The votes are burning
A natural experiment on the effect of the Swedish wildfires on the 2018 national election to the Swedish parliament

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Abstract

This thesis examines the Swedish wildfires 2018 and their effect on the voting patterns in the national election the same year. With a departure point from the field of voting behaviour and electoral studies, it follows the theory of retrospective voting. Building on the previous research of retrospective voting in the context of natural disasters, this thesis contributes to the field with the case of the Swedish wildfires 2018 and government’s crisis response that followed. The crisis concerned a great deal of the population and was geographically widely spread. Additionally, international aid was needed to control the aggressive fires. The main actor ultimately responsible for the crisis response was the government, which also became the main target for criticism. By using the design of a natural experiment and analysing the Swedish municipalities’ relative burned area and the change in vote shares for the government parties, through the method of regression analyses, the results show that the electorate did punish the government in the following election to the Swedish parliament. More precise, the reached conclusion is that the electorate punished the government to the extent of a decrease with 6.246 percentage points in the government’s vote shares for each percentage point higher relative burned area. Moreover, it was the Social Democratic Party that was punished, holding a vast majority of the minister posts, and not the other part of the government coalition, the Green Party. This suggests support for the retrospective voting theories, that the electorate does hold the government accountable by evaluating their actions and either punishes or rewards it based on the outcomes of their actions.
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1. Introduction

Voting behaviour is a well-explored and continuously researched area within political science. Knowledge of why people vote as they do and what they build their decisions on are important factors and tools for politicians to keep on their best behaviour if they believe it will bring them votes, and thus important to study and further develop. Within this field many studies focus on economic voting, with the often reached conclusion that people vote for what will bring them the best economic outcome and that they are making rational choices (Key, 1966:7). One view within this field is the retrospective voting perspective, which has an *ex post facto* focus on voters’ decisions (Key, 1966). According to this theory, voters evaluate the incumbent government’s actions and decisions, and the outcomes of them, and if the voters are not satisfied with the government’s work, they hold the government accountable by punishing it by voting for another alternative (Manin et al, 1999:8). Hence, voters make their decisions retrospectively. This theory has been further developed in the area of parliamentary democracies (Strom, 2003), and more recently, in contexts where major events like crises, or a natural disaster, trigger changes in the electorate’s voting patterns as the voters retrospectively evaluate the incumbent government’s crisis response (Eriksson, 2017). The conditions of natural disasters has one major advantage in the context of studying retrospective voting, as they are impossible to predict, which makes it reasonable to assume that the voters are evaluating the crisis response retrospectively (Eriksson, 2017:28). The research that has focused on natural disasters and the crisis response to them are few, but examples exist from some different democracies. Some notable examples are studies of tornadoes in the United States (Healy and Malhotra, 2010), the Elbe flooding in Germany (Bechtel and Hainmueller, 2011), and the storm Gudrun in Sweden (Eriksson, 2016). This research has collectively found that voters do evaluate the crisis response by either rewarding or punishing the government (Eriksson, 2017).

This thesis builds on these previous studies of the retrospective voting literature that focus on natural disasters as a case for retrospection. By focusing on Sweden in the year of 2018, when the country experienced an exceptional summer with extreme heat, drought and a particularly extensive and aggressive spread of wildfires, this thesis contributes to knowledge of retrospective voting in the context of natural disasters in general, and to the existing research on Sweden in particular. These wildfires occurred all over the country and had a large impact on the Swedish population in numerous ways. In total, 25 000 hectare forest burned, leading to
heavy economic losses for affected people (SVT, 2018), as well as mandatory evacuations from their homes (Lindstam, 2018). The drought also hit the agricultural sector hard. Due to insufficient food resources, farmers had to slaughter cattle prematurely to avoid having them starve (Svensson, 2018). Since this crisis affected more or less the whole population, extensive coordination of the national emergency services as well as the international aid, a lot of actors were involved. Who to hold responsible for a natural disaster is unclear, but the government should nevertheless be the actor ultimately responsible for the preparedness, to make sure the country has sufficient means and the right capacity, and the crisis response. Thus, the actor the voters would hold accountable for the management of the crisis is most reasonable the government. As the election took place the 9th of September, the wildfires coincided with the last months of the election campaigns and became a part of the political debates (Eriksson, 2019b). These wildfires, the crisis response, and the election will be the subject of this thesis. Specifically, the aim of this thesis is to understand if voters responded to the wildfires of 2018 by holding the government accountable for its crisis response by either punishing or rewarding it. Thus, the research question for this thesis is

*To what extent did the wildfires and the government’s crisis response affect how the electorate voted in the following election?*

2. **Theoretical framework and previous research**

2.1 **Accountability**

Theoretically, this thesis departs from the principal-agent framework of representative democracy, which highlights the centrality of accountability. In a representative democracy, accountability is a crucial part. It gives the citizens a tool, a mechanism, to hold the government responsible for its actions (Manin et al, 1999:10). Manin, Przeworski, and Stokes describe it as: “Governments are ‘accountable’ if citizens can discern representative from unrepresentative governments and can sanction them appropriately” (1999:10). Thus, in theory, the citizens need enough information and insight into the government’s work to know whether it is representative in its actions and are acting in the best interest of the citizenry. If they would find the government to misbehave, or in other ways not to be representative, the citizens need a mechanism to be able to sanction the ones responsible. Strom (2003) refers to non-representative actions by a government as “agency loss”, within the principal-agent framework
This framework demonstrates the principal as the electorate, the citizens, who are represented by the agent, the government, whom the citizens have elected and authorized to rule. Agency loss is thereby when the government is not representing the citizens in accordance with what the citizens are expecting. Strom (2003) means that agency loss could be a consequence of asymmetric information, which is when the principal is not correctly informed of who the agents are, their competence and skills, and when the government is not transparent in what they are doing. This could lead to adverse selection, when the citizens select a candidate who might not be who the voters thought they voted for due to poor information, or to moral hazard, when the elected agents can hide their actions from the principal due to a personal hidden agenda that includes non-representative actions (Strom, 2003:62).

In theory, accountability works to avoid agency loss and can in practice be achieved in several ways. Strom (2003:63) describes prospective and retrospective means. The prospective ones are mechanisms through which the principal can signal to the possible agents what their preferences and expectations are, and get more information about the candidates beforehand (Strom, 2003, Manin et al, 1999). The retrospective mechanisms are instead means for the principal to control the chosen agent’s behaviour once elected (Strom, 2003:63). Apart from these examples, there are mechanisms that are both prospective and retrospective. In this thesis, the focus will be on elections, which is the most fundamental type of accountability mechanism (Strom, 2003:63). Through the election mechanism, the citizens create an incentive for the government to act in accordance with the citizens’ interests, or the government may risk losing their power.

Manin et al (1999:8) describe how the election process begins before the election as the citizens signal their preferences to the candidates, then vote for the candidates they see as most suitable to fulfill these preferences. When the government is elected, the citizens can evaluate the outcomes of their actions and decide if they would like for the government to remain in power for another electoral term or if they want to sanction them by not voting for them again (Manin et al, 1999:8). On the one hand, the election can therefore be seen as a prospective mechanism, where the citizens beforehand make the decision of which candidate or political party they believe are most suitable to represent them and their interests. On the other hand, the election function as a retrospective mechanism, as the citizens can evaluate actions and decisions made by the incumbent government during the previous mandate period and decide whether it is suitable for another term, or if it should be sanctioned and not reelected (Strom, 2003:63).
2.2 Retrospective voting

The electoral behaviour theories of prospective and retrospective voting are continuously being discussed from several directions, and surely most often both views are used simultaneously by voters, as well as there might be other important factors that affect our voting behaviour (Manin et al, 1999). Even so, both perspectives are useful tools to get a better understanding of election outcomes and voting patterns. In this thesis, the retrospective voting will be the specific theoretical focus. More precisely, the focus will be on retrospective voting in the case of natural disasters.

As mentioned previously, retrospective voting means that voters evaluate the actions of an incumbent government and based on this decide whether it is eligible for another term. The first to describe the retrospective voting behaviour was Key (1966). His main argument is that “voters are not fools” (Key, 1966:7) and that voters act rationally by evaluating previous events and outcomes of the government’s actions. This is mainly in the context of economic outcomes, which has been the case of many voting behaviour theorists. More recently, researchers have examined the retrospective voting when following a major event such as natural disasters. As Eriksson (2017) argues, the case of natural disasters is a useful context for retrospective voting as the crisis response is mainly the government’s task. In addition, such events create a lot of pressure on the incumbent from the citizens and media, which would lower the risk of asymmetric information and agency loss (28) This is the context of this thesis and will be further explored in the following section.

2.3 Previous research

Within the field of retrospective voting, the focus of natural disasters have become a more and more studied area where this thesis will fit in. This focus has an advantage as natural disasters are unpredictable, why it is reasonable to assume that the possible change in voting patterns are due to retrospective evaluations (Eriksson, 2017:28). The previous research within this specific field is limited, but a few examples from different democracies exist. For instance, these include Healy and Malhotra (2010), who explore voters’ responses in the event of tornadoes in the United States and find that the voters sanction the incumbent government for the economic damages due to the tornado (207). Further, similarities are found by Gasper and Reeves (2011) who are examining voters’ responses in the presidential and gubernatorial elections in the case of severe weather. They find that the electorate punishes the incumbent
for not taking action, and reward the president or governor who offers aid or openly shows that they intend to (2011:352). In line with this, Bechtel and Hainmueller (2011) look at the electoral response after the Elbe flooding in Germany 2002. They focus on how long lasting the responses are to governmental actions that were beneficial to the citizens affected. They find that voters might be keeping the actions surrounding the natural disaster in mind on a longer term than previously expected in theory, and probably impact their voting in future elections as well. Their findings also show that the effect of retrospective voting is stronger in the more affected areas than in the unaffected ones (2011:865). There is however a different view within this field, which means that the voters are not punishing the crisis response of a natural disaster, but rather the crisis itself. Two scholars arguing for this view are Achen and Bartels (2004) who explore the electoral response to several different droughts, the Spanish flu and shark attacks, in elections on different levels. Their assumption is that the voter is not rational and does not evaluate the government’s crisis response, but that the voters instead want someone to blame for the pain they experienced during the crisis (Achen and Bartels, 2004).

Surely, whether the voters are punishing the government for the crisis itself or the response is quite difficult to notice when studying election turnouts. It is rather dependent on an assumption, if the voters are considered rational and able to distinguish what a government can control and not, as well as what is a good or a bad crisis response. This most likely differs from case to case, and depends on how transparent the government is with their actions and how well-reported the case is in the media. This thesis will however make the assumption, in line with Key (1966) and many others within this field, that voters are rational and are able to evaluate the government’s actions, as well as holding it accountable.

This thesis will follow the line of the previous research done exploring the crisis response to natural disasters, and more specifically build on the existing research in Sweden. Eriksson (2016) is studying the crisis response to the storm Gudrun that hit Sweden in 2005 and finds that the electorate punished the Social Democratic incumbent party in the following election in 2006 for its poor crisis response. This was, according to the estimated effect, one important factor that led to an historic regime shift from the Social Democratic government to the Moderate led Alliance government consisting of the Moderates, the Christian Democrats, the Liberal Party and the Centre Party (Eriksson, 2017). Similarly, this thesis will look at the empirical case of Sweden and the wildfires that occurred the summer of 2018, which will be covered in the following section.
2.4 Empirical background: the Swedish wildfires 2018

This section will briefly outline the context of the wildfires in the summer of 2018, the political actions and coverage in media, and the following election that same year. This context is important and necessary to be able to follow the theoretical framework and understand whether the voters would have wanted to demand accountability either by punishing or rewarding the government in the election of 2018. Thus, we need to get an idea of the circumstances of the wildfires and how the political parties positioned themselves on the issue of the crisis response.

2.4.1 The wildfires

The season for wildfires started early in the summer of 2018, in May instead of in the end of July like a normal year (SOU 2019:7, p. 13, 15). High temperatures and no rain caused a dry climate and an extreme risk for wildfires that were present throughout the summer of 2018, May to August, all over Sweden (MSB, 2018:5). By the beginning of June there were already 27 active wildfires in different parts of Sweden (MSB, 2018:6). The Swedish Civil Contingencies Agency (MSB) started preventive actions in May such as having cooperation conferences in the purpose to prepare the relevant actors and agencies on what the risks would mean, and making sure the material resources were placed in the areas most exposed to the risk of wildfires (MSB, 2018:9). In the end of May, MSB also proactively activated the EU Emergency Response Coordination Centre (ERCC), giving Sweden access to water bombing aircrafts (MSB, 2018:10). In the mid of June two aircrafts arrived from Italy and were used in several fires (MSB 2018:11). In July, more severe wildfires started and the risk of them spreading while new fires were starting was continuously heightened. More international aid arrived, mostly through the ERCC but also from the neighbouring countries Norway and Finland (MSB 2018:19-20). In total, the number of wildfires was five times bigger than a normal year, with 500 instead of 100 wildfires (SOU 2019:7, p. 109).

2.4.2 The crisis response

Looking back at the events and the crisis response from the agencies, some criticism has arised from several relevant actors, both politicians, media, and organisations that helped in the firefighting. People who were victims of the wildfires were also critical to the management, and flaws became visible (P4 Extra, 2018). Some of the more significant and reoccurring ones were the lack of resources in firefighting equipment, an insufficient judgement of the extent
and severity of the fires, which led to a sometimes too slow reactions and operations, unclarity concerning who had the authority to act and take decisions, and some unclarities in the information to the public (SOU 2019:7, s. 15-16) It became clear that Sweden did not have all the resources necessary to manage a crisis like this by itself (SOU 2019:7, s. 13).

Another recurring point in debates and media concerned the investigation after the wildfire in Västmanland in 2014. The government was accused for not acting in line with the outcomes and suggestions from the investigation. The Västmanland fire was, similar to the fires in 2018, very large and aggressive but concentrated to one place, and it became clear that Sweden was not prepared enough to handle a wildfire of such extent by the time, which is why the question was asked why not more measures had been taken to prepare for a new crisis. The wildfires in 2018 were both larger and more spread over the country, which made the management of them even more difficult. (Sveriges Riksdag, 2018)

In the end of August 2018, representatives from all parties participated in a debate in the parliament regarding the management of the wildfires. In the debate, most of the criticism directed towards the government, consisting of the Social Democratic Party and the Green Party, was concerning the preparedness, mainly posed from the opposition parties in the former government, the Alliance. The Sweden Democrats directed a lot of the criticism directly towards the minister representing the government in the debate, at the time the minister for Justice and Home Affairs, Morgan Johansson. From the government, a more defensive position was held, as the Social Democratic Party were expressing a more positive image of the management of the fires, even if they also expressed the need for further expansion of the capacity. The Green Party mentioned the economic resources the government had put in for climate adaptation, claiming that they had made efforts to expand the capacity. They also meant that more long-term efforts had to be made to prevent the strike of more natural disasters. The Left Party was holding a similar position but were also critical towards the government’s efforts. (Sveriges Riksdag, 2018)

The Alliance also put forward proposals on what measures that should be done to extend the capacity of firefighting and crisis management which was published in the end of July (Jacobsson, 2018). The government’s proposal on what measures they were taking and planned to take in order to prevent more fires and extend the capacity was published shortly after, in the beginning of August (Mårtensson, 2018). When it comes to the government, it should be mentioned that the vast majority of it consisted of the Social Democratic Party. They got 31,01% of the votes in the national election of 2014, while the Green Party got 6,89% (Swedish Election Authority, 2014a), and was appointed 6 out of 23 minister positions (Grönberg, 2014).
Since the Social Democratic Party is the biggest party in Sweden and has held the governmental position several times throughout history, it can be argued that people in a greater extent associate this party to the government, rather than the Green Party. Accordingly, people might see them as the most responsible party in the government coalition at the time.

As the media probably is where most people are gathering their information and where they get an image of how the government were handling the crisis, it is likely that the news reports were the main source for the electorate’s evaluation of incumbent government’s actions. The parties’ views were summarized in one article, which were similar to the standpoints they held in the debate in the parliament (Johansson, 2018). The different proposals and statements made of the different parties or other actors were also continuously reported on different media platforms. The wildfires were spread all over the country and affected a lot of people, and the crisis became well-reported. In fact, it was covered in media in 830 news reports (Eriksson, 2019), which can be an argument for the people being informed and hence able to evaluate the government’s action and hold it accountable.

In summary, there was clearly a criticism towards Sweden’s capacity and preparedness to handle wildfires like these, and the main criticism is directed towards the government as the main actor in the crisis response. Since it was in the end of a political campaign, it is reasonable to believe that the oppositional parties want the main criticism to be directed at each other. It should also be mentioned that the political debate was quite similar to the one regarding the wildfire in Västmanland 2014, with the difference that the government at the time was the Alliance (Röstlund, 2018). Even if the parties’ standpoints did not differ tremendously on how to extend the capacity of the crisis preparedness with some different proposals on measures to be taken, what becomes clear when outlining the events and the crisis response is the target for the criticism. As seen in previous research as well, both other parties and the people are directing the criticism towards the government. Furthermore, from both the debate in the parliament and the reports in media, the criticism is mainly directed towards the Social Democratic party. To conclude this section, based on the theoretical framework and the empirical case, two hypotheses are posed:

**Hypothesis 1:** The electorate punished the incumbent government in the national election 2018 for their crisis response to the wildfires in the preceding summer.

**Hypothesis 2:** The Social Democratic Party was punished harder than the Green Party.
3. Method and design

Moving towards the results and analysis, in this section the analytical framework will be described. Firstly, the research design will be explained and discussed, followed by a description of the data and the independent and dependent variables used in this thesis. Thereafter, the choice of method will be examined.

3.1 Research design: a natural experiment

The design of this thesis follows the one of natural experiments. A natural experiment is a design where the units of analysis are randomly exposed to a treatment, and where it is possible to examine the effects of the treatment, usually compared to a control group consisting of preferably similar units of analysis that has not received the treatment (Dunning, 2008). The “natural” part of the experiment is that the treatment has occurred naturally and randomly, and is thus not under control of the researcher. One of the main strengths of this design is the possibility to isolate a causal relation between the variables as all other explanatory factors are implicitly controlled for. That is, when the treatment is randomly assigned to the units of analysis, or at least as if randomly assigned, all other factors and variations in the possible explanatory variables are balanced within the group, and would not affect the possible causal effect of the treatment (Dunning, 2012:5). This strength makes it possible to isolate one explanatory factor and examine a causal effect between it and the dependent variable when a situation arises under these circumstances, such as a natural disaster. Thus, it is not necessary to include control variables. Instead, the units not exposed to the treatment, the control group, are necessary to eliminate possible covarying variables. This will be further developed below.

One characteristic feature of the natural experiment is that the treatment and the manipulation is out of control of the researcher, compared to other controlled experiments where the researcher can manipulate the treatment and units of analysis exposed to it (Teorell and Svensson, 2007:79). Some argue that this design should not be called experimental, since it is not possible for the researcher to manipulate neither the selection nor the treatment (Teorell and Svensson, 2007:79) Nonetheless, these discussions mostly concerns the wording of the design, and as the situation has arisen naturally and the treatment is randomly assigned, it could still be examined through an experimental logic (Teorell and Svensson, 2007:79).
In the case of this thesis, the wildfires that occurred is the treatment in the study. Where the fires started and spread was at random all over the country. Surely, one could argue that there are some meteorological factors that might increase or decrease the risk of being exposed to a wildfire, but since this summer was exceptional and 500 fires were spread all over the country, these possible factors were most likely of little significance this specific year. The units of analysis are the Swedish municipalities, and as such those municipalities not affected by the fires serve as the control group in this experiment, which is further described below. As all other factors that might affect people’s voting behaviour are implicitly controlled for, this research design should be a useful tool to identify and isolate the possible effect between the wildfires and the election turnout. Finally, it is assumed that the randomly geographical distribution of the wildfires will trigger changes in the voting patterns and thus be visible in the election turnout. The explanatory variable, the treatment, is the wildfires and the dependent variable is the change in voting behaviour, which would suggest retrospective evaluations of the crisis response.

3.1.1 Independent variable: treatment

The treatment, and hence the independent variable for this thesis, is the impact of the wildfires. This is measured through the total area of burned forest and land in each municipality, in hectare. Since the Swedish municipalities differ in geographical size, it is necessary to calculate the relative amount of the burned area, i.e. how much of each municipality that was burned to understand how much impact the burned area had for each municipality. The relative burned area is hence measured in percent for each municipality. The data for the total area of each municipality is gathered from Statistics Sweden (SCB). The data of the burned area is collected from the Swedish Civil Contingencies Agency. This is a combination of data provided by The Swedish Forest Agency, and data on rescue operations, provided by the municipal emergency services, where the main or consequential incident was a fire in forest or land (MSB-IDA, 2019). Since MSB is the representative of the Swedish emergency services on a central level (MSB, 2019), with its own data portal, this source should be considered reliable. It does however have some flaws, as the data that MSB has registered is based on reports from the different municipal emergency services and The Swedish Forest Agency, and the reports were not always consistent. The assessment from MSB is however that the the data from the emergency services often is more precise (Ekberg, 2019). Moreover, the emergency services do not have any legal obligation to report this data to MSB, although close to all emergency
services are doing so\(^1\). Even so, the municipality of Malå has not reported any data to MSB, and thus registered as a missing observation. However, according to The Swedish Forest Agency, there has been a fire of 77 hectare in Malå, which is confirmed by the municipal emergency service. Since the burned area has not been officially confirmed and was not considered at the time the data was made available by MSB to the general public, it is registered as a missing value in the material and also in the data of this thesis (Ekberg, 2019). In addition, there might be more incidents not reported by the municipal emergency service and how many, especially ones smaller than 75 hectare, are not known for MSB\(^2\). Apart from Malå, all municipalities do have registered fire incidents. Since this thesis is focusing on the wildfires effect on the election, the material is limited to the registered fires between May and August 2018 to avoid catching possible effects of incidents that occurred after the election that took place the 9th of September.

The extreme temperatures combined with the lack of rain did however not only cause numerous wildfires, but also an extended drought, which hit farmers and the agricultural sector hard (Svensson, 2018). Even so, since the effects of a drought are not always visible directly but might have long-term effects for the farmers, on the crops and cattle for example, we may not identify the full effect of the wildfires on the electorate’s retrospective evaluations only by examining their voting behaviour in the 2018 election. Hence, this thesis will only focus on the wildfires and the crisis response before the election in September 2018.

3.1.2 Dependent variable

The dependent variable in the thesis is the change in voter support for the government parties consisting of the Social Democratic Party (S) and the Green Party (MP) between the 2014 and 2018 national elections per municipality. This is measured by comparing the vote shares for each party between in the election 2014 and the election in 2018, for each municipality (Swedish Election Authority, 2014b, 2018). The difference in vote shares thus constitutes the measure for the dependent variable per unit of analysis. The data is collected from the Swedish Election Authority, which keeps data from all elections, on all levels of government, and for each municipality. The difference in vote shares between the elections per municipality is calculated in percentage points, both for S and MP.

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\(^1\) Information from an email contact with MSB.

\(^2\) Ibid.
3.1.3 Control variable

As this thesis is following the design of a natural experiment with a random assignment of the treatment, and thus other possible explanatory variables are implicitly controlled for, it is not necessary to include control variables. The variations within the treatment group and the control group is thus assumed to be statistically independent from the treatment (Dunning, 2012:6). In addition, as the treatment is exogenous to the Swedish political landscape, and the geographical distribution of the wildfires considered to be at random, there should not be any confounding variable, i.e. a variable influencing the wildfires and the election turnout. Nevertheless, covarying factors might exist that affect the election turnout in the same way that the wildfires do. Even if this is unlikely, this will be controlled for to ensure that no other unknown factors is captured in the analysis. In order to do so, the units of analysis are divided through a binary variable. All municipalities where the relative burned area is 0, that is were the burned area was less than 1 hectare, are given the value of 0. All other municipalities that had a larger relative burned area, and thus a burned area larger than 1 hectare, are given the value of 1.

3.2 Choice of method

To answer the research question, to what extent the Swedish wildfires during the summer of 2018 and the following crisis response affected how the electorate voted in the national election, the method of a simple regression analysis will be used. While this method is frequently used in political science, often in combination with several control variables, it does not always imply the effect being causal. By using the design of a natural experiment, however, the effect should be considered causal. The regression model used is the ordinary least squares (OLS), which estimates a line that minimizes the squared distance for each observation. The regression follows the equation

\[ y_i = a + bx_i + e_i \]

where \( y \) is the value of the dependent variable for each unit of analysis \((i)\), given by the intercept \((a)\), which is where the estimated line intercepts the y-axis, and the \( b \), the regression coefficient, which shows how much the dependent variable is affected for each dependent variable. In other words, the \( b \) describes how many units the dependent variable shifts on the y-axis for each unit of the independent variable \((x)\). The \( e \) is the error term, which is the deviation of the estimated regression line from the observed value. (Teorell and Svensson, 2007:173)

It should be mentioned that the OLS regression line is estimating the possible effect between the variables as a linear effect (Teorell and Svensson, 2007:167). When it comes to
the variables in this thesis, the amount of burned forest or land and the change in the election outcomes, it is most likely not a perfectly linear relation. It is reasonable to assume that the effect of the punishment on the government does not increase linearly after a certain value of relative burned area. Rather it is likely that the effect is strongest for municipalities that have been affected moderately to quite a lot, and is not expected to rise linearly for each hectare of burned area thereafter since the fire by then is likely to have reached a critical point triggering retrospective evaluations. Hence, the plausibility of the relation being linear as the model will estimate, is not perfectly given. Even so, the OLS regression analysis is a strong tool to estimate relations between different variables and data and very useful when trying to explain a specific phenomenon (Esaiasson et al, 2012:381). The tool is also what has been used in previous research within the field of retrospective voting and natural disasters and will thus also be used in this thesis (Eriksson, 2017).

Since the OLS regression line is an estimation of an average relation drawn from all observations for the units of analysis, it is also vulnerable to outliers, i.e. values that are unusual in the data in the manner that it is much larger or smaller than all other observations. In the case of the Swedish wildfires, some fires were considered extreme in a larger extent than others, why they could constitute outliers in the data. An outlier that have a large value on the error term can affect the result of the regression analysis, which means that the regression would not show a representative image of the whole population (UCLAA). As will be seen below, an outlier is detected in the data, which is why another type of regression, a robust regression, is used to handle the outlier. This will be further explained and illustrated below.

Moreover, in the following section, the OLS regression analysis will be done in four steps. