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Spatial Patterns for Potential Climate Voting
The political economy of public support for climate politics in Sweden 2006-2018

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The need to curb global warming is evident, and efficient climate policies are essential. But within the democratic context, public support for climate politics is needed to implement mitigation efforts. Sweden has long been known as a forerunner for climate change mitigation, however, there are indications that the voters' interest in climate politics is waning. This study aims to visualize the evolution of spatial patterns of support for climate politics on a regional level in Sweden between 2006-2018 and explore how selected factors might be related to the trends on a regional level. This is done by constructing the Climate Prioritization Index, which is based on the voter's perceptions of the political parties' climate politics since the study is concerned with what steers voters' behaviour. It is found that, on a national level there was a moderate increase in the propensity to vote for the climate until 2011, when a dramatic decline was initiated. The southern regions pioneered the drastic decrease, where South Sweden had the most extreme decline. Even though this trend is nationwide, the northern regions and Stockholm show persistence in their support for climate politics. Regional level labour income does not appear to have an effect, neither do climate tax, while the effects from access to public transport and price on gasoline are ambiguous and CO_2 emissions per capita has a panoptic positive relation. The persistence in the pattern is likely related to interdependence of voters and the neighbourhood effect, and the mechanism in which the voters position themselves according to the political reference point in their region. The overall decline can, partially, be explained by the collective action of political participation, where the voter is discouraged to vote if the party they voted for does not gain power, as the voter loses the sense of political usefulness.

Key words: public support, Climate politics, Electoral Geography, Voter's Behaviour, Sweden, Climate change

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BLUE	–	Best Linear Unbiased Estimator
CPIX	–	Climate Priority Index
CSN	–	Central Committee for Study Support
CO_2	–	Carbon Dioxide
ECM	–	Error Component Model
EU ETS	–	European Union Emissions Trading System
GLS	–	Generalized Least Squares
GM	–	Gauss-Markov
H0	–	Null Hypothesis
NUTS	–	Nomenclature for Territorial Units for Statistics
OLS	–	Ordinary Least Squares
SEK	–	Swedish Krona
VAT	–	Value Added Tax
UN	–	United Nations
KD	–	the Christian Democrats (Abbreviation for Kristdemokraterna)
M	–	the Moderate Party
C	–	The Center Party
L	–	The Liberal Party
SD	–	the Sweden Democrats
MP	–	The Green Party (Abbreviation from Miljöpartiet de gröna)
S	–	The Social Democratic Party
V	–	The Left Party (Abbreviation for Vänsterpartiet)

1 Introduction

1.1 The Problem

In the Paris Agreement from 2015, the nations agreed on the ambitious, but essential, target to keep global warming well below 2°C compared to pre-industrial levels and to pursue efforts to limit the temperature rise to 1.5°C (United Nations, 2022a). In the more recent Glasgow Climate Pact from 2021, the need for an accelerated climate action was emphasized (United Nations, 2022b). Specifically, the urgency of stronger national action plans was declared (United Nations, 2022b). In 2017, the Swedish Parliament agreed on the national climate pact, with the committed to reach zero net emissions by 2045 (Swedish Climate Policy Council, 2019), Reaching the climate targets does not only require efficient policies, but within the democratic context and process, it also requires public support for climate regulation.

Sweden has long been known as forerunner for climate change mitigation (Andersson, 2019). However, recently the Green Party (MP) has been losing ground among voters, and in May 2022 Radio Sweden announced that in 1 of 4 municipalities, the party does not have any candidates for the election in September 2022 (Radio Sweden, 2022). This begs the question whether the Swedish voters have de-prioritized climate politics, and what is influencing the voter in a climate conscious country to stray from climate mitigation. As democratically elected leaders rely on votes to remain in power, it might cause policymakers to be reluctant to implement climate policy if they anticipate public opposition (Drews & van der Bergh, 2015). Thus, to efficiently curb global warming, it is crucial to deepen the understanding of how the public support for climate politics is shaped.

1.2 Relevance and Aim

As the need to mitigate climate change is accelerating, a complex issue arises when public support is waning. If politicians and policymakers find themselves with their hands tied, the much-needed climate change mitigation can potentially be hampered. In light of the parliamentary election 2022 in Sweden, visualizing the evolution of voting patterns for climate politics on a regional level becomes highly relevant to gain knowledge of the state of public support. In addition, exploring what regional characteristics that might shape the green voting preference will further extend the sentience of public support for climate politic and illuminate how the voter's preferences of climate politics might translate into electoral turnout.

The aim of the study is twofold: firstly, it aims to explore how the aggregate voting patterns for climate politics on a regional level have been affected by carbon emissions per capita, income per capita, environmental taxation and access to public transport in the regions.

Secondly, the study intends to examine and visualize how the patterns have evolved over time and reveal when the slow-down in potential climate voting started. Consequently, the paper will examine the following research questions:

- ◊ To what extent have carbon emissions per capita, income per capita and access to public transport affected the voters' attitudes toward climate politics on a regional level in Sweden?
- ◊ How has the propensity to vote in favour of climate politics evolved in the Swedish regions between 2006 and 2018?

Although there is a vast amount of literature on the public support for climate regulation, the research on how the public opinion translates into political support for climate politics is scarce. In addition, the research on the spatial variation in voting patterns in Sweden is voluminous, however, the research on spatial patterns for green voting is, so far, absent. Consequently, this study can bridge this gap in the literature. Thus, a holistic examination of aggregate climate political preferences needed. By constructing an index of potential climate voting on a regional level, this study contributes with the spatial analysis of aggregate voter preference for climate politics. In turn, this renders a deeper understanding of the voter's behaviour on a regional level over the four most recent elections.

1.3 Scope and Delimitations

The study stretches over twelve years, including four national Swedish elections. The election years will be used as reference years when mapping the overview of the evolution as they occur in the beginning, middle and end of the period. Since 2006, the political discourse around climate change has accelerated, consequently, 2006 is used as the first observation. Subsequently, the last year of interest is the year of the latest national election in Sweden, 2018. This timeframe is short enough to provide detailed analysis of the development of aggregate public support for climate politics, yet long enough to visualize a spatial pattern. The study will use regional level data on macro-level to identify larger trends and aggregate patterns for political preference in Sweden. The regions are: Upper and Central Norrland, North-Central Sweden, East-Central Sweden, Stockholm, West Sweden, Småland and the Islands and South Sweden.

In pursuance of the aim to reveal when public support for climate politics started to wane, annual data is required. Naturally, there is no annual data on voting as national elections occur every four years in Sweden. As a substitute, self-reported party affiliation is used. Although it is intended to mimic electoral turnout, this is not representative of actual electoral turnout, nor should it be interpreted as such. Thus, the study does not examine actual voting patterns, but potential voting patterns. Data for the variables of interest is retrieved from Statistics Sweden's database or the responsible government agency. This allows the use of relevant and reliable data with annual frequency. To investigate the spatial patterns for climate voting, the Climate Priority Index (CPIX) is created, based on how the voters perceive the climate politics of each party. In addition to mapping the development of Climate Priority Index over the four election years, two statistical models are constructed. First, a Generalized Least Squares regression is used, and secondly, an Error Component Model with time specific effects is used to identify shocks that are exogenous to the model.

1.4 Outline of the Thesis

The structure of the thesis is as follows: Section 2 provides background information about the Swedish climate strategy and the Swedish political landscape, where the parties' respective climate politics are compared. Section 3 works as the analytical backbone of the thesis. First, the interphase between voter's behaviour and electoral geography is presented, and secondly, the implications of the collective action problem. Section 4 reviews the previous research in the field, which allows for positioning the thesis in a broader academic context. First, the spatial voting patterns is presented, followed by an assessment of the state of and drivers for public support for climate politics. Section 5 present the data, the construction of the CPIX and statistical models. Section 6 presents the results. It is found that the potential climate voting has been relatively stable until 2011, when a dramatic decline was initiated, and a North-South divide started to emerge around 2010. Except for carbon intensity, the explanatory variables do not provide much insight into the roots of discouragement of climate voting. Section 7 elaborates on the results in the intersection of electoral geography, voter's behaviour, and collective action. Section 8 concludes and highlights the most essential findings.

2 Background

2.1 The Swedish Climate Politics and National Strategy

In 2017, the Swedish Parliament voted to adopt a national climate action plan, a commitment which has been considered a milestone for Swedish climate politics (Swedish Climate Policy Council, 2019). Within the Swedish Climate strategy there is one overarching goal and several interim targets. The overarching goal is to have net zero emissions by 2045, and thereafter net negative emissions. In 2019, the Swedish Climate Policy Council found that these targets would not be achieved without stronger policy actions. The Swedish parliament has stated that the 2045 target is within reach, but only if the emissions within Sweden are reduced by 85 percent compared to 1990 levels (Swedish Climate Policy Council 2021).

Whereas the overarching target covers the total greenhouse gas emissions in Sweden, the interim targets relate to a subsection of emissions. Broadly speaking, Sweden's emissions can be divided into two categories: Emissions from sectors that are covered by the EU Emissions Trading System (ETS), and emissions from sectors that are not. For the emissions that occur outside of the EU ETS, three interim targets apply. The 2020 interim target was that greenhouse gas emissions should be reduced by 40 percent compared to the 1990 level (Swedish Climate Policy Council, 2019). By 2030, the target is that the greenhouse gases should be reduced by 63 percent, and by 2040 the greenhouse gas emissions should be reduced by 75 percent compared to 1990 levels (Swedish Climate Policy Council, 2021).

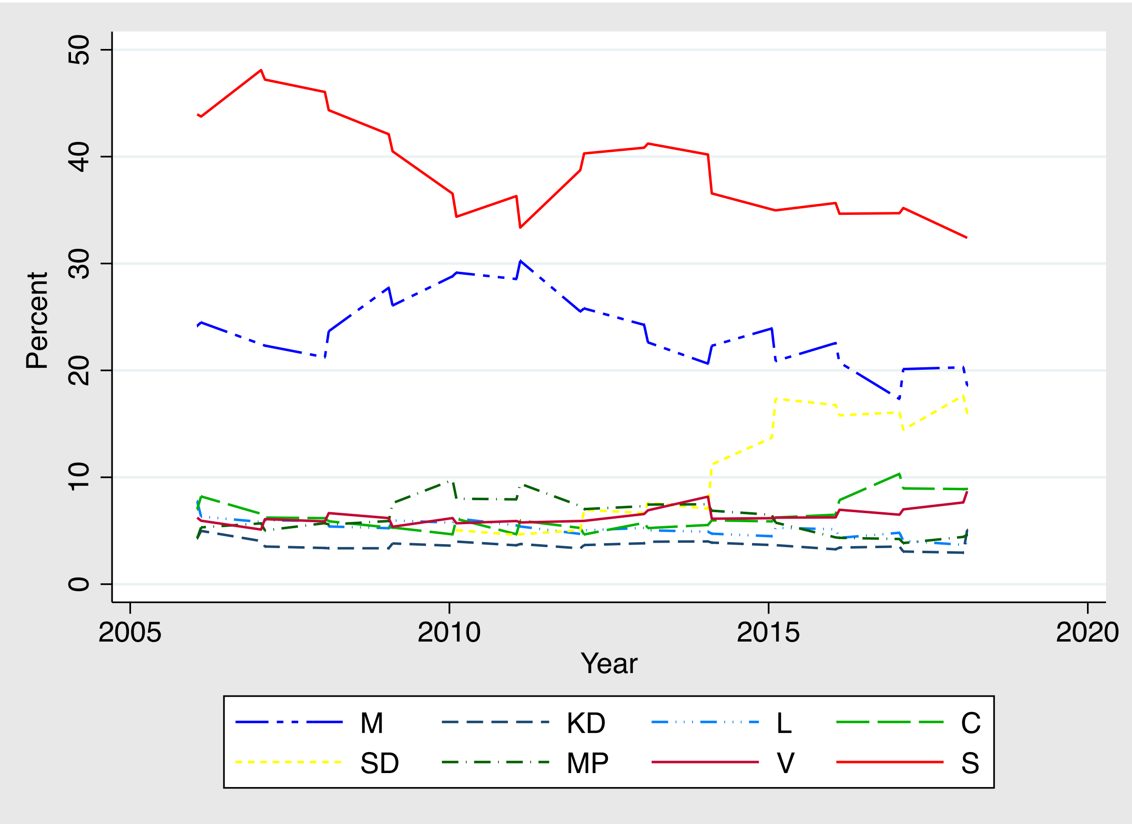
In March 2021, the Swedish Environmental Protection Agency published the scenarios for the future trends in emissions and concluded that the targets beyond 2020 will not be achieved without comprehensive further policy action. More specifically, by 2030, the emissions outside of the EU ETS will only be reduced by 44 percent, compared to the targeted 63 percent, and for the 2040 target, the projected decrease was 51 percent, compared to targeted 75 percent (Swedish Environmental Protection Agency, 2021). Consequently, much stronger policy action and ambitious climate politics are required.

2.3 Sweden's Political Landscape

Sweden is a unity state, with the vertical power divided between the national and regional governments as well as the municipalities (Hague & Harrop, 2019). The political landscape is characterised by a multi-party system with eight parties represented in the parliament (Michaud, Mäkinen, Szilva & Frisk, 2021). From right to left, as per the parliamentary seating order, these parties are the Christian Democrats (KD), the Moderate Party (M), the Center Party (C), the Liberal Party (L), the Sweden Democrats (SD), the Green Party (MP), the Social Democratic Party (S) and the Left Party (V). The sheer number of parties implies that there is a need to arrange coalitions to form governments, and historically it has been a left-right division (Michaud et al. 2021). Since the 2006 election there has been one majority bourgeois coalition (M, KD, L, C), a minority bourgeois coalition, followed by a Social democratic minority coalition (S, MP), supported by V (Michaud et al. 2021). After the election 2018, a non-traditional coalition was formed where a minority government was established with S, L, MP, and C (January Agreement, 2019).

Out of the eight political parties represented in the Swedish parliament, MP, KD, and SD are the youngest (Statistics Sweden, 2021a). MP entered the parliament in 1988, KD in 1991 and SD in 2010 (Statistics Sweden, 2021a). In Figure 1, it is possible to observe the trend

Figure 1: Self-Reported Party Affiliation, 2006-2018



Note: The survey is performed in May and November each year.
Source: Statistics Sweden, 2021b

for each party. Between 2006-2018, the support for S fluctuates, but it has remained the party with the highest support rate, although to a decreasing extent. M has remained the second largest party, nearly catching up with S in 2011. The interesting development occurs when SD enters the parliament in 2010, incessantly gaining support since. The four remaining smaller parties have not enjoyed excessive changes. A noteworthy change is that MP started to gain support in 2009, but the support started to fall in 2014. C has enjoyed more support since 2016, whereas KD and L have remained at stagnating levels throughout the period.

2.4 The Political Parties and Climate Politics

In terms of environmental prioritization, the parties differ. The rankings of the parties are ambiguous and depend on which indicators are used. However, a coherent result is that MP is ranked the highest, and SD the lowest (Swedish Society for Nature Conservation, 2018; Radio Sweden, 2018; SOM-Institute, 2020). Before the election 2018, the Swedish Society for Nature Conservation (2018) examined the political ambition of each party by compiling a list of 18 suggestions for sharper climate politics (see Appendix, Table A.1.). From this inspection, MP and V was ranked highest, agreeing on all the suggestions, closely followed by L (Swedish Society for Nature Conservation, 2018). S ranked highest of the large parties, and M and the SD scored the lowest, responding positively to six and two suggestions respectively (Swedish Society for Nature Conservation, 2018).

