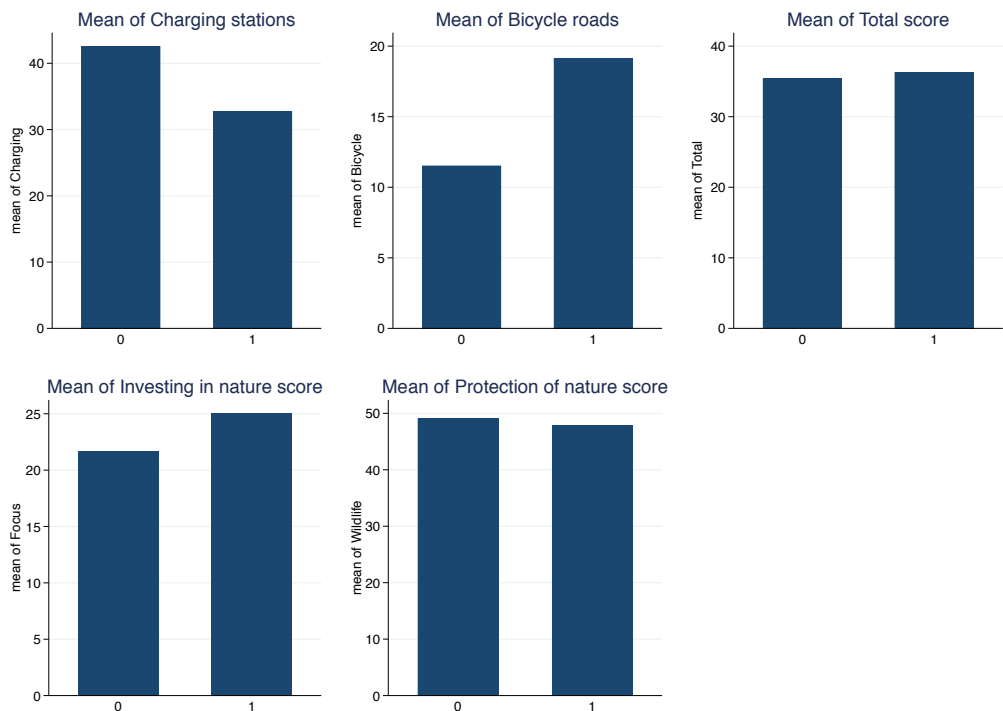
### 4.1.0 Effect on policy

I will now present the main evidence to support my findings for the first question. What is the effect Green parties have on environmental policy? Environmental policy is measured by the outcome variables presented in section 3.4.

Fig. 9 presents the differences in mean on elected and non-elected municipalities in period  $t+2$ . The mean for Protection of nature score and Total score is insignificantly different between the control group and treatment group. We do

however find that there is on average 10 more charging stations per 1000 capita in the control group. The ratio of bicycle roads and the Investment in nature score is respectively 7 and 3 percentage points larger in the treatment group. The difference in charging stations is the most surprising as it is the largest difference and favors the control group. I do note that Charging stations is arguably the variable that is most vulnerable to population effects.

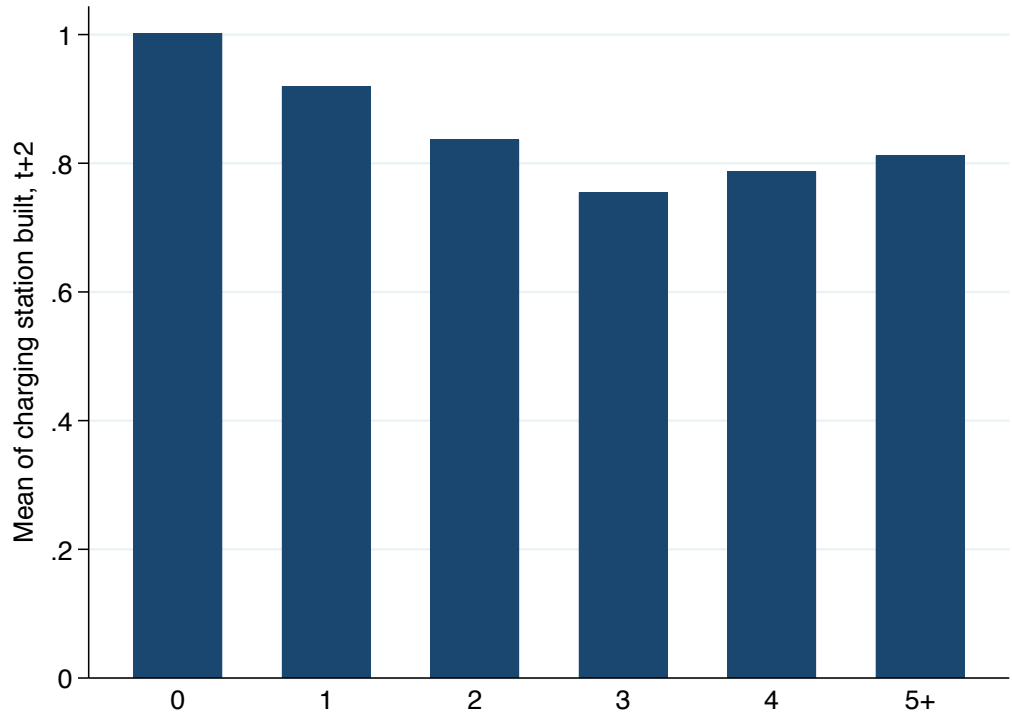
**Fig. 9:** Bar chart of policy outcome variables



*Note: Mean of outcome variables at time t+2. Left bar is the mean of an outcome variable in the control group. Right bar is the mean of an outcome variable in the treatment group. Charging stations is normalized to per 10.000 capita. All other variables are in percentages. The sample includes the 2015 and 2019 election.*

Fig. 10 presents the relationship between charging stations built and green representatives in local government. The results are comparable to the findings in Fig. 9. Untreated municipalities have built the most charging stations per capita in the two years following the local election. It naturally follows that these municipalities also will be the ones with the most charging stations at time t+2.

**Fig. 10:** Number of charging stations built in t+2 per 1000 capita.



*Note: X-axis is the number of representatives won by the Green party. Y-axis is the mean of charging stations built during the two years after local election. Number of charging stations built are normalized to per 1000 capita. 5+ are municipalities where the Green party won 5 or more seats. 351 observations are included in the sample.*

#### 4.1.1 Main analysis

I use, as previously mentioned, a regression discontinuity design to address my research question. Fig. 11 shows a graphical presentation of the treatment effect around the cut-off. The untreated municipalities are on the left-hand side of the cut-off and treated municipalities are on the right-hand side of the cut-off. The coefficient measures the causal effect on the treatment group.

The baseline specification of the model is a local linear control function. In addition to this, I also test for a second order polynomial. The forcing variable is the distance to threshold in election at time  $t$  and I use robust standard errors.

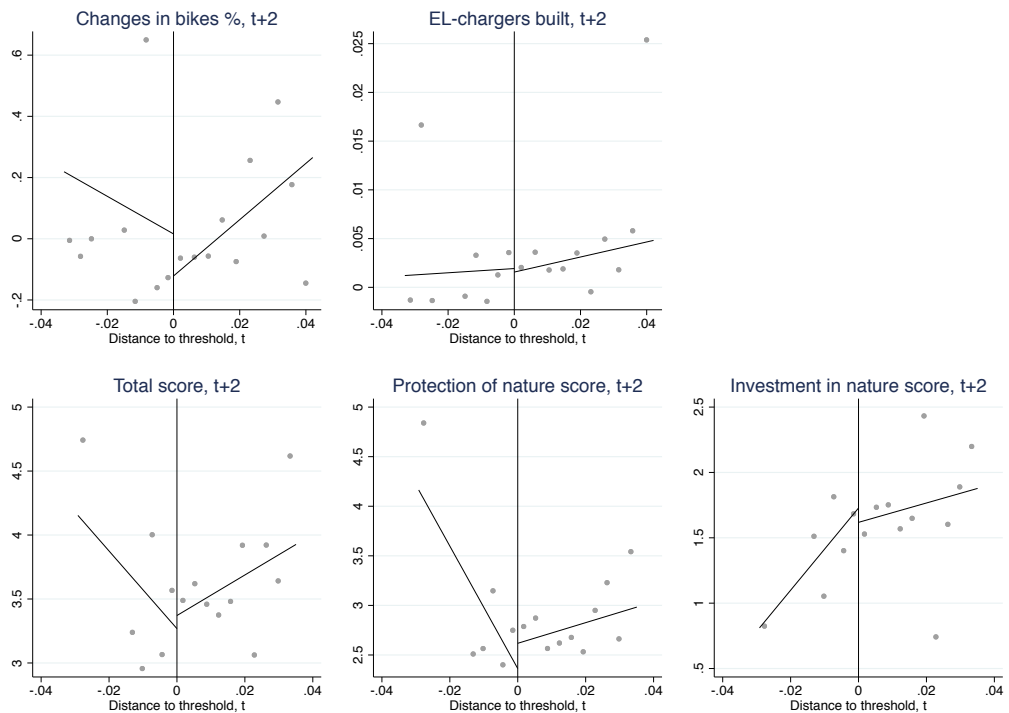
The following results is estimated through the `rdr` software developed by Calonico et al. (2017). The null hypothesis is that the Green party does not influence environmental policy.

Each observation is standardized by being divided by the standard deviation of all observations. The growth of electric charging stations will depend heavily on population, I have therefore normalized it to charging stations per 1000 capita. Changes in charging stations and bike roads are calculated by subtracting the observations at time  $t+2$  with the observations at time  $t$ . Using a two-year gap allow me to use observations from the 2019 election and at the same time give the local government time to influence policy.

The sample consists of 54 municipalities in the control group and 174 municipalities in the treatment group for the effect on charging stations. It is 53 municipalities in the control group and 171 in the treatment group for the effect on bike roads. The differences are due to missing observations in the outcome variables. For the analysis on the three variables measuring environmental score, there is 19 observations in the control group and 78 observations in the treatment group. This analysis has fewer observations because they only look at the 2019 local election.

Fig. 11 provides five key plots of the primary analysis. The panel in the top left corner presents the effect on bike roads and finds a negative effect with a coefficient of -0.13. The top panel on the right presents a non-existing effect on electric charging stations. The lower left panel presents the effect on the overall environmental score. It has a positive effect with a coefficient of 0.1. The middle lower panel looks at the effect on protection of nature score, which has a positive coefficient of 0.25. The last panel on the lower right corner examines the effect on Investment in nature. It finds a negative effect of -0.11. All effects are insignificant at the 10% level and we cannot reject the null hypothesis. The analysis is presented numerically in the appendix, *table 1.A*.

**Fig. 11:** Graphical presentation of RD-analysis



*Note: RD-plot. Effect of winning a seat on charging stations. I use a first order polynomial. Bandwidth of 1 for all eligible observations. Effect of winning a seat on received environmental score. Each score is given by the organization Sabima. Description of outcome variables are provided in section 3.6. First order polynomial is applied. Full bandwidth for all eligible observations.*

Interpretation of the analysis requires an understanding of the standardization that is applied. All effects are expressed as deviation from the mean in standard deviation units. The largest effect is in the protection of nature score.

Municipalities in the treatment group has a protection of nature score that is approximately one quarter of the standard deviation larger than the control group. We consider this an insignificant effect. All effects are well within the range of 1 standard deviation unit.

*Table 1.A* in the appendix presents the effect with both a first and second order polynomial. Selection of polynomials has no effect on the conclusion for this analysis. The effects remain small and insignificant between both models, but I do

note that the effect on green infrastructure variables changes from a negative to positive effect, when changing from a first order to second order polynomial.

**Table 2:** Regression discontinuity analysis of the Green party

Local linear specification (1)					
	Charging	Bicycle	Total score	Investment in nature	Protection of nature
RD estimate	0.114 (0.331)	-0.358 (0.27)	-0.244 (1.326)	-1.456** (0.688)	0.478 (1.257)
Bandwidth	0.006	0.004	0.005	0.004	0.006
Local quadratic specification (1)					
	Charging	Bicycle	Total score	Investment in nature	Protection of nature
RD estimate	-0.078 (0.359)	-0.394 (0.411)	0.180 (2.754)	-2.278** (0.831)	2.315 (3.073)
Bandwidth	0.012	0.006	0.006	0.006	0.005

*Note: (1) Estimated effect of the Green party. Robust standard errors are in parenthesis. Description of outcome variables are provided in section 3.6. Uses the mean squared optimal bandwidth by Calonico et al. (2017). \*\*  $p < 0.05$ .*

Table 2 presents the model when mean squared error optimal bandwidths developed by Calonico et al. (2017) are used. We do this to test how sensitive our model is to selection of bandwidths. There is a significant difference in the Investment in nature variable and the Protection of nature variable. Both variables have quite a small sample size because they are limited to the 2019 election. A smaller bandwidth reduces the effective observations and estimate results that could be unreliable due to a low number of effective observations. The effect on charging stations and bicycle roads appears to be robust to changes in bandwidth.

#### 4.1.2 Environmentally friendly parties

Our previous findings suggest little to no effect of green parties on environmental policy in local government. One plausible explanation is that other political parties have their own climate political agenda. A survey conducted during the 2021 election found that climate and environmental issues were listed as the second most important issue for Norwegian voters (Aas, O. I., 2021). Social differences were the only issue considered more important for voters. It is therefore necessary for all parties to focus heavily on environmental issues, thereby decreasing the policy gap to green parties.

I will test this theory by expanding the list of parties that constitute a green party. In this analysis I will examine municipalities where the Green party (MDG), The Liberal party (V), the Socialist Left party (SV) and the Red party (R) has won a seat in the local council. The argumentation for picking these four parties is the received score in Fig. 2.

A critical evaluation of the differences between the analysis in table 2 and 3 require an understanding of the differences in the Green party and environmentally friendly parties. SV, R and V are parties that has been developed to represent a political stance on primary policies. Primary policies are issues that the majority of voters pay attention to. For example, the tax rate, which is the central policy on the left to right spectrum (Folke, 2014).

The Green party differentiates itself from these parties, because its primary focus is their stance on environmental policy, which can be categorized as a secondary policy.



**Table 3:** Regression discontinuity analysis for all green parties

Local linear specification (2)					
	Charging	Bicycle	Total score	Investing in nature	Protection of nature
RD estimate	-0.045 (0.09)	0.209* (0.13)	0.056 (0.33)	0.170 (1.13)	-0.062 (-0.36)
Bandwidth	1	1	1	1	1
Local quadratic specification (2)					
	Charging	Bicycle	Total score	Investing in nature	Protection of nature
RD estimate	0.124 (0.11)	0.206 (0.17)	0.121 (0.58)	0.307 (1.61)	-0.080 (-0.35)

*Note: (2) Estimated effect of the Green, Socialist Left, Red and Liberal party. Robust standard errors are in parenthesis. Description of outcome variables are provided in section 3.6. Full bandwidths are used. \*  $p < 0.1$ .*

Widening the characterization of green parties provide similar results as when only investigating the Green party. There is a small effect of 0.2 standard deviation units at the 10% significance level for the ratio of bicycle roads, in the case of a local quadratic specification of the model. The effect on bicycle roads is consistent between both specifications. The largest effect is on the investing in nature variable, which increased by 0.3 standard deviation units away from the mean.

Our results suggest that the effect on the investment in nature variable and ratio of bicycle roads are larger when the number of green parties increase from one to four. We are however not able to conclude that there is a significant effect on policy from representation of green parties.

#### 4.1.3 Discussion of policy effects

Based on the regression discontinuity analysis conducted in section 4.1.1 and 4.1.2, we can argue that green parties have no significant effect on environmental policy. These findings correspond well with the findings of Potrafke and Wüthrich (2020), who found no evidence of green governments being able to reduce CO<sub>2</sub> gas emissions or increase the usage of renewable energy.

It is interesting to review the results in context of the findings by Folke (2014). He also uses an impartial environmental ranking to measure environmental policy and concludes that a 1% increase in seat share by the Swedish Green party in local government, increases the environmental ranking by 2%. The Green party has the largest effect on environmental policy of all running parties according to his paper. In comparison, our findings suggest that representation by the Green party in local council only increased the total environmental score by 0.1 standard deviations from the mean.

Differences in results could be correlated with how easy it is to implement the policy that our rankings are based on. The ranking used in Folke (2014) takes in to account the municipalities initiative to provide “green” information to inhabitants, that can easily be implemented by a marketing campaign. The ranking applied in this paper leans more towards a municipality’s regulation of natural areas.

My analysis looks at the environmental effect that has been implemented two years after the local election. It is a possible explanation that local government need more than two years to significantly impact our outcome variables. The urban environment agency (Bymiljøetaten) states that over 30 projects for development of bike roads in Oslo in 2019 were delayed 1-2 years because of bureaucratic processes.

Our analysis is conducted at the municipal level, and the effect of the Green party should be interpreted as such. Local governments face different constraints than the national government. Since municipalities are smaller, they generally have a more homogeneous population. Ferreira and Gyourko (2009) argues that this discourages strategic extremism because there are less people in the thin minority

of extreme opinions. A party, such as the Green party, which is on the far side of environmental values, will move towards the center.

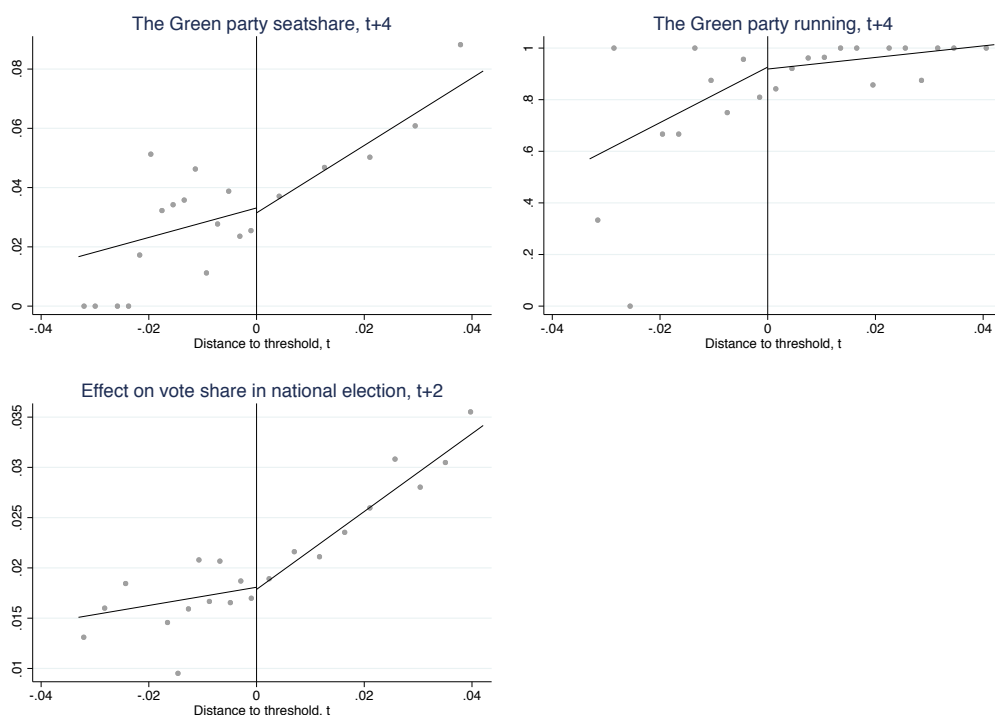
#### 4.2 Incumbency effect

In this part I will move on to the second and third part of my research question. How does winning a seat in local elections affect upcoming local and national elections for green parties.

The paper from Fiva and Røhr. (2018) uses a RD design to examine the incumbency effect in local elections. I will extend on the same research design as used in the paper. My research topic extends on the original design in two ways. Firstly, I will look at incumbency effect in local elections, but only focus on the Green party in the regression. Secondly, I will look at the effect on cross governmental levels.

Fig. 12 presents the incumbency effect the Green party get from winning a seat in local government on future elections. The panel in the top left corner presents the incumbency effect on seat share in the next local election. The panel on the top right corner presents the incumbency effect on running in the next local election, and the panel in the bottom left corner presents the local incumbency effect on vote share in the next national election. Our findings suggest that the Green party obtains no effect in future elections. This is in line with the findings of Fiva and Røhr (2018), who also found that there is no significant incumbency effect on the party level in local elections.

**Fig. 12:** Incumbency effect in electoral settings.



*Note: Forcing variable is distance to winning a seat. Panel (1) on the upper left side presents the effect on running in the next local election. Panel (2) on the upper right side presents the effect on vote share in next national election. Panel (3) below presents effect on seat share in the next local election. The vertical line is a zero win margin for the Green party. The variable for running in  $t+4$  is 1 if the Green party run for election in the next municipal election and 0 if the party does not run.*

Fiva and Røhr (2018) found that parties who win a seat in local election are 15% more likely to run in the next election. Our findings suggests that the Green party's decision to run in the next election are uncorrelated to a seat change. The Green party is one of the smaller significant parties in Norwegian politics. It is therefore reasonable to assume that they will choose to run again regardless of a loss, as it could be an expected outcome.

It is important to evaluate these findings in a shared context. I began this thesis by examining if the Green party were able to influence policy by representation in local council, and then use that momentum to improve future election results. It is

possible that it is the opposite mechanism that happens. Since the Green party are not able to significantly move policy, the voters choose to not respond with a larger vote share and the future election results remain unaffected. It is difficult for a political party to gain attention during their time in local government, when they are not able to implement measures and policies that create discussion.

The lack of either a positive or negative effect provide no evidence to either the theory of incumbency effect or divided government proposed by Ade and Freier (2017). If the Green party is unable to implement their policy, then this should remove the voters need to balance out policies by voting different in the next election.

## **5.0 Conclusion**

The primary focus of this paper is to examine the effect of green parties on environmental policy. We measure environmental policy through bicycle roads, electric charging stations, and received environmental score. The environmental score is conducted by an impartial and professional third party and development of green infrastructure is critical for reducing gas emissions. We therefore evaluate the outcome variables as a valid measurement of environmental quality. The political data is collected from the local government dataset (Fiva et al., 2020) and kommunedatabasen, which deliver reliable data of high quality on local elections in Norway.

The main analysis uses a regression discontinuity design to approach our research question. Municipalities where the Green party won one seat are the treatment group and municipalities where they ran for election but did not win any seats are the control group. We use a linear control function as baseline and found no significant jump around the cut-off. Our findings suggest that we cannot reject the null hypothesis for any of our outcome variables.

The entrance of the Green party around the threshold has no significant effect on policy. Next part of our research examines the incumbency effect from representation in local council on the next local and national election. Our

findings suggest no significant incumbency effect on local or national elections for the Green party.

The shared findings of the research questions asked in this paper suggests that the Green party is not able to move environmental policy. Local bureaucratic processes and homogeneity in local voter population hinders implementation of drastic environmental actions. Municipalities in the research sample are therefore not able to gain the same media publicity and traction as the party has gained in Oslo. It is reasonable to assume that this is the reason the party has not been able to obtain an incumbency effect in represented municipalities to increase vote share in future elections.

### 5.1 Suggestions for future research

An interesting approach for further research is to replicate the research design at a later stage. We focus on the 2015 and 2019 election, since the Green party is a relatively young party and publicly available data on environmental factors predating 2015 are scarce. It would therefore be interesting to replicate the research design with more data to increase precision and reduce the small-sample bias.

The research conducted in this paper is done using local government data. It is possible to recreate this paper using international data. We mention in section 1.1 examples of European countries where Green parties are part of coalition governments. It would be interesting to recreate the research design to look at differences in environmental tax, where countries that has Green parties as part of a coalition government is the treatment group.

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