In a report from Radio Sweden (2018), two climate researchers gave points between 1 to 5 to each party according to the viability of their climate strategy. The result was that MP received 4 points, followed by C, which received 3.5 points. L and S shared the third spot, receiving 2 points each, followed by KD with 2.5 points. Compared to the examination from the Swedish Society for Nature Conservation (2018), V scored remarkably low, only receiving 2 points (Radio Sweden, 2018). M and SD ended up with a shared last place in the ranking, only receiving 1 point each (Radio Sweden, 2018).

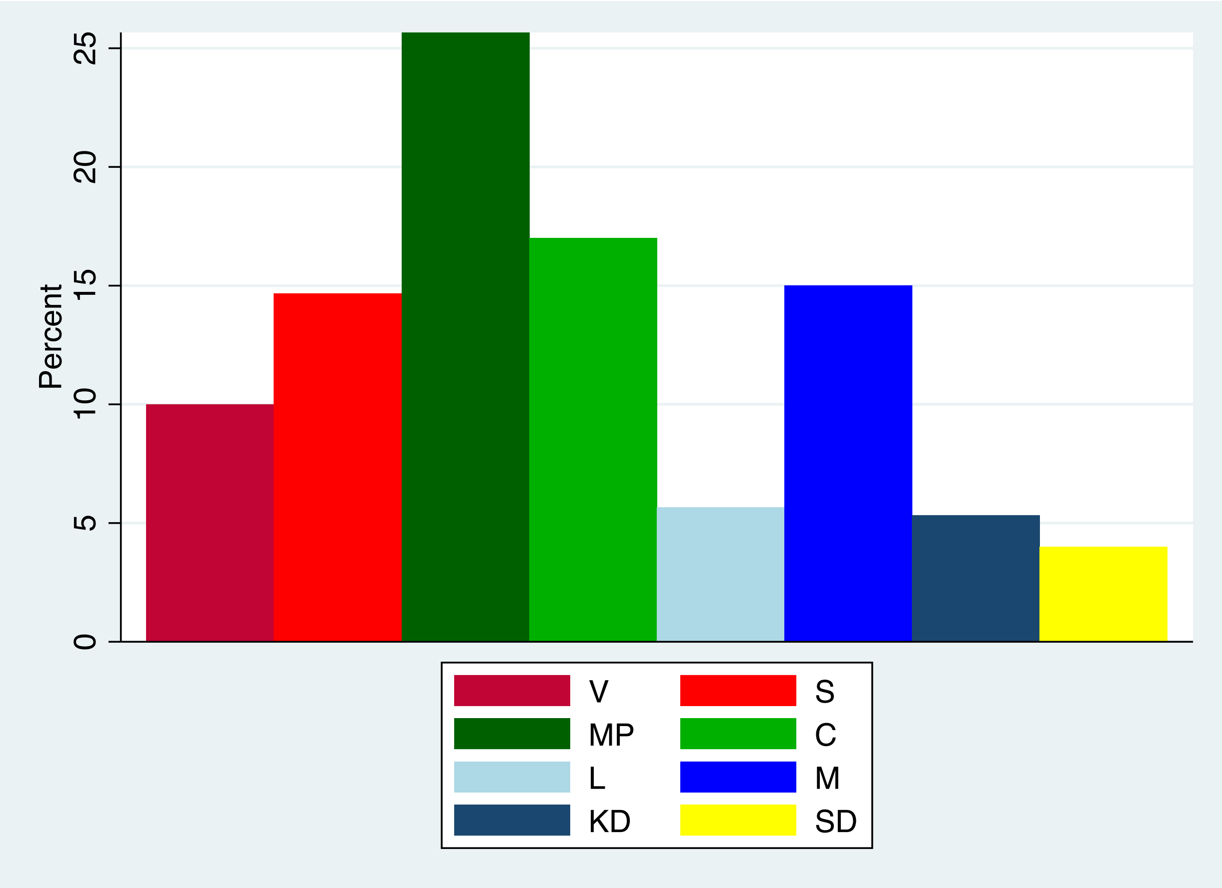
Table 1: Ranking of the Political Parties' Climate Politics

Ranking	Swedish Society for Nature Conservation	Radio Sweden	SOM-Institute
1	MP**	MP**	MP**
2	V	C*	C*
3	L*	S, L*	M
4	S*		S*
5	KD*	KD*	V
6	C	V	L
7	M		KD
8	SD**	SD**, M	SD**

Adapted from Radio Sweden (2018); SOM-institute (2021); Swedish Society for Nature Conservation (2018)
Note: *, ** implies that the party kept its place in the raking in two and three examinations, respectively.

Besides how scientists rank the parties and how the parties rank themselves, it is also appropriate to complement with how the voters rank the parties. The SOM-institute (2021) carried out a survey of which parties that are highest ranked in the most voters' most important questions, compiled in a report by Martinsson and Weissenbilde (2021). In the question regarding climate change the voters ranked MP as the highest, receiving 25.67 percent

Figure 2: Perceived Political Ambition to Mitigate Climate Change

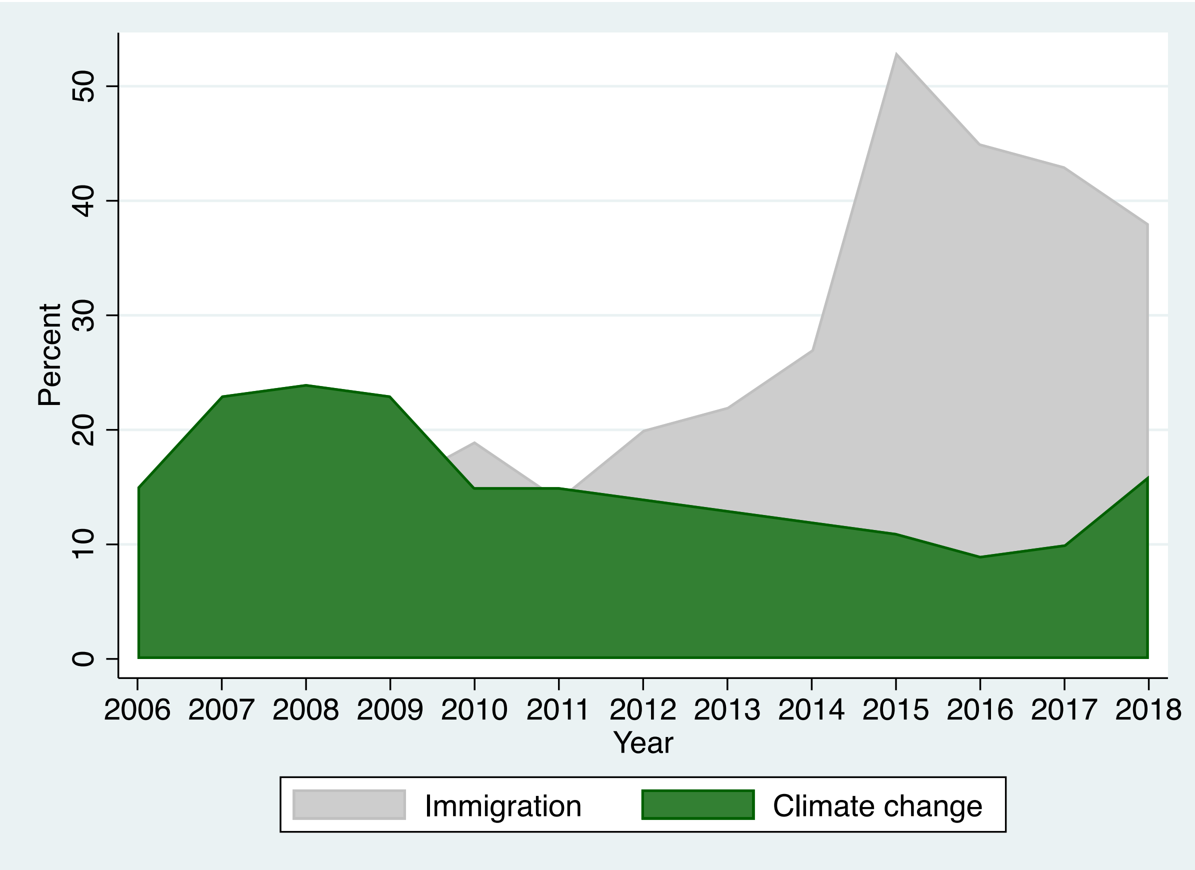


Note: The mean of the result of the survey by the SOM-institute between 2016 and 2020.
Source: Adapted from Martinsson and Weissenbilde (2021)

on average between 2016-2020, followed by C, which received 17 percent (Martinsson & Weissenbilde, 2021). This is closely followed by M and S which attained 15 and 14.67 percent respectively. V ranks in the middle, with a 10 percent, and L, KD, and SD ranks the worst with 5.67, 5.33 and 4 percent on average respectively (Martinsson & Weissenbilde, 2021).

It is important to emphasize that what the voters perceive as important political questions might influenced by contemporary events. Between 2006 and 2018, the most popular political topics have varied (Martinsson and Andersson, 2022). The SOM-Institute performs an annual survey in which they ask the respondents which political question is the most important (Martinsson & Andersson, 2022). Between 2006 and 2018, the question which has grown the most in importance among the voters is immigration and integration (Martinsson & Andersson, 2022, see Table A.2, Appendix). It is clear from Figure 3 that the question of integration and immigration has grown ceaselessly since 2011, and between 2014 and 2015, it grew drastically. As Sweden received more immigrants than usual in 2014 and 2015 (Statistics Sweden, 2016) it is not surprising that it became the most important issue among voters between 2016-2018 (Table A.2). Contrarily, most citizens seem to have de-prioritized climate change as the percent of people which perceives it as the most important has fallen gradually since the peak in 2008 (Martinsson & Andersson, 2022). Drews and van den Bergh (2015)

Figure 3: Citizens' Perceived Importance of Immigration and Climate Change



Note: the percent indicates the respondents which perceived either climate change or immigration as the most important political issue.
Source: Adapted from Martinsson and Andersson (2022)

emphasize that media coverage of political topics at least implicitly has an influence over the citizens' policy preferences. Thus, although media coverage is an important guardian for democracy, it might also have the power to influence the focus of the public.

Consequently, even if the Climate action Plan was concretized by the parliament in 2017, the issue appears to be losing its standing among voters. The political parties differ, both in the support they receive and how they prioritize mitigating climate change. Going forward, the interesting intersect to investigate is the ranking of parties' political ambition to mitigate climate change, weighted by their support in each region. This can potentially to reveal whether there is regional variation in public support for climate politics. However, between 2006-2018, various issues have dominated the political agenda. SD has grown incessantly since their entry into the parliament in 2010, and additionally, the political question they represent – immigration an integration – most people perceive as the most important. As SD remains at the bottom of every ranking for climate politics, their immense growth is likely to have influenced the regional variation in public support for climate politics.

3 Analytical Framework

The following section will serve as the analytical backbone of the thesis. It will have its point of departure in the interphase between voter's behaviour and electoral geography. While voter's behaviour is more concerned with how individual values are aggregated into social preferences, electoral geography analyses systematic spatial patterns of elections and political preferences. In close connection to this, and further providing insight regarding voters' behaviour, is collective action, which is used to complement the general understanding of how political support is shaped.

3.2 Voting Behaviour and Electoral Geography

Theories on voting behaviour and electoral geography are interlinked, and together they provide analytical insight into the mechanisms of modern politics. However, whereas voting behaviour stems from social choice; the normative branch of economics (Page, 1977), electoral geography has its roots in political science (Kovalcsik & Nzimande, 2019). In contrast to theories of voting behaviour, which typically intend to explain political preference from an individual perspective, electoral geography seeks to identify the spatial characteristics (Kovalcsik & Nzimande, 2019). To provide an elaborative view on voting behaviour in aggregate terms, it is useful to view political preference from the intersect of these two frameworks.

One of the dominating trends within electoral geography is what impacts the political preferences of voters and through which mechanisms this is materialized (Agnew, 1990; Kovalcsik & Nzimande, 2019). The main concern is whether the influence primarily comes from a higher level, or if it is a local effect. More specifically, the local effect refers to what is known as the neighbourhood effect, first developed by Cox (1969). The neighbourhood effect implies that the voter is influenced by their local social networks (Cox, 1969). In parallel vein, within voter's behaviour, Page (1977) emphasizes that an important aspect of preference forming among voters is interdependence, implying that a voter's preferences are connected to that of another. Urban voting behaviour tends to deviate from non-urban areas. Kovalcsik and Nzimande (2019) highlight that a plausible reason for the deviation that people with similar preferences deciding to move to urban areas. The beforementioned mechanism in which social interactions impact the voter's behaviour is also thought to be intensified in urban areas, which is typically a heterogenous setting (Kovalcsik & Nzimande, 2019).

There are dynamics, both within electoral geography and voter's behaviour that contribute to persistent trends in individual political preferences. Evidence from the U.S. shows that most Americans have a persistent party loyalty from election to election and that the individual's stated party affiliation is highly correlated with the vote (Page, 1977). In close connection, Feinberg, Tullett, Mensch, Hard and Gottlieb (2017) emphasize that political identity is not shaped from a vacuum but derives from a myriad of conditions. They mean that locations tend to diverge in how right or left oriented they are in general. The rationale behind this is that in the process of determining one's political identity, people tend to rely on the political views of those around them (Feinberg et al. 2017). This has mainly two possible explanations (Feinberg et al. 2017). The first is that the political identity of others is used as a reference point, to which voters adjust themselves when they position themselves on the political spectrum. Secondly, Feinberg et al. (2017) mean that it is likely that people feel pressure to conform to certain political beliefs that are predominant in their location of residence, thus pulling people's political identities closer to the political perception of the location. Coherently, Michaud et al. (2021) find a regional counterpart to this in Sweden, suggesting that the social norms for voting differ between regions, giving rise to different politico-cultural standards.

3.2 Collective Action, Political Participation and Climate Change

Systematising collective action is essential for any society, as the provision of public goods is a key issue (Weimann, Brosig-Koch, Heinrich, Hennig-Schmidt & Keser, 2019). A public good is a good which is available for everyone, regardless of whether the consumer pays for it or not (Harris, 2007; Olsson, 1965). The collective action problem arises when the benefit for each member of society from provision of the good is smaller, or at least less salient, than the cost of contributing to the provision. Both mitigating climate change and voting can be considered to be suffering from a collective action problem (Grasso, 2004; Harris, 2007; Kanazawa, 2000; Weimann et al. 2019).

Mitigating climate change can be regarded a national public good since each citizen's reduction of emissions implies higher cost than benefit, and each citizen's emissions contribute cumulatively to climate change (Grasso, 2004; Weimann et al. 2019). Climate change mitigation induces the collective action dilemma as it requires cooperation within a large group of people (Weimann et al. 2019). Even though there is usually a collective demand for a public good, there is a collective lack of interest to pay for the good (Harris, 2007). As each member the society will benefit from the good regardless of whether they pay or not a large group implies that each member benefits less and, consequently, the further the group is from achieving optimal provision of the public good (Harris, 2007; Olsson, 1965).

Voting in large parliamentary elections makes an interesting collective action problem. The outcome of the election is experienced by everyone, regardless of whether the citizen is pleased or dejected by the result (Kanazawa, 2000). Additionally, in large national elections, the probability that one voter would cast the decisive vote is not significantly different from zero (Kanazawa, 2000). Kanazawa (2000) finds that citizens sense an association between their decision to vote or abstain and the outcome of collective action. More specifically, citizens who abstain from voting, yet support the winning party and those that vote for the losing party are slightly less likely to vote in following election (Kanazawa, 2000). Inversely, those that abstain from voting, yet support the losing party and those that vote for the winning party are slightly more prone to vote in the following election (Kanazawa, 2000). A plausible reason for this is a sense of personal fulfilment of political usefulness.

Consequently, in the case of propensity to vote for climate politics, the process is likely to be influenced by geography, as well as a twofold collective action problem: both in terms of political participation and the provision of climate change mitigation (Harris, 2007; Kanazawa, 2000). With these underlying mechanisms in mind, it is appropriate to examine the previous research of the voting patterns in Sweden and public support for climate politics.

4 Literature Review

The subsequent section outlines the previous research in the field to position the thesis in a broader academic context. The section departs with presenting the spatial voting trends in Sweden across time. Followingly, it will outline the previous research on drivers for public support for environmental policies. It will conclude with developing hypotheses, based to what is found to influence spatial trends and public support for environmental policies.

4.1 Spatial and Persistent Trends for Political Support in Sweden

The regional disparities in electoral behaviour in Sweden are relatively pronounced and reasonably persistent (Oscarsson & Holmberg, 2008). The studies of the long-term electoral evolution in Sweden are scarce, most literature in the field instead focuses on single-election analysis (e.g., Oscarsson & Holmberg, 2008; Sannerstedt, 2017). Michaud et al. (2021), however, performs a long-term analysis of the spatial development in electoral turnout and Oscarsson, Andersson, Falk, and Forsberg (2018) similarly estimate the concentration in geographical party support 1991-2018. There are, evidently, regional characteristics in voting patterns that appear to be consistent. Even if the voting patterns are stable, they are not stationary. Contrarily, Elinder (2010) finds that economic indicators on a regional level have an impact on the outcome in national elections in Sweden.

In terms of geographical divide, there are two distinctions that characterizes political behaviour in Sweden. Firstly, there are persistent differences between the North and South of Sweden (Oscarsson & Holmberg, 2008). In the northern regions, support for S and V is stronger than the national average. In the south of Sweden, SD receives an above average support (Oscarsson & Holmberg, 2008; Sannerstedt, 2017). Additionally, Oscarsson and Holmberg (2008) suggest that there is a distinction between the voting patterns of urban and rural voters, where three main tendencies are recognised. Firstly, the support for M, L, and MP is greater than average in large cities, in particular M receives large support in the in Stockholm, and L in Gothenburg (Oscarsson & Holmberg, 2008). Secondly, in medium-sized cities there is a stronger than average support for S, and finally, in rural areas the support for KD, C and SD is above the national average (Hagevi, 2011; Oscarsson et al. 2018).

Several researchers have shown particular interest in the dynamics of SD (e.g., Michaud et al. 2021; Sannerstedt, 2017). In addition to performing better than the national average in rural areas, SD has a distinctively large support in South Sweden, particularly in the counties Blekinge and Scania (Sannerstedt, 2017). Using the results from the 2014 election, Sannerstedt (2017) developed a measure of over/underrepresentation. From this, he concluded that the party is underrepresented in Stockholm and Norrland, proportionally represented in West Sweden and overrepresented in South Sweden, Småland, East-and North-Central Sweden. Scrutinizing the long run spatial voting patterns, Michaud et al. (2021) find that the entry of SD has initiated a noteworthy difference for South Sweden. He finds that between 1985 to 2018, the politico-cultural communities went from three to four. The fourth community is the Far South, which emerged during the 2000s. It has a large vote share in SD but practically all other parliamentary parties are underrepresented (Michaud et al. 2021).

The long-term geographical concentration of party support has been quite stable. Oscarsson et al. (2018) outline the development of each political party between 1991 until 2018. They observe that the support for M and S seems to be relatively persistent over time, as these parties had the smallest deviations in regional support. Similarly, Michaud et al. (2021) explore the spatial evolution of electoral turnout over a 33-year period and find that the general image has been relative stable. The three identified politico-cultural communities besides the Far South – the North, Urban, and the Rural South – have persisted since 1985. In the Northern community, S and V have been overrepresented, whereas M and KD have been underrepresented (Michaud et al. 2021). In the Urban communities, they find, similarly to Oscarsson et al. (2018), that M and L are overrepresented, while S and C are underrepresented Michaud et al. 2021). Since 2002, SD has also been underrepresented in the urban areas. In the Rural South, C and KD are still overrepresented while S and V are underrepresented. However, as the spatial voting patterns are not stationary, there are still factors that affect the extent of support on a regional level.

Despite the relative stability in voting patterns, contextual factors can be disruptive. Elinder (2010) find an association between economic indicators and support for the government on a regional level in Sweden. Investigating the influence of economic growth and change in the unemployment share on a regional level, he discovers a large impact from changes in unemployment. The impact from economic growth is also substantial, however not statistically significant (Elinder, 2010). The effect on the election turnout for the government showed an increase in 1.71 and 0.38 percentage points for economic growth and unemployment, respectively. For municipalities, the effect from unemployment was much lower, and the effect from economic growth was close to zero, indicating that regional level characteristics play a larger role in political preference (Elinder, 2010).

Thus, the spatial voting patterns for Sweden are relatively pronounced and persistent. There is a strong scholarly consensus for the North-South divide in voting patterns, but that the entry of the Sweden Democrats has disturbed the long-run trend (Michaud et al. 2021; Oscarsson et al. 2018). Regardless of the stability, the spatial patterns are not stationary and can be affected by circumstantial economic factors (Elinder, 2010). With a comprehensive understanding of the geographical dynamics and of the political trends in Sweden, it is appropriate to examine which factors that are likely to influence support for climate politics.

4.2 Public Support for Climate Politics

As voters, directly or indirectly, determine the approach to and extent of climate policy, examining the state of public support and its drivers is essential. Dominioni and Heine (2019) state that opposition from the public can impede sufficiently strong climate action. Some scholars argue that perceived effectiveness of climate policies is important (Carattini, Carvalho & Fankhauser, 2018; Drews & van den Bergh, 2016; Eriksson, Garvill & Nordlund, 2008) as well as the role of contextual factors (Cragg, Zhou, Gurney & Kahn, 2013). How these features contribute to public support are essential to scrutinize to understand the roots of public support.

The attitude among voters, at least partially, determine the reluctance or willingness of policymakers to implement ambitious climate politics. Lucas (2017) means that a majority of the U.S. population supports government action to mitigate climate change but prefers green subsidies over carbon taxation. Coherently, Drews and van den Bergh (2016) suggest that non-coercive measures generally enjoy greater support. Lucas (2017) emphasizes that a compelling explanation for this is opportunity cost neglect. This implies that the costs from carbon taxation are more salient than the costs from subsidies (Lucas, 2017). Thus, voters tend to disapprove of coercive measured due to a perceived higher financial or behavioural cost of the policy, although more efficient policies are cheaper in the long run (Drews & van den Bergh, 2016; Lucas, 2017).

Eriksson, Garvill & Nordlund (2008) investigate the acceptability of transport policies in Sweden and find in some regards similar results as Drews and van den Bergh (2016). Overall, Swedes tend to perceive pull measures, such as green subsidies, as more effective and acceptable (Eriksson, Garvill & Nordlund, 2008). Increased ambitions to mitigate climate change is also more likely to be accepted among the public if the access to public transport is improved (Eriksson, Garvill & Nordlund, 2008; Jagers & Hammar, 2009). In parallel vein, Kallbekken and Aasen (2010) find that the acceptability of even expensive policy measures can be increased with complementary measures. They emphasize that improving the access to public transport can ease the public resistance to financially implicating climate measures.

In addition to the individual's perceived financial implications of the policy, there are studies that point towards the role of contextual factors, such as geography and income. Cragg et al. (2013) investigate the voting patterns of climate legislation in the house of representatives in the U.S. congress and find that conservatives are less prone to vote in favour of climate related legislation. They emphasize that this is primarily since the representatives have incentives to consider how their respective districts are impacted by climate regulations. They find that representatives from richer and less carbon intensive districts are more likely to vote in favour of climate mitigation legislation. Interestingly, by holding geography specific income or carbon emission per capita constant, they discover that conservatives still tend to vote against climate regulation. This implies that ideology has a fundamental role in climate politics.

Consequently, voters determine directly or indirectly the reluctance or willingness among politicians to implement mitigation efforts, which is why public support for climate politics is an essential part of the prospect to curb climate change (Dominioni & Heine, 2019). There are several drivers for public support. The extent of coerciveness of the political direction appears to be one, in part due to opportunity cost neglect (Drews & van der Bergh, 2016; Lucas, 2017), but alleviating policy measures such as improved access to public transport is likely to increase acceptability (Eriksson, Garvill & Nordlund, 2008; Jagers & Hammar, 2009). In addition, the level of income per capita and CO_2-emissions per capita in a region is also found to influence voters' attitudes toward mitigation efforts.

4.3 Hypothesis development

The hypotheses are derived from the previous research and the mechanisms presented in section 3 and serves to anticipate how a selection of factors might influence the propensity to vote for climate politics on a regional level in Sweden. Firstly, as outlined by Cragg et al. (2013) voters in regions with high income per capita and low CO_2-emission per capita was found to be more inclined to support climate politics. Followingly, the same trend is expected to hold in Sweden and the first hypothesis becomes:

> <u>*Hypothesis I:*</u> *Regions with low levels of CO_2 emissions per capita and high income per capita will be more likely to support climate change mitigating politics.*

Improved access to public transport has been found to increase the acceptability of climate policy in Sweden (Eriksson, Garvill & Nordlund, 2008; Jagers & Hammar, 2009). Thus, it is hypothesized that this will hold at an aggregate level, not only for individuals' policy attitude, but in extension, for regional propensity to vote for the climate.

> <u>*Hypothesis II*</u>*: Regions with better access to public transport is more likely to support climate change mitigating politics.*

Consequently, access to public transport is expected to be positively related to climate voting. In extension, Hypothesis II as another implication. As increased price on gasoline increases the cost of transport for the individual, it is sensible that in regions with poor access to public transport, the price on gasoline is negatively related to potential climate voting.

Correspondingly, environmental taxation is also expected to have a negative effect on the potential climate voting. The rationale behind this twofold. First, coercive measures, including taxation, typically enjoy less support than noncoercive measures (Drews & van den Bergh, 2016; Jagers & Hammar, 2009; Lucas, 2017). The second dynamic is opportunity cost neglect, where the financial implication from taxation is more salient than other measures, albeit non-coercive measures are costlier in the long run.

> Hypothesis III: *Environmental tax is predicted to have a negative impact on the propensity to vote for the climate.*

There appears to be a consensus that the Swedish voting patterns pertain to a North-South divide (Michaud et al. 2021; Oscarsson et al. 2018; Sannerstedt, 2017). As stated by Sannerstedt (2017) and Michaud et al. (2021), the entry of SD has disrupted the stability in the voting patterns. As SD is both overrepresented in the south (Sannerstedt, 2017), and attains the lowest ranking of climate politics (Martinsson & Weissenbilde, 2021; Radio Sweden, 2018; Swedish Society for Nature Conservation, 2018), this is expected to cause the southern regions to pioneer the overall decrease in the propensity to vote for the climate

> Hypothesis IV: *The North-South divide persists but is less pronounced for potential climate voting than for parliamentary elections and is mostly driven by the downturn in the southern regions.*

Secondly, as Stockholm is a largely urban region, the trend is likely to diverge from the remaining regions as large cities are more likely to support the Green Party (Michaud et al. 2021; Oscarsson et al. 2018) and voting trends in urban areas tend to deviate (Kovalcsik & Nzimande, 2019; Page, 1977). With these hypotheses established, it is appropriate to outline how they will be examined.

5 Methodology

This study sets off to visualize the spatial patterns of potential climate voting as well as identify and explore possible influential variables for the evolution. The following section presents the data and explains the strategies used to explore the potential influence of contextual factors and the evolution of the pattern of potential climate voting between 2006-2018.

5.1 Description of Data and Variables

From the previous research within the field, variables that have an influence over the propensity to vote for the climate have been identified. Data for the relevant variables on regional level are compiled from different data sources, mainly Statistics Sweden's database or government agencies, thus, it is not one unified dataset that is used, but a self-compiled dataset with variables chosen due to their relevance. The regional division follows NUTS, which is the regional division used for statistical analysis within the EU (Statistics Sweden, 2019a). Specifically, NUTS2 is employed, which in Sweden corresponds to eight larger regions: Stockholm County, East-Central Sweden, Småland and the Islands, South Sweden, West Sweden, Central Norrland, Upper Norrland, and North-Central Sweden (Statistics Sweden, 2019a). The final data set consists of 7 regions, as Upper- and Central Norrland are collapsed into one region, with 13 observed years. This renders 91 observations in total.

Firstly, data on party affiliation on a regional level from Statistics Sweden (2021b) is used. The survey asks the respondents three questions: 1: Is there any of the political parties which you are more loyal to than the others? 2: If YES, which? 3: if NO, which party do you sympathise the most with? Thus, the measure is self-reported, and is not an exact measure of electoral turnout, although it mimics such measure (Statistics Sweden, 2021c). In the data by Statistics Sweden (2021c), Central Norrland and Upper Norrland are collapsed into one region, as a result subsequent data is compiled accordingly. To adequately represent the population, Statistics Sweden uses a random sample. The population of interest is all citizens who would have been entitled to vote if there would have been an election the year the survey was carried out (Statistics Sweden, 2021c). The sample size in a regular survey is around 9000. As to any data, there is a certain degree of uncertainty. In this case, these mostly consist of lapse in response and misinterpreting the questions (Statistics Sweden, 2021c).

Total CO_2-emissions to air, CO_2-emissions from transport and CO_2-emissions from industry per region is used, also from Statistics Sweden (2021d). For emissions from transport, the only emissions from road transports are included. The measure accounts for direct emissions to air by Swedish domestic economic activity. Dividing each CO_2-emissions variable with the population in each region respectively renders CO_2-emissions per capita. Total CO_2-emissions per capita is reported in kilos emitted to air per citizen. Despite a collective measure of trustworthiness, Statistics Sweden (2021e) deems the data to be reliable.

Data on labour income on a regional level is retrieved from Statistics Sweden (2022), where the total income for citizens 16 years old or older for each region is compiled. Labour income is given in millions of SEK and is the total annual income, including taxation. Statistics Sweden retrieves the information from registers at the Swedish Tax Authority, the Pension Agency and CSN to name a few (Statistics Sweden, 2021f). Statistics Sweden (2021f) deems the data to be highly trustworthy covering all official sources of income. Population size is also from Statistics Sweden (2022). To achieve a measure of population density, regional area in km^2 is retrieved from Rosés and Wolf (2020). Data on Available vehicle kilometres per citizen is used as a proxy for Access to Public Transport. Available vehicle kilometres pertain to the number of operated kilometres with trains, road vehicles and ships by the public transport agencies in each region (Transport Analysis, 2020). The data is reported annually by the regional agencies for public transport and compiled by Transport Analysis (2021). The unit is kilometre per citizen and year. In the absence of information about distance between stops, it is calculated by the linear distance multiplied by 1.57 (Transport Analysis, 2020).

Environmental tax is also retrieved Statistics Sweden (2011, 2021g) and is measured by the government revenue in current prices (Statistics Sweden, 2019b). This includes carbon tax, vehicle tax, sulphur tax, energy tax on fuel and electricity and electricity production tax. Noteworthily, an increase in climate tax revenue may not necessarily indicate an increase in consumption of environmentally damaging goods but can be caused by an increased tax rate. Statistics Sweden (2019b) states that the reliability of the data is ambiguous. The measurement is based on various primary sources, and the reliability thus pertains to the trustworthiness of these sources (Statistics Sweden, 2019b). The data on gasoline price is retrieved from Drivkraft Sverige AB (2022), and the price includes carbon tax and fuel tax, Value Added Tax (VAT), gross margin and production cost (Drivkraft Sverige AB, 2022). The tax rate is based on the mixture of 5 percent ethanol in the gasoline. The price is based on the price at gas stations, is reported in SEK/litre and is deemed to be reliable (Drivkraft Sverige AB, 2022).

5.2 Regional Characteristics in Sweden

In this study, regional level data will be employed to explore the spatial patterns of climate voting over time. Below follows a summary of how the regions are situated in terms of the data presented in the previous section.

Figure 4: Map of the Swedish Regions at NUTS2 Level

Note: Upper Norrland and Central Norrland are combined into one region
Source: Author's own map, using coordinates data from European Commission (2021)

Figure 4 graphically displays the regional division used in the study. Naturally the regions differ in terms of income, population, CO2 emissions and access to public transport. An important characteristic is that due to its population density, Stockholm County is its own region where 40 percent lives in an urban area (Stockholm Stad, 2019). As a contrast, Upper and Central Norrland is the most scarcely populated area. Table 2 displays the total population and population density in each region. Upper and Central Norrland is the region with the largest population, due to covering a large part of Sweden. This is followed by Stockholm, which also has the highest population density. Naturally, this pertains to the fact that the region is home to Stockholm, Sweden's capitol.

Table 2: Regional Population and Population Density

Region	2006	2010	2014	2018
Upper and Central Norrland	**2,622,232**	**2,681,582**	**2,751,256**	**2,884,635**
	11.68	*11.95*	*12.25*	*12.85*
North-Central Sweden	**825,674**	**826,336**	**831,226**	**853,620**
	12.90	*12.91*	*12.99*	*13.34*
East-Central Sweden	**1,521,298**	**1,561,998**	**1,612,177**	**1,695,022**
	39.40	*40.45*	*41.75*	*43.90*
Stockholm Country	**1,901,767**	**2,031,125**	**2,177,849**	**2,321,898**
	291.73	*311.57*	*334.08*	*356.17*
Småland and the Islands	**801,402**	**810,490**	**821,607**	**859,589**
	24.04	*24.31*	*24.65*	*25.79*
West Sweden	**1,820,830**	**1,871,092**	**1,929,649**	**2,025,046**
	61.89	*63.60*	*65.59*	*68.83*
South Sweden	**1,326,274**	**1,387,981**	**1,432,232**	**1,511,057**
	94.86	*99.26*	*102.43*	*108.07*

Source: Adapted from Rosés and Wolf (2020), Statistics Sweden, 2022
Note: Total region population is presented in bold, population density is presented in italics. It is calculated as population/km^2; hence it is number of people per square kilometre.

The region with the smallest population in the beginning of the period is Småland and the Island, followed by North-Central Sweden. However, in 2017, Småland and the Islands surpassed North-Central Sweden. Population density illustrates the differences between the regions even more clearly. Table 2 demonstrates that, the population density is the lowest in Upper and Central Norrland, closely followed by North-Central Sweden. Labour income also differs between the regions. There is a distinctively lower labour income, per capita for Upper and Central Norrland. Stockholm, and to a lesser degree West Sweden, has a continuously higher labour income per capita (Table C.1, Appendix C).

Table 3: CO2-Emissions to air per capita per region

Region	2006	2010	2014	2018
Upper and Central Norrland	1.15	1.10	0.93	0.78
North-Central Sweden	2.28	2.21	1.89	1.65
East-Central Sweden	2.02	1.89	1.62	1.41
Stockholm Country	1.85	1.69	1.41	1.25
Småland and the Islands	2.41	2.30	1.96	1.68
West Sweden	2.13	2.01	1.69	1.45
South Sweden	2.22	2.04	1.68	1.48

Source: Adapted from Statistics Sweden (2021d; 2022)
Note: Kilo per person and year, emissions to air only.

In Table 3, the CO_2-emissions to air per capita from each region are displayed. Throughout the period, Småland and the Islands remains the most carbon intensive region, followed by North-Central Sweden and South Sweden. Upper and Central Norrland, followed by Stockholm, are the least carbon intensive regions. How the regions are positioned relative to each other is identical over the period (Figure C.1, Appendix C). One observation is that the CO_2-emissions has decreased for all regions (Figure C.2).

Table 4: Access to Public Transport per region

Region	2006	2010	2014	2018	μ*
Upper and Central Norrland	73.78	74.55	88.68	76.11	76.14
North-Central Sweden	57.57	66.54	71.02	76.72	69.26
East-Central Sweden	59.67	62.00	61.88	79.70	66.23
Stockholm County	124.60	112.55	117.32	109.35	115.34
Småland and the Islands	52.07	59.50	71.32	69.56	63.87
West Sweden	115.02	62.15	73.92	83.48	85.30
South Sweden	63.42	75.73	63.60	74.41	72.26

*The mean value across the entire period 2006-2018
Source: Adapted from Transport Analysis (2021)
Note: Access to public transport is measured by available kilometre per citizen provided by the regional public transport agency annually.

In terms of access to public transport, Stockholm has the best access throughout the period, which is expected since a large share of the population lives in a metropolitan area. One peculiar result is that West Sweden has a decent access to public transport in 2006, but it dramatically declines in until 2010. The region which has the lowest access to public transport is Småland and the Islands. This holds for every year, except for 2014, when East-Central Sweden provided roughly 10 kilometres less per citizen than Småland. Categorizing the regions, North-Central Sweden, East-Central Sweden and Småland are the regions with worst access to public transport, South Sweden and Upper and Central Norrland have a moderate provision of public transport and Stockholm and West Sweden have the best access to public transport. Expectedly, the access to public transport is also correlated with population density, with a positive correlation of 0.775, indicating that more scarcely populated regions have poorer access to public transport.

After having gained a thorough understanding of how the regions are situated in terms of the independent variables, it is appropriate to examine the main attraction: the Climate Priority Index, which is created in pursuance of revealing the spatial patters for aggregate climate voting behaviour.

5.3 Dependent Variable: Climate Priority Index

To achieve an aggregate measure of climate political preference on a regional level, the Climate Priority Index (CPIX) is constructed. The index consists of two features: the self-reported regional support for each political party and the how the voters perceive each party's political ambition to mitigate climate change. The perceived viability of the climate politics is retrieved from the report from the SOM-institute (Martinsson & Weissenbilde, 2021). The report is based on a survey which asks the respondents which party is strongest in various of political topics, among which is environment, and the survey has been performed 2016, 2018 and 2020 (Martinsson & Weissenbilde, 2021). During the period, the ranking of the parties' climate politics has remained identical, signalling that the way in which the population ranks the parties regarding climate politics is relatively stable.

Table 5: Numerical Assignation of Climate Politics Points

Political Party	Abbreviation	Mean % of perceived best climate politics	Points
The Green Party	MP	25.67	1
The Center Party	C	17	0.662
The Moderate Party	M	15	0.584
The Social Democrats	S	14.67	0.571
The Left Party	V	10	0.389
The Liberal Party	L	5.67	0.221
The Christian Democrats	KD	5.33	0.201
The Swedish Democrats	SD	4	0.156

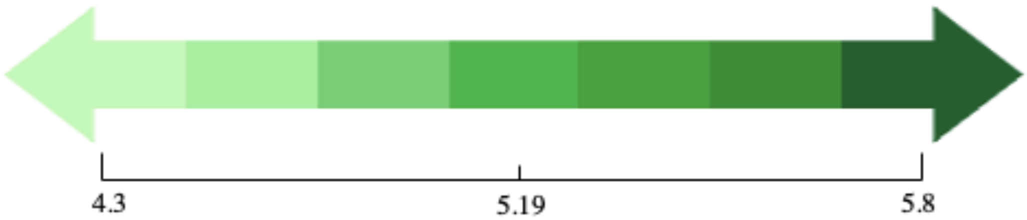
Note: The points are computed as a ratio to the points given to MP, such that each party is given a point relative to how they compare to the highest ranked party (MP).
Source: Adapted from Martinsson & Weissenbilde (2021)

Followingly, the regional CPIX is constructed as:

$$CPIX_{i,t} = \sum_{i=1} x_{i,t} z_i \tag{5.3.1}$$

Where x is the self-reported party affiliation for party i at time t, and z is the climate politics points for party i. This is computed for each region, thus forming a Climate Priority Index for the population in each region. As the index is constructed using how the voters perceive the viability of the respective parties' climate politics, the CPIX merely reflects how voters' perceptions affect the regional performance in potential climate voting. The reason for using the ranking based on the citizens' perception is that the thesis is concerned with how voters behave on an aggregate level. Consequently, it is most feasible to use the citizens' interpretations of the parties' climate politics, as that is what will steer their behaviour.

Figure 5: Light Green to Dark Green Spectrum



Source: Author's own calculations

Instead of using a standard left to right spectrum, the Climate Priority Index transfers to a light green to dark green spectrum. This figure outlines the green spectrum for Sweden between 2006-2018. The values mark the CPIX minimum, mean, and maximum. A value close to 4.3 implies underperformance in Climate Priority index relative to other regions, corresponding to a light green shade. Inversely, a value close to 5.8 means overperformance relative to other regions, corresponding to dark green. In section 7, this will be used to compare the results to the theories which refer to a red to blue political spectrum.

5.3 Methods

The quantitative analysis will have its point of departure in mapping the density of the CPIX on a regional level. This it done to visualize and assert the spatial trends in potential climate voting, as well as observe the developments and persistence in the regions. Each election year – 2006, 2010, 2014 and 2018 – is mapped to visualize the pattern over time. Subsequently, to assert the relationship the explanatory variables have with the CPIX, univariate Ordinary Least Squares (OLS) regressions are first run separately for each independent variable, and in addition, the correlations are calculated. An OLS regression is a linear estimation of the slope coefficients (β) for the variables, in which the sum of the residuals is minimized to find the best linear fit of the data (Dougherty, 2011). For the OLS to be considered the Best Linear Unbiased Estimator (BLUE), the Gauss-Markov assumptions must be met (Appendix B.2).

Table 6: List of Variables

Variable	Units	Role	Theoretical effect on CPIX
CPIX: Climate Priority Index	Points	Dependent	--
Total CO_2 Emissions/capita	Tonnes	Explanatory	Negative
Labour Income per capita	Millions SEK	Explanatory	Positive
Access to Public Transport	Kilometre /citizen	Explanatory	Positive
Environmental Tax	Millions SEK	Explanatory	Negative
Gasoline Price	SEK per Litre	Control explanatory	

Note: The theoretical effects are elaborated on in section 4.3 *Hypothesis Development*

5.3.2 Model I: Generalized Least Squares Regression

The Gauss-Markov assumptions are rather extreme, and there is a high likelihood that they do not hold (Dougherty, 2011). It is discovered that the error terms are homoscedastic, which adheres to the second GM-assumption. However, Serial Correlation in the error term is detected, which implies that a given variable is dependent on itself in a previous observation. Consequently, the third GM-assumption is violated (see Appendix B.2.1). Thus, the OLS will not be BLUE anymore, and there is a need for an alternative model. A Generalized Least Squares (GLS) model is typically used to deal with serial correlation, heteroskedasticity or both (Dougherty, 2011). In cases where the GM-assumptions are violated, GLS becomes BLUE (Dougherty, 2011). Consequently, to estimate the predictive powers of the independent variables, a multivariate GLS regression is performed, where the regions are included as dummies to observe whether there are significantly different effects between the regions.

5.3.3 Model II: Error Component Model with Time Specific Effects

All effects on the dependent variable that are not included in the model appears in the error term ($\varepsilon_{i,t}$). However, some years might have characteristics that affect CPIX, but are not measured by the independent variables. This can be controlled for by using an Error Component Model (ECM) with time specific effects, where the error term ($\varepsilon_{i,t}$) is divided into two components: the stochastic error term ($\mu_{i,t}$), and the time specific effect (γ_t), such that:

$$\varepsilon_{i,t} = \gamma_t + \mu_{i,t} \tag{5.3.2}$$

The important attribute to discover is whether γ_t is endogenous or exogenous with respect to the explanatory variables. If it is exogenous, a Random Effects estimator should be used, but if it is endogenous a Fixed Effects estimator should be used (Dougherty, 2011). As the time specific effect is found to be endogenous, the fixed effect estimator is applied (see Appendix B.3). The ECM thus measures how large the unobserved effects are each year as well as the nature of their relation to the CPIX. This implies that there is no omitted variable bias, as the fixed effects model eliminates that risk. Despite the autocorrelation between γ_t and the explanatory variables, the estimates of the coefficients are consistent, efficient, and unbiased (Dougherty, 2011).

5.4 Limitations

Regardless of careful statistical testing, there are still limitations to the data and the method. Firstly, it is appropriate to examine the dependent variable. The CPIX works merely as an indicator of the proneness to vote for the climate and is not an exact measure. Although each party is weighted by the climate politics ranking, there are various factors that impact an individual's decision to affiliate with a particular political party. These are disregarded in the creation of the CPIX, making it inherently biased. Yet it works as a rough estimate on an aggregate level, contributing to a conducive discussion about climate priority on a regional level. However, acknowledging that the CPIX fails to capture every nuance of the voter's mindset regarding climate politics is important.

The other weakness is that macro-regions are used instead of electoral districts, which would have provided a more detailed picture of the spatial patterns. However, the Statistics Sweden's (2021b) Survey of Party Affiliation is only performed at a macro-level, thus, to obtain annual measures on a regional level, this is the most feasible approach. Regardless, using larger regions still produces insights of the broader spatial trends, which is still an important contribution to the knowledge of spatial patterns in climate voting. Additionally, in Statistics Sweden's (2021b) Survey of Party Affiliation, Central Norrland and Upper Norrland are collapsed into one region, which inhibits observing deviations in the pattern between these two regions. Additionally, as observed in Table 4, the access to public transport in West Sweden decreased dramatically from 2006 to 2010, which is a suspicious result. This might indicate that the measure for access to public transport is insensitive.

A final remark that deserves some elaboration is that there is no data on blank votes or vote abstention. These two instances could have had interesting effects, as they can signal a general discontent, disinterest, indifference, or insufficient information about the national politics. Keeping these limitations in mind, the subsequent section will outline the results.

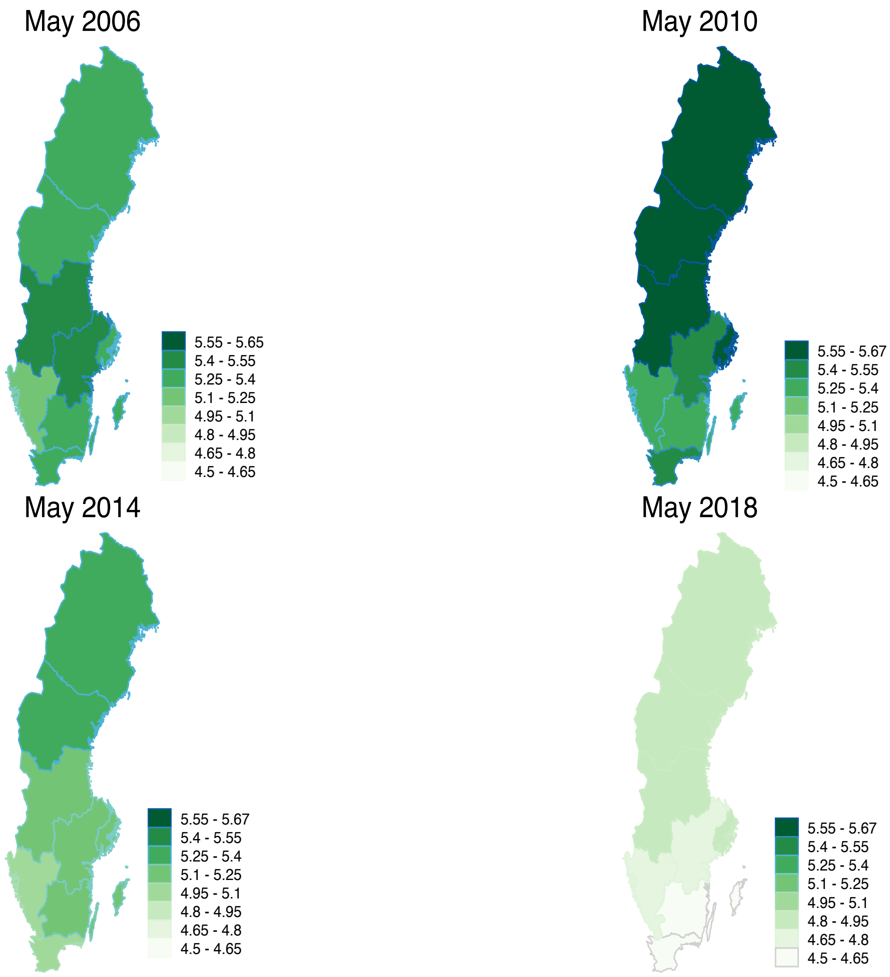
6 Results

The following section will present the results. It is organized in accordance with the research questions: First, the spatial patterns of CPIX is mapped and visualized. Secondly, the influence of the independent variables is estimated and compared, and finally, the evolution over time is explored.

6.2 Exploring Spatial Patterns of Climate Voting

The first strategy applied when visualizing the geographical patterns for potential climate voting is to provide maps for each election year. An interesting observation from is that in 2006, North-and East-Central Sweden the obtains the darkest shade, corresponding to a higher

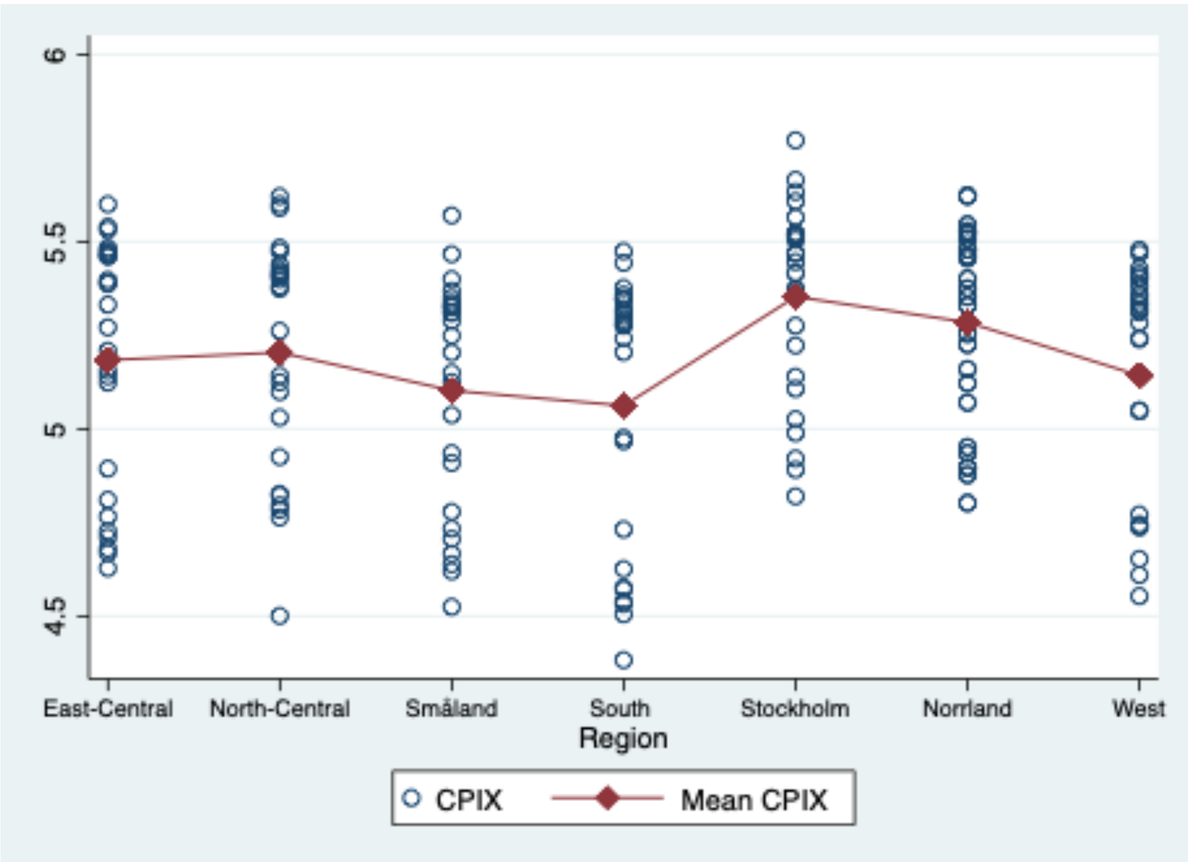
Figure 6: Regional Climate Priority Index, 2006-2018



Source: Author’s own maps, using coordinate data from the European Commission (2021) propensity to vote for the climate, whereas all other regions except West Sweden are on par. In 2010, this pattern has faded, and instead Upper and Central Norrland, North-Central Sweden and Stockholm shows greater potential climate voting, but in 2014, Upper and Central Norrland has the darkest green shade, implying a higher score in CPIX. In 2018, these three regions show an equally high propensity for climate voting.

When examining the potential climate voting for the regions over time, three things are noteworthy. Firstly, the CPIX increases for all the regions from 2006 to 2010, where Stockholm and North-Central Sweden takes the lead, except for East-Central Sweden which maintains its position on the green spectrum. However, between 2010 and 2018, the CPIX gradually decreases. Secondly, in this process it appears that Upper and Central Norrland lags behind, as the region retains the highest score in 2014, before returning to the same level as Stockholm and North-Central Sweden in 2018. Thirdly, South Sweden and Småland are on the same level of CPIX in the first and last observation years, South Sweden scores higher in 2010 and lower in 2014, suggesting a more drastic decline in climate voting for South Sweden.

Figure 7: Heterogeneity in CPIX across Regions



Source: Author's own calculations

These results indicates that, the fall in the CPIX is initiated by the southern regions, primarily South Sweden and Småland. Captivatingly, from 2010 and onwards it appears that a North-South divide starts to emerge.

It also provides insight to look at the heterogeneity in climate voting across regions. Figure 6 displays the mean CPIX for each region between 2006-2018. The distribution of the CPIX demonstrates the variance in the observations. In the observed years, there has been a lack of dramatic differences among the regions. On average, Stockholm retains the highest score, followed by Upper and Central Norrland. These two regions are also the only regions that receives a higher score than 5.3 (See Table C.3, Appendix C) Between the remaining regions, there is little variation in the mean CPIX, although South Sweden clearly performs the worst, and is the only region that scores a mean CPIX below 5.1. The variation in the mean CPIX only ranges between 5.072 and 5.345 across the regions, which indicates that the largest variance in CPIX occurs over time. In Figure 7, the distribution of observations for each region shows the variance over time. The variance, measured by standard deviation, indicates inconsistency over time in potential climate voting. South Sweden is the region in which the standard deviation is the highest, 0.3636, (Table C.3). North-Central Sweden and Stockholm have the lowest standard deviation, 0.2633 and 0.2663 respectively (Table C.3), indicating a higher level of consistency in potential climate voting.

When examining the relationships that the independent variables have on the CPIX in general, some results are surprising. First, the relationship between CO_2-emissions per capita, in all categories, is positive (Table 7). This entails that a higher level of emissions is associated

Table 7: Relationship between CPIX and explanatory variables

Variable	Correlation	Coefficient (OLS)	Units
CO_2 Emissions	0.2769	0.129**	kilos per Capita
CO2 transport	0.3764	0.759**	kilos per Capita
CO2 Industry	0.2671	2.623	kilos per Capita
Labour Income per capita	-0.3428	-5.033**	Thousands SEK
Access to Public Transport	0.0611	0.0009	Kilometre / citizen
Environmental Tax	-0.7438	-0.0005**	Millions SEK
Gasoline Price	-0.3751	-0.934**	SEK per Litre

Note: *, **, *** signifies that the coefficient of determination is statistically significant at the 90, 95 and 99 percent confidence level respectively. The coefficients are the β-estimators from a univariate OLS, with CPIX as the dependent variable.

with a lower CPIX score. However, as displayed in in Table 7, these correlations are relatively weak. The coefficients from the univariate OLS regression are statistically significant within the 95 percent confidence interval, except for access to public transport and CO_2-emissions from industry. The explanatory powers of the coefficients confirm the positive, yet weak, association between the emissions and the CPIX. The coefficient for the total CO_2-emission per capita indicates that an increase of 1 kilo of emissions per capita is related to a 0.129 increase in the expected value of CPIX, keeping all other variables constant. The environmental tax is quite strongly negatively correlated with the CPIX, but an increase in 1 million SEK in environmental tax revenue corresponds to a 0.0005-point decrease in the expected value of the CPIX, which is a small decrease. The price on gasoline is an interesting observation. There, an increase in 1 SEK/Litre is related to a 0.934-point decrease in the CPIX.

The multivariate GLS regression returns more precise results, as the issue with serial correlation is controlled for, thus providing unbiased, efficient results with consistent standard errors. When measuring the associations that the regional level variables have with CPIX, the

Table 8: Cross-Sectional Time Series Generalized Least Squares Regression

Panels: Homoscedastic
Correlation: Panel-Specific AR (1)

N=91
Groups=7
Years=13

CPIX	Coefficient	Std. Errors	z	P > I z I
CO_2 Emissions per capita	7.717***	1.516	5.09	0.000
Labour Income per capita	-0.067***	9.132	-7.37	0.000
Public Transport Access	0.034***	0.01	3.32	0.001
Environmental Tax	0.00003***	0.00001	3.38	0.001
Gasoline Price	-15.512*	7.99	-1.94	0.052
Regions				
North-Central Sweden	0.266***	0.096	2.75	0.006
Småland and Islands	0.231**	0.117	1.96	0.050
South Sweden	-0.135***	0.041	-3.28	0.001
Stockholm	1.266***	0.129	9.77	0.000
Upper and Central Norrland	-7.697***	1.285	-5.99	0.000
West Sweden	0.318***	0.072	4.41	0.000

Note: *, **, *** signifies that the coefficient of determination is statistically significant at the 90, 95 and 99 percent confidence level, respectively.

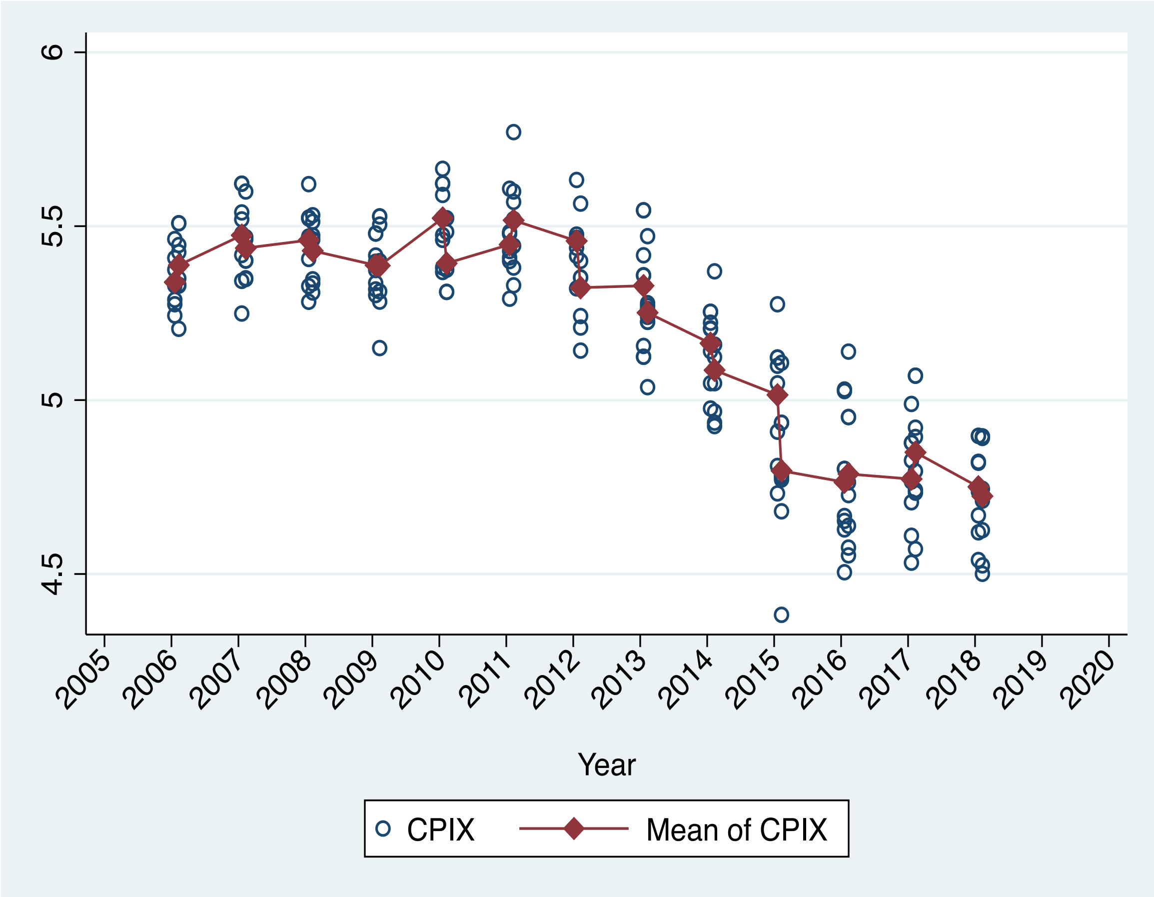
miniscule effect from environmental tax persists. Although it is different from zero, it is by a thin margin. The labour income on a regional level has an overall negative effect; an increase of 1000 SEK per citizen corresponds to a 0.067-point decrease in the CPIX. The access to public transport has an inverse effect: providing one extra kilometre of public transport per citizen and year implies that the expected value of CPIX would increase by 0.034 points. The estimates from regional CO_2-emissions to air per capita and the national gasoline price are somewhat suspicious. One additional kilo of CO_2 emitted per citizen corresponds to 7.72-point increase in the CPIX, which is a considerable change. Likewise, increasing the price on gas by 1 SEK per litre corresponds to a 15-point decline in the CPIX.

When including the regions as dummies in the GLS regression, the differences between the regions are interpreted as different intercepts. In this case, East-Central Sweden is kept constant. The effect from the different regions there is, not surprisingly, a negative effect from South Sweden. However, the peculiar result is for Norrland, which has a strongly negative effect. Stockholm has a pronounced positive effect, confirming that the region has an advantage considering the potential for climate voting. The remaining regions: North-Central Sweden, Småland and the Islands and West Sweden all show a slightly higher potential to vote for the climate compared to East-Central Sweden. These differences are statistically significantly, implying that there are indeed persistent deviations between the regions.

6.3. Exploring the Patterns in Potential Climate Voting over Time

As beforementioned, the changes in the potential for climate voting shows more variation over time. Interestingly, when looking at the heterogeneity in the CPIX across years, it is noticeable that before 2011, the index is relatively stable with a moderate increase. After 2011, however, the mean CPIX decreases continuously until 2018, which has the lowest mean value of 4.73 CPIX points. (Table C.4, Appendix C).

Figure 8: Heterogeneity in CPIX across years



Source: Author's own calculations

Interestingly, when examining the correlations between the CPIX and the independent variables, after 2011 it shifts from a negative to a positive relationship or vice versa for all but labour income per capita and access to public transport (Table 9). The shift in the relationships may, however, be because the CPIX went from moderately increasing before 2011 and a relatively sharp decrease after, whereas the other variables have changed continuously in either direction.

Table 9: Correlation between CPIX and explanatory variables, pre and post 2011

Variable	Correlation before 2011	Correlation after 2011	Difference
CO_2 Emissions per capita	-0.4512	0.2316	**+0.6828**
CO2 transport	-0.5625	0.3815	**+0.9440**
CO2 Industry	-0.3987	0.2810	**+0.6797**
Labour Income per capita	-0.2083	-0.2856	-0.7730
Access to Public Transport	0.1854	0.0688	-0.1166
Environmental Tax	0.0972	-0.7158	**-0.8130**
Gasoline Price	0.0796	-0.0698	**-0.1494**

Note: When the differences are in bold, it signifies a sign shift from negative to positive or vice versa.

To establish if there are factors that effects the CPIX, besides what is measured by the independent variables, the time specific fixed effect model is applied. The model thus measures how large the unobserved effects are each year, and the nature their relation to the CPIX. The first noticeable result is that the coefficients are generally much lower, plausibly because the fixed effects model eliminates the omitted variable bias. However out of the coefficients for the independent variables, the only statistically significant result is for price on gasoline. An increase in the price on gas by 1 SEK per litre is now estimated to correspond to a 0.039-point increase in the CPIX. The effect from labour income per capita and access to public transport becomes minuscule, but remains positive, whereas environmental tax is now negative, but the explanatory power is so low that is can almost be considered zero. CO_2-emissions still have a large predictive power; however, this is not statistically significant.

Table 10: Time Specific Error Component Model

R^2
Within: 0.9251
Between: 0.1005
Overall: 0.7747

N=91
Groups=7
Years=13

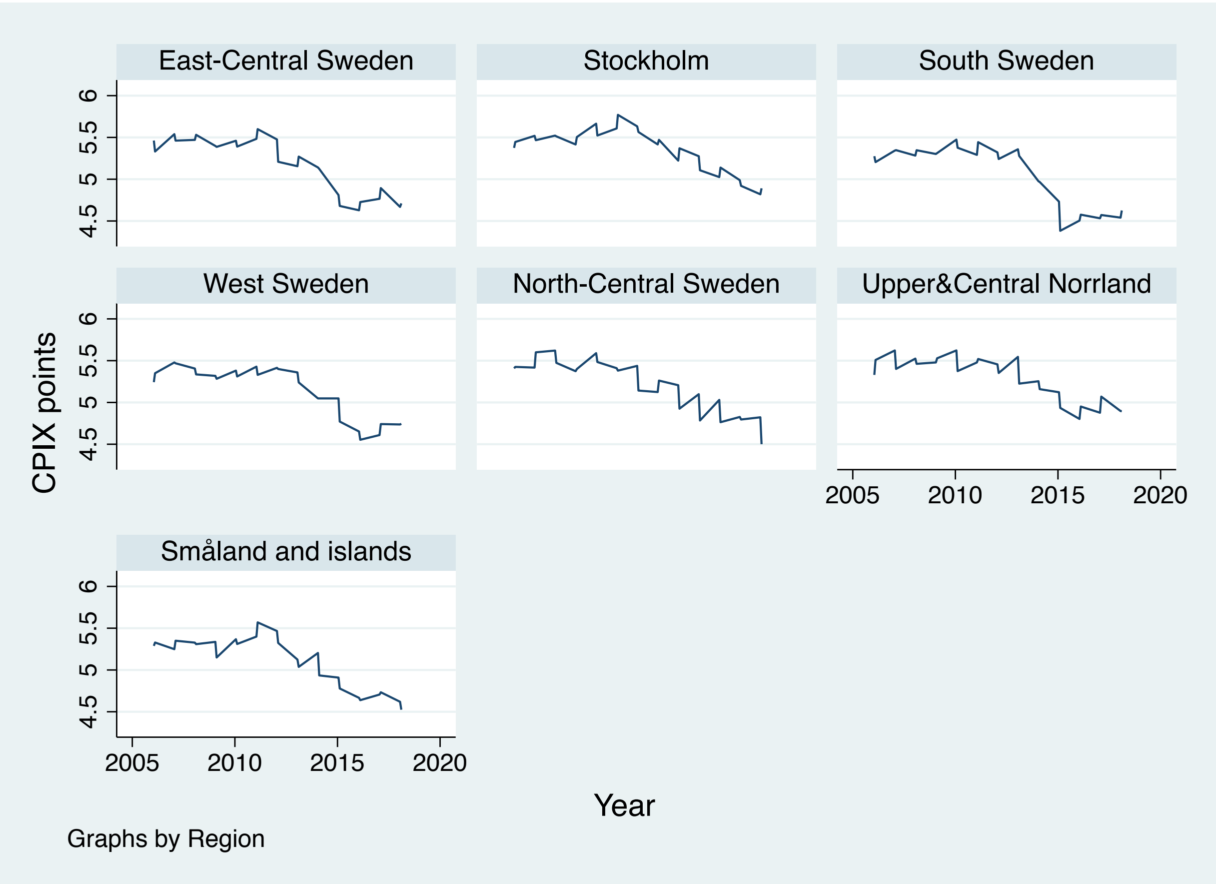
CPIX	Coefficient	Std. Errors	t	P > I t I
CO_2 Emissions per capita	0.127	4.83e-07	0.60	0.550
Labour Income per capita	0.00002	235.057	0.63	0.532
Public Transport Access	0.00014	0.001	0.33	0.742
Environmental Tax	-0.00005	0.036	1.11	0.271
Gasoline Price	0 .039***	0.00002	-3.30	0.002
Year				
2007	0.172***	0.053	3.25	0.002
2008	0.194***	0.052	3.72	0.000
2009	0.237***	0.055	4.31	0.000
2010	0.476***	0.066	7.24	0.000
2011	0.185**	0.074	2.49	0.015
2012	0.168	0.110	1.54	0.129
2013	0.024	0.103	0.23	0.818
2014	-0.227	0.149	-1.53	0.130
2015	-0.085	0.064	-1.32	0.190
2016	-0.010	0.061	-0.16	0.873
2017	[omitted]	-	-	-
2018	[omitted]	-	-	-

Note: *, **, *** signifies that the coefficient of determination is statistically significant at the 90, 95 and 99 percent confidence level, respectively.

Keeping 2006 constant, the largest time specific effect is found in 2010, where it is positive, and the effect corresponds to a 0.476-point increase in the CPIX. This implies that, in 2010, something outside the model occurred which had quite a large effect on the CPIX. From 2014 and onward, the effect not measured by the independent variables has a negative impact on CPIX. 2014 is the year in which the unobserved negative effect is the largest, corresponding to a 0.227 decrease in the CPIX.

Even though the pattern of CPIX across the regions is resemblant, is evident from Figure 9 that there are variations. The clear outlier is South Sweden, where a sharp fall occurs between 2012 and 2016, a pattern which is difficult to group together with the other regions. As a contrast, the pattern North-Central Sweden and Norrland is relatively linear and demonstrates a steady decrease. Another remarkable observation is that Stockholm and Småland have similar patterns, resembling an inverted V-shape. Similarly, East-Central Sweden and West Sweden has comparable developments. The two latter results are noteworthy as these regions are not border-connected

Figure 9: CPIX over time, sorted by region



Source: Author's own calculations

It is also interesting to note that most regions had an increase, or at least a stability, in the CPIX until around 2011-2012, where it fell to a varying extent among the regions. The exception to this is North-Central Sweden, where there has been a continuous decrease. After this thorough review of the results, it is appropriate to compare it to previous findings.

7 Discussion

The following section serves to connect the results to the analytical framework and the literature, in pursuance of formalizing similarities in the spatial patterns. The section will be organized around the research questions: Firstly, the explanatory powers of the independent variables will be discussed and connected to the previous research. Secondly, how the patterns have evolved over time is compared to the previously found voting patterns in Sweden. Lastly, the section concludes with a discussion of how the insights from electoral geography, voter's behaviour, and collective action might explain the regional trends.

7.1 Unexpected and Ambiguous: The influence of contextual factors

The relationships and explanatory powers of the independent variables, have in many regards been surprising. Before properly scrutinizing these results, it is appropriate to recall the three hypotheses connected to this. Firstly, it was predicted that regions with low levels of CO_2 emissions per capita and high income per capita will be more likely to support climate politics. Secondly, as several scholars found that improved access to public transport increased the acceptability of climate change mitigating policies it was anticipated that regions with better access to public transport is more likely to support climate politics. Thirdly, environmental taxation was expected to have a negative effect on the potential climate voting due to being a coercive measure and by the mechanisms of opportunity cost neglect.

Cragg et al. (2013), found that lower of levels CO_2-emissions per capita and higher levels of income per capita was associated with a higher likelihood to vote in favour of climate regulation. Thus, it was expected to find a similar pattern in this study. However, scrutinizing CO_2-emissions there is a panoptic positive explanatory effect from the models. The positive effect from regional CO_2 emissions implies that, unexpectedly, regions which are more carbon intensive show a higher propensity to vote in favour of climate politics. Intriguingly, Stockholm which is second to least carbon intensive region with the highest income per capita (Figure C.1, Table 3) has throughout the study shown one of the highest potential climate voting. This trend is both visualized in Figure 6 and confirmed by the GLS regression (See Table 8). Thus, for Stockholm, Hypothesis I can be confirmed, however this corroboration does not extend to other regions. Upper and Central Norrland, which from 2010 an onwards has competed with Stockholm for the first spot has the lowest CO_2-emissions per capita, but also the lowest income levels. Captivatingly, Småland and to a lesser extent South Sweden, are partially coherent to hypothesis I as the two regions have high emissions per capita but scores low on the CPIX, at the same time as the income levels are in the bottom half. Contrarily, North-Central Sweden has an inverse relationship.

According to Eriksson, Garvill and Nordlund (2008) and Jagers and Hammar (2009), increased efforts to mitigate climate change are expected to be more acceptable among the Swedes if access to public transport is improved. Consequently, it was expected that regions with a better access to public transport would be slightly more prone to support climate politics. This hypothesis cannot be confirmed with certainty. Inspecting the results from the both the GLS and the ECM, the regional level access to public transport is positively associated to the CPIX. However, its predictive power is low, especially in the ECM where its effect is almost zero. Stockholm is, indisputably, the region with the best access to public transport, which supports hypothesis II. However, this is where the cohesiveness ends. Upper and Central Norrland and South Sweden has comparable access to public transport but are polar opposites in climate voting. Gasoline price was mainly used as a control variable; however, it was also believed to be negatively associated with the potential climate voting, especially in the regions where access to public access is poor. The regions with the worst access to public transport are North-Central Sweden, East-Central Sweden and Småland. These regions are scattered on different positions on the green spectrum. The general effect from gasoline price is ambiguous, with a large negative explanatory power from the GLS and a low positive effect in the ECM. Consequently, no clear conclusion can be drawn.

Similarly, climate taxation was presumed to have a negative impact on potential climate voting. This is mainly due to two things: Firstly, coercive measures, such as taxation, are typically perceived as less acceptable compared to noncoercive measures (Drews & van den Bergh, 2016; Jagers & Hammar, 2009; Lucas, 2017). The second dynamic is opportunity cost neglect. Opportunity cost neglect arises when the public favours measures, with smaller financial implications for the individual, but that are costlier in aggregate terms (Lucas, 2017). The connection to potential climate voting might seem vague, but there is a consensus among policymakers that environmental taxes are the cheapest and most effective way to mitigate climate change at the speed and scale necessary (Weitzman, 2015). However, in all the models, the explanatory power of environmental taxation has been almost non-existent, and thus, no evidence is found in support of hypothesis III.

Consequently, with the evidence presented, no hypothesis stated in section 6.3 can be confirmed in its entirety so far. Hypothesis I. holds relatively well to Stockholm but cannot be generalized for other regions. However, some results have been compelling. Firstly, Stockholm stands out again. As re region has the high climate voting propensity and the best access to public transport, it is coherent to Hypothesis II. On a general level access to public transport does not appear to explain potential climate voting to any considerable extent. Price on gasoline is ambiguous in its explanatory power and, finally, environmental taxation has not been found to have any impact on climate voting on a regional level.

The deviations from the expected connections are curious, and consequently, deserve attention. The first plausible explanation pertains to the data. The CPIX is a somewhat rough estimate. It works well to outline the trends, but there are many factors that affect political preferences that a more sophisticated measure potentially would be able to capture more nuance. Additionally, the data for environmental tax and access to public transport might not reflect the effects intended by the theories. Environmental tax is measured in government revenue, thus affected both by the tax rate and the level of consumption. For access to public transport, a proxy is used, followingly, it is possible that it fails to precisely capture access to public transport. Another option is that the model specifications do no manage to reflect the actual patterns in the data. Contrastingly, it might be the case that the theories do not explain the found patters because they need updating. However, it is possible that something entirely different disturbs the expected connections: the entry and growth of SD. The party is overrepresented in the south (Michaud et al. 2021; Sannerstedt, 2017) and scores the lowest climate points, plausibly causing the southern regions to pioneer the downturn. After a thorough review if the evolution and persistence of the spatial patterns in the subsequent section, this argument will be continued in section 7.3.

7.2 Patters and Persistence: Regional Evolution in CPIX

In terms of the solid geographical voting patterns for Sweden, there are some prominent factors. Firstly, there has been a persistent North-South divide in Sweden for electoral turnout (Oscarsson & Holmberg, 2008). Secondly, there is also a persistent urban to rural divide (Hagevi, 2011; Oscarsson et al. 2018; Oscarsson & Holmberg, 2008). Thirdly, the general optics of electoral turnout have been stable in the long run; since 2002, there has been four politico-cultural communities in Sweden: The North, Urban, Rural South and Far South

(Michaud et al. 2021). These previously found trends will be compared to the patterns of potential climate voting to explore the validity of the fourth hypothesis: the North-South divide is expected to persevere to a lesser extent, and primarily pioneered by the southern regions.

Nationwide, the CPIX has been everything but stable, contrarily, the potential for climate voting has plummeted. This translates to regional level, although some regions show persistence. For instance, from Figure 6 it is possible to note that, except for 2010, Stockholm and Upper and Central Norrland follow each other's pattern and relative to other regions, they keep their status. Remarkably, concerning potential climate voting, it appears that the North-South divide have emerged during the beginning of the period. In the first year of observations, 2006, the longitudinal division was not clear, more specifically, the North and South were placed in the middle of the green spectrum, and North-and East-Central Sweden had a more distinct dark green placement. However, looking at 2010 and onward, a rather pronounced North-South divide surfaces, with Stockholm developing alongside the North. Here, the North and Stockholm is persistently more prone to vote for the climate, whereas the South is less so. Considering Hypothesis IV, it is a relatively reasonable anticipation. Indeed, the decline has been pioneered by the southern regions. Regarding the development in Stockholm, although it lacks clear deviation, it is unexpectedly parallel to the Northern regions.

Some parallels can be drawn between the spatial development of the potential climate voting and the politico-cultural communities found by Michaud et al. (2021), however, only quite vaguely so. Placing South Sweden in the Far South community, it is possible to see that that the development for South Sweden has been astonishingly rapid, but that Småland and the Islands, considered Rural South, has caught up (See Figure 6 & 9). The Northern Community would correspond to Upper and Central Sweden and North-Central Sweden, which, as mentioned, maintains one of highest propensities to vote in favour of climate politics. The Urban community is much more difficult to detect, as only Stockholm has a high share of urban population. But Stockholm, with its metropolitan characteristics, still makes a candidate for the urban community.

Consequently, the spatial patterns for potential climate voting in Sweden does not perfectly correspond to the regional voting patterns found by Michaud et al (2021) and Oscarsson et al. (2018), although there are clear similarities. The most compelling result is that the North-South divide which persistently has been observed in Sweden, appears to have started to emerge after 2010 in terms of climate voting. Hence, it is appropriate attempt explaining these developments using the mechanisms of electoral geography, voter's behaviour, and collective action.

7.3 Explaining the Patterns: Reference Point, Interdependence, and Collective Action

There are mechanisms that could help to explain some potential underlying reasons for the persistence. The first is related to what Feinberg et al. (2017) refer to as a political reference point. Accordingly, when determining where to place themselves on the green spectrum, the individual will adjust themselves to those around them, and consequently, there are a certain level of stickiness to how the regions develop relative to each other in terms of the CPIX. Feinberg et al. (2017) make another valid point that is applicable in the case of potential regional climate voting in Sweden: Social pressure to conform to the dominant political beliefs in the location of residence. This would entail that the green political reference point becomes increasingly rigid. There is a clear parallel between this and Page's (1977) statement of interdependence, implying that a voter's preferences are connected to another's, thus this could plausibly explain how some regions, for instance Upper and Central Norrland, has had a continuous and slower decrease in the CPIX, while South Sweden has had a dramatic plummet. Cox's (1969) neighbourhood effect also serves well, which also implies that the voter is influenced by their social networks.

Since 40 percent of the population in the Stockholm region resides in a metropolitan area, the observed deviations the pattern for Stockholm could be explained by the statement by Kovalcsik and Nzimande (2019) that urban voting behaviour tends to divert from trends in non-urban or rural areas. Kovalcsik and Nzimande (2019) highlight that this can, partially depend on people with similar preferences deciding to move to urban areas. Further, since a metropolitan area typically is a heterogenous setting, the mechanism in which social interaction influence the voter's behaviour is intensified (Kovalcsik & Nzimande, 2019). Additionally, voters' preferences often change in accordance with their social networks, a process which through the lens of electoral behaviour, is intensified in metropolitan areas. Hence, this could partially explain why Stockholm remains one shade darker green that the bordering regions.

Apart from sticky political reference points and enhanced neighbourhood effect in urban areas, there are one last thing that is useful to explain the drop in CPIX. Mitigating climate change is often recognized to be suffering from a collective action problem (Grasso, 2004; Weimann et al. 2019), and so is political participation (Kanazawa, 2000). As the voter has only one vote to cast in the national election, to maximize utility a voter prefers to place the vote where it makes the most desirable impact (Kanazawa, 2000). Hence, the voter's cost becomes the vote. The collective action problem with climate politics is that within the democratic context a large support for climate politics is required to mitigate emissions, at the same time as the benefits from the mitigation effects are very small for the individual today. Kanazawa (2000) also finds that citizens who abstain from voting yet support the winning party and those that vote for the losing party are slightly less likely to vote in following election (Kanazawa, 2000). This could be translated into the green spectrum. If low climate voting is considered abstaining from voting, not seeing enough progress decreases the sense of political usefulness, causing the voter to be less likely to continue to support climate politics. This could partly explain the incessant decrease in the propensity to vote for climate politics.

There are however, as measured in the ECM, factors that have had an impact on the CPIX but that are not accounted for in the model. More specifically, there was large positive effect in 2010, and a large negative impact in 2014. In these years, some exogenous occurred shock that had a larger explanatory power than the variables in the model. What these shocks might consist of is not investigated, but one can speculate that the growing support for SD during the increased immigration in 2014-2015 could have caused the change as SD has very low climate politics score. In Figure 2, it is also displayed that the question of integration and immigration has grown in importance among voters, especially between 2014-2015, further lending support to the idea. Thus, the identified patters of the southern regions as pioneering the downturn, are probable to be highly influenced by the advance of SD since their entry in 2010. Additionally, it is unlikely to be a coincidence that this is the year in which the North-South divide in potential climate voting commenced. This might indicate that winds of opinion and contemporary events influence the voter's behaviour to a large extent.

8 Concluding remarks

8.1 Research Aims and Objectives

The parliamentary election in Sweden is approaching fast and without the public's support, the room for politicians to implement efficient climate politics becomes limited. By the creation of the CPIX, this study has provided the research community with an index of voters' climate political preference on an aggregate level. There are, ominously, indications that public support for climate politics has been waning. As democratically elected leaders depend on votes to remain in power, they are incentivized to obey by the will of the public. Thus, the troubling consequence of declining public support for climate politics is that politicians might be reluctant to implement climate policy. In light of the election in September, the study has aimed to visualize the evolution of aggregate potential voting patterns for climate politics on a regional level and explore the influence of contextual factors. Subsequently the study set off to examine how the patterns have evolved over time and reveal when the slow-down in potential climate voting started.

In pursuance of answering the research questions, some results have been particularly noteworthy. First, it becomes evident that around 2011, the Climate Priority Index start to dramatically fall. Without insinuating causality, it is noticed that this coincides with SD entering the parliament in 2010 (Michaud et al. 2021). With that observation in mind, it can be concluded that none of the hypotheses can be confirmed in their entirety. CO_2 emissions per capita on a regional level is, astoundingly, positively related to the potential climate voting. However, Stockholm adheres well to hypothesis I as the region has both the highest income per capita and the second lowest emissions per capita, but this result is not generalizable for the remaining regions. For the other explanatory variables, only ambiguous relationships are found. Climate taxation and the price on gasoline are unexpectedly, not found to discourage potential climate voting.

Exploring how the spatial evolution has shaped the patterns provided some insight. First, there is a resemblance to the North-South divide, but not until 2010. Also, Stockholm, a largely metropolitan region stands out with a higher propensity to vote for the climate. The southern regions appear to pioneer the decline, which conforms to Hypothesis IV. The regional divide and the regions' respective positions seem to be relatively persistent, which can be partially explained by various mechanisms. First, the tendency among voters to conform to the political reference points in their region is coherent to the development. Secondly, interdependence and the neighbourhood effect possibly enhance the adherence to a reference point. Lastly, a collective action problem is likely to have contributed to the nationwide decline in the propensity to climate vote.

8.2 Practical Implications

In a democratic context, public support is needed to implement the much-needed climate policies. In the absence of such support, even ambitious climate politicians might find themselves with their hands tied. Regarding what contextual factors that drive the waning of support on a regional level, not much clarity has been provided. Such insight could have guided politicians towards topical focus areas which could have aided increased acceptability of climate politics. Despite the somewhat disappointing results, these findings are not impractical.

The discovery of a lack of association is also important for understanding what the mechanisms for climate voting, or maybe more adequately, what the mechanisms are not. However, deepening the understanding of the spatial fluxes and trends over time is far from useless. The study has provided an aggregate knowledge of voter's propensity to vote for the clime on a regional level over time, in turn useful to understand the regional political reference points.

The absence of explanatory effects from the included variables and the evident unobserved shocks occurring in specific years lead the line of thought in an alternative direction. It appears that the entry and growth of SD, coupled with the increased interest in immigration and integration, is highly associated with the plummet of the Climate Priority Index. This indicates that the winds of opinion and the public's awareness of certain issues can dictate voters' behaviour, in turn the extent of media coverage, can potentially be powerful for the public support for climate politics. These dynamics have only been speculated upon in this study. In pursuance of further explaining the underlying mechanisms for what drives voters to support climate politics investigating the sensitiveness of public opinion and what role media coverage of contemporary events has in opinion creation is of relevance for future research. The upcoming election in Sweden is dawning, and it yet stands to see whether the public lends the support required to efficiently, once and for all, curb climate change.

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Appendices

Appendix A: Background

Table A.1: Questions asked by the Swedish Society for Nature Conservation

	V	S	MP	C	L	M	KD	SD
1. Klimatskadliga subventioner	green	grey	green	green	green	green	green	red
2. Förändrade reseavdrag	green	grey	green	green	green	red	green	grey
3. Flygets miljökostnader	green	green	green	green	green	green	green	red
4. Exportkrediter	green	grey	green	green	green	red	green	red
5. Konsumtionsbaserade utsläpp	green	green	green	red	green	red	red	grey
6. Klimathandlingsplaner	green	green	green	green	green	green	grey	red
7. Skydda värdefulla skogar	green	green	green	red	green	red	red	red
8. Översyn av skogspolitiken	green	red	green	red	green	green	green	grey
9. Mineralutvinning i naturskyddade områden	green	red	green	red	green	red	red	red
10. Ekologiskt jordbruk	green	green	green	green	red	green	green	red
11. Miljöavgift på växtskyddsmedel	green	green	green	grey	green	red	grey	red
12. Miljöersättnignar till betesmarker	green	green	green	green	green	red	green	green
13. Marint skydd	green	green	green	red	green	red	green	red
14. Begränsa bottentrålning	green	green	green	red	grey	green	red	red
15. Återvinning av plast	green	green	green	green	green	green	green	red
16. Information om varors kemikalieinnehåll	green	green	green	green	green	green	green	green
17. Ägardirektiv till statliga bolag	green	green	green	green	green	green	green	red
18. Stärk miljöbalken	green	red	green	red	green	green	green	grey

Source: Swedish Society for Nature Conservation (2018)
Note: a green circle implies "yes", a grey circle implies "don't know", and a red circle implies "no".

1) Environmentally damaging subsidies, 2) Change in travel deductions, 3) the environmental costs of aviation, 4) the export credits, 5) Consumption-based emissions, 6) Climate Action Plans, 7) Protect valuable forests, 8) Review the forest politics, 9) mineral extraction in protected areas, 10) Organic agriculture, 11) Environmental fee on pesticides, 12) Environmental compensation for pastures, 13) Marine Protection, 14) Limit trawling of sea-beds, 15) recycle plastics, 16) Information about the chemical contents of consumer goods, 17) Ownership directives for state-owned corporations, 18) Strengthen the environmental law (Authors own translation)

Table A.2: The most important issues according to the Swedish citizens, in percent

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Law and order	17	15	15	16	10	9	6	7	7	4	5	12	17
Health Care	27	29	**25**	**24**	24	26	24	23	28	33	24	29	37
Integration/immigration	15	15	14	13	15	19	14	20	22	27	**53**	**45**	**43**
Climate change	12	15	23	24	23	15	15	14	13	12	11	9	10
Education	19	24	21	22	21	26	25	24	30	**40**	29	34	30
Social issues	11	12	15	11	11	16	17	14	14	12	12	12	15
Elderly	20	16	14	16	13	14	17	16	17	18	13	14	14
Labour market	**34**	**46**	23	22	**38**	**35**	**30**	**38**	**33**	24	21	13	9
Democracy	5	4	5	4	4	4	3	3	3	4	3	3	5
Economy	6	6	8	17	14	8	15	11	7	7	7	6	4
Taxes	9	7	5	4	5	4	3	3	3	2	3	2	3
Family politics	7	7	7	6	6	4	5	4	4	3	3	2	3
Housing and contruction	1	2	2	2	1	2	3	3	4	3	7	6	5
Governance	3	2	1	1	1	1	1	2	2	2	3	2	2
Foreign politics	3	1	2	1	1	2	2	1	1	4	3	4	3
Number of respondents	3499	3336	3435	3259	4926	5007	4720	6289	6688	3431	4829	4908	5344

Note: Response to the question "Which question(s) or issues do you think is the most important for the society today?". The question is open, and the respondent can answer maximum three questions. The table presents the 15 largest categories, in percent of people perceiving them as *the most* important. The numbers in bold represent the most important category that year.
Source: The National SOM-Survey, Martinsson and Andersson (2022)

Appendix B: Statistical Specifications

B.1 Ramsey Regression Equation Specification Error Test (RESET)

Both OLS and GLS are designed to find the best linear fit of the data. However, However, it might be optimistic to assume that all variables have a strictly linear relationship to the dependent variable, which is why a Ramsey Regression Equation Specification Error Test (RESET) is performed, using powers of the fitted values for CPIX, detect possible non-linearities in the model (Dougherty, 2011). Under the null hypothesis (H0) that there is no misspecification, probability > F = 0.000, which implies that the H0 is rejected, and that the data is non-linear. Thus, a regression including the first and second order polynomials of the fitted values ($\widehat{CPIX}$) is run:

$$CPIX_t = \beta_1 + \beta_2 x_{1,t} + \beta_3 x_{2,t} + \beta_4 x_{3,t} + \beta_5 x_{4,t} + \beta_6 x_{5,t} + \beta_7 \widehat{CPIX}^2 + \beta_8 \widehat{CPIX}^3 + \varepsilon_t \quad \text{(B.1.1)}$$

Where β is the slope coefficient, x_1 i= the total CO_2- emissions per capita, x_2 = Labour income per capita, x_3 = Access to public transport, x_4 = environmental tax and x_5 = Price on Gasoline. t indicates time in years (t=1, …,13). Subsequently, a Ramsey RESET is performed a second time, returning a Probability > F = 0.262, implying that the H0 cannot be rejected, and the model is correctly specified (Dougherty, 2011). In subsequent regression models, the powers of the independent variables are included.

B.2 Gauss-Markov Assumptions

Under the Gauss-Markov (GM) assumptions, the OLS estimators of β are consistent, efficient, and unbiased, with consistent standard errors, implying that running inference will be accurate. There are three GM-assumptions when using time series factors: exogeneity, homoscedasticity, and no autocorrelation.

$$E\left(\varepsilon_{i,t} \middle| x_{1,1}, \ldots, x_{k,T}\right) = 0 \quad \text{(B.2.a)}$$

This implies that the error term is exogenous with respect to the independent variables. Thus, the expected value of the error term given the explanatory variables is zero. The second assumption concerns homoscedasticity:

$$Var(\varepsilon_{i,t} | x_{1,1}, \ldots, x_{k,T}) = \sigma^2 \quad \text{(B.2.b)}$$

This implies that the variance of the error term given the independent variables is constant. The third GM assumption concerns autocorrelation in the error term:

$$cov\,(\varepsilon_t, \varepsilon_s) = 0 \qquad for\ t \neq s \quad \text{(B.2.c)}$$

This implies that there should no correlation between the error term at time t and some earlier time s. This violation is also referred to as serial correlation. Thus, no variable at time t should be dependent on itself at time t-s. If these assumptions hold, the OLS is BLUE; Best Linear Unbiased Estimator (Dougherty, 2011).

B.2.1 Testing the Gauss-Markov Assumptions

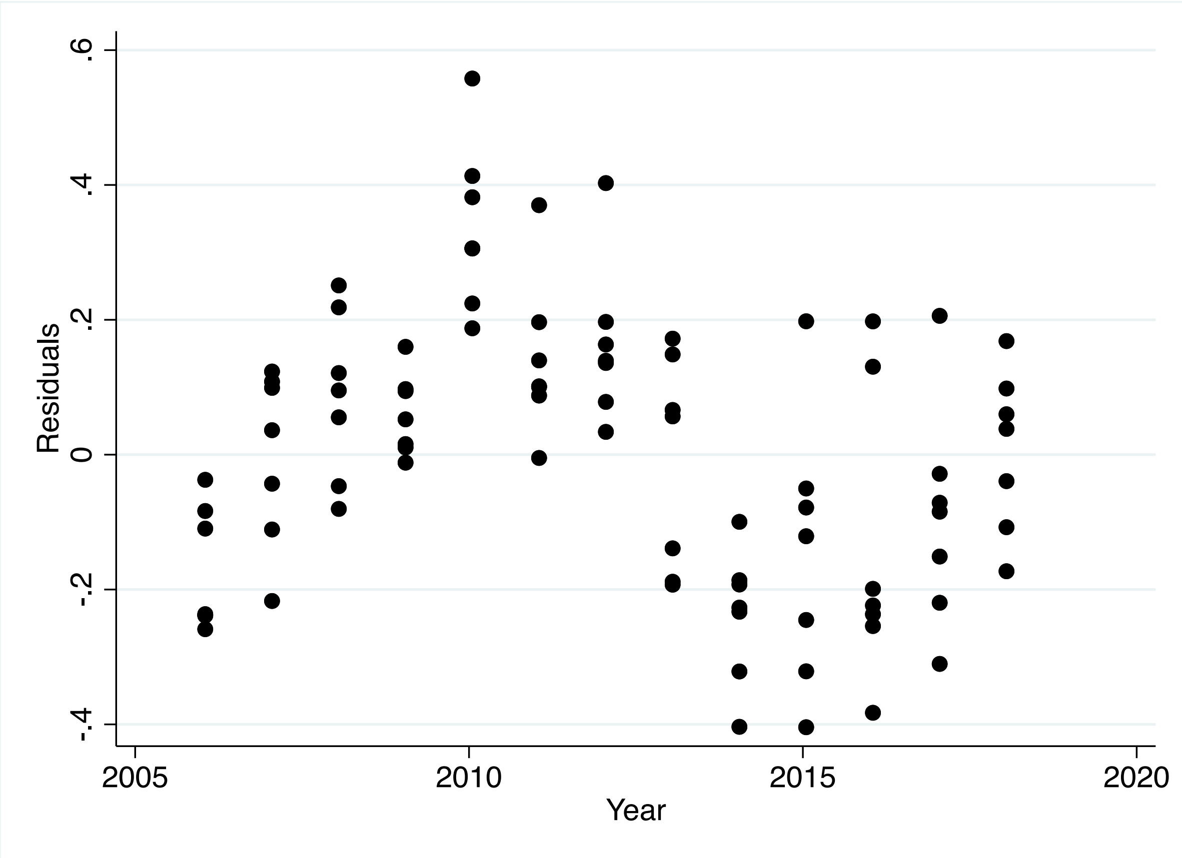
Consequently, there is a need to test for heteroskedasticity, endogeneity and serial correlation. First a Breusch-Pagan test is performed, with the null hypothesis (H0) that the variance is constant. The test result is that Prob> chi-squared = 0.5253, meaning that the H0 cannot be rejected, which indicates homoscedastic errors. When performing a Bias-corrected Born and Breitung test to detect Serial Correlation, implying that a given variable is dependent on itself in a previous observation under the H0: No serial correlation up to order p, it returns a P-value = 0.000, implying that the H0 is rejected, which indicates that there is serial correlation in the error term. I tested for 1 time lag, corresponds to an AR(1) process. This is confirmed by the cyclical distribution of the residuals against time in Figure B.2.1.

The AR(1) process looks like:

$$CPIX_{i,t} = \beta_1 + \rho_1 CPIX_{i,t-1} + \varepsilon_{i,t} \quad \text{(B.2.1.a)}$$

Such that CPIX for region *i* at time *t* depends on CPIX for region *i* at time *t-1*. To take an example, the GDP in a country does not vary randomly from year to year, but to some extent ρ it depends on the GDP the preceding year(s) (Dougherty, 2011). When testing for panel specific autocorrelation using Pearson's correlations, it returned a correlation of = -0.7867. This implies a relatively strong negative correlation within the panel, leading me correct for panel specific serial correlation in the GLS model.

Figure B.2.1: Scatterplot of CPIX Residuals across Time



In figure B.2.1, it is evident that the variance in the residuals (the estimated error term) is relatively constant over time, confirming that the errors are homoscedastic. However, the cycles in the residuals indicate the prevalence of Serial Correlation in the error terms (Dougherty, 2011).

B.3. The Error Component Model with Fixed Effects

In the Error Component Model with time specific effect, the error term is divided into two components: the stochastic error term ($\mu_{i,t}$) and the time specific effects (γ_t) such that:

$$\varepsilon_{i,t} = \gamma_t + \mu_{i,t} \tag{B.3.a}$$

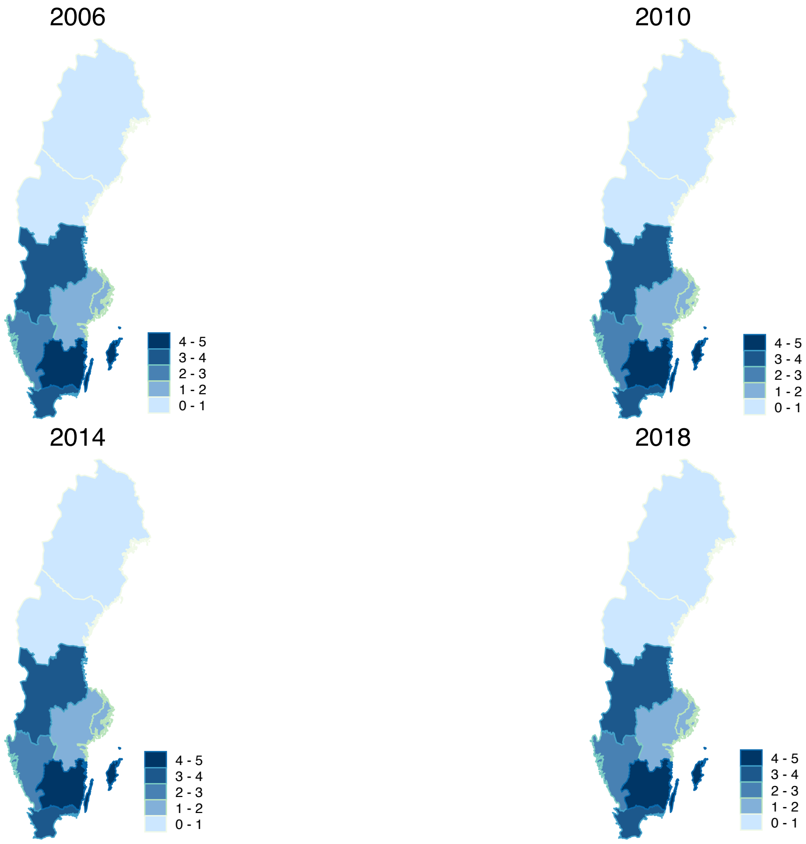
where γ_t is the time specific effect. The important attribute to discover is whether γ_t is endogenous or exogenous with respect to the explanatory variables. If it is exogenous, a Random Effects estimator should be used, but if it is endogenous a Fixed Effects estimator should be used (Dougherty, 2011). This is tested using a Hausman test, under the null hypothesis that the difference in the coefficients is not systematic. The Hausman test returned a Prob>Chi-Squared = 0.4859, which means that I fail to reject the null-hypothesis and a Fixed Effect estimator should be applied. My Time Specific Fixed Effects Model thus becomes:

$$CPIX_{i,t} = \alpha + \gamma_t + \sum_{k=1}^{t,n} \beta_k x^*_{k,i,t} + \mu_{i,t} \qquad \text{(B.3.b)}$$

Where k = 1, …, 5, t= 1, … 13 and i = 1, …,7, β is the slope coefficient, x_1 = the total CO_2-emissions per capita, x_2 = Labour income per capita, x_3 = Access to public transport, x_4 = environmental tax and x_5 = Price on Gasoline. The asterisk implies that the non-linearities in the data is controlled for.

Appendix C: Descriptive Data

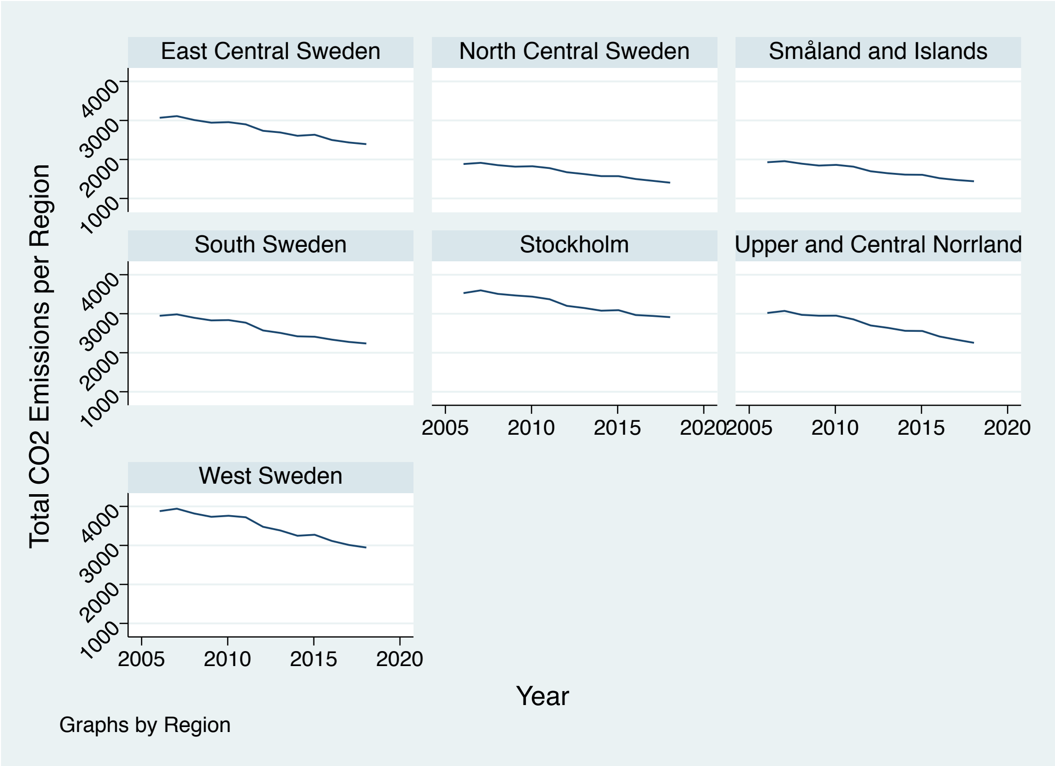
Figure C.1: Map of CO_2-emissions per capita 2006-2018



Note: Using quintiles, the results are relative to the other regions' performance

The persistence in the carbon intensity among the regions is evident. All regions have maintained their ranking throughout the period.

Figure C.2: CO_2- emissions per region



The CO_2-emissions have declined in all the regions. The region with the sharpest decline in total CO_2-emissions is West Sweden, but it important to note that the region also started at a higher level.

Table C.1 : Labour Income per Capita

Region	2006	2010	2014	2018
Upper and Central Norrland	111.42	122.18	134.98	145.90
North-Central Sweden	163.42	181.77	204.15	228.91
East-Central Sweden	167.39	186.71	208.63	233.33
Stockholm Country	200.42	223.87	249.02	281.00
Småland and the Islands	162.92	181.94	203.69	227.58
West Sweden	171.57	191.04	215.46	244.77
South Sweden	164.74	181.46	206.59	231.62

Source: Adapted from Statistics Sweden (2022)

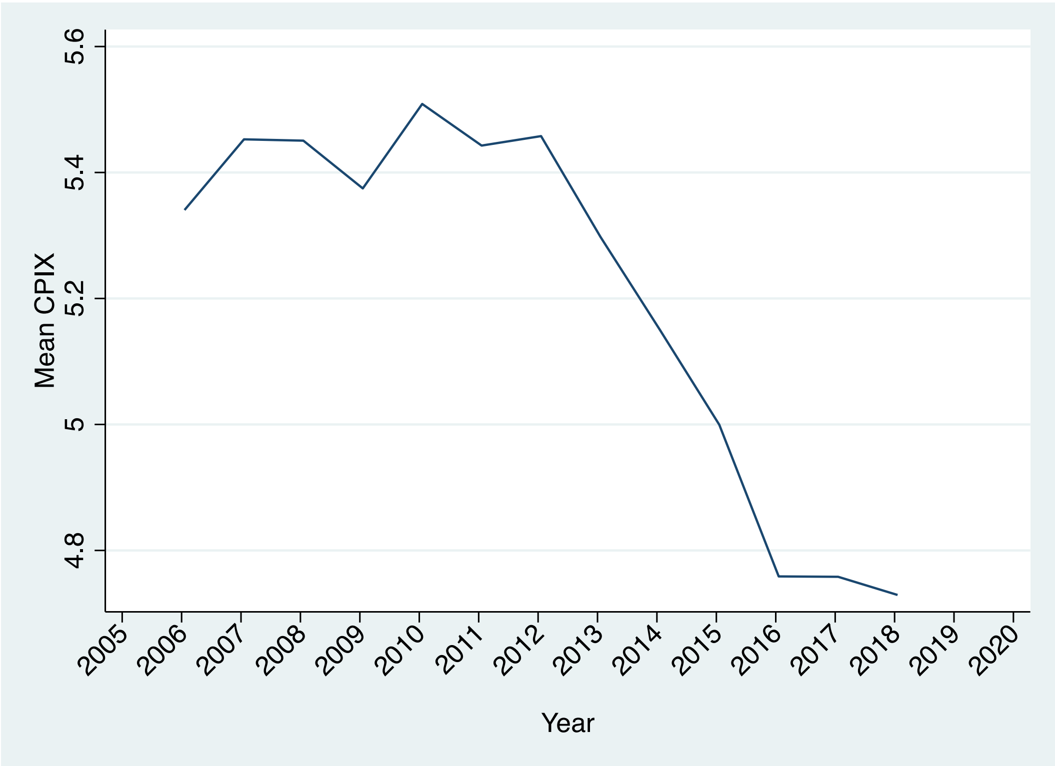
Table C.2: The CPIX across regions for the election years

Region	2006	2010	2014	2018
Upper and Central Norrland	5.33	5.62	5.25	4.90
North-Central Sweden	5.41	5.59	5.21	4.82
East-Central Sweden	5.46	5.46	5.14	4.67
Stockholm County	5.37	5.66	5.22	4.82
Småland and the Islands	5.29	5.37	5.20	4.62
West Sweden	5.33	5.38	5.04	4.74
South Sweden	5.28	5.47	4.98	4.54

Source: Author's own calculations

Table C.2 elaborates on the progression of the Climate Priority Index (CPIX). The trend is, naturally, identical to the map (Figure 6), as the map merely is a geographical visualization of the table.

Figure C.3: Mean CPIX 2006-2018



In figure C.3, the plummet in the CPIX is displayed. The Index goes fluctuating around roughly the same level until 2011, to a dramatic drop between 2012-2016.

Table C.3 : Standard Deviation and mean CPIX across the regions

Measure	East-Central	North-Central	Småland	South	Stockholm	Norrland	West
Std.dev, σ^2_t	.3505	.2633	.2989	.3636	.2663	.2929	.3139
Mean, μ_t	5.189	5.259	5.128	5.072	5.345	5.309	5.163

Table C.4: Standard Deviation and mean CPIX across the years

Measure	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Std.dev, σ^2_i	.078	.126	.119	.062	.118	.097	.093	.164	.102	.191	.203	.156	.127
Mean, μ_i	5.34	5.45	5.45	5.37	5.51	5.44	5.45	5.30	5.15	4.76	4.77	4.77	4.73

In figures C.3 and C.4, the variances are displayed. Table C.3 displays the variances by region, implying that the standard deviation is across years, for every given region. Accordingly, the mean value is the CPIX for an average year. Thus, μ and σ are indexed by t. Followingly, in Table C.4, the variances are displayed by year. This implies that μ is the average region, and the σ is the standard deviations between the regions, thus indexed by i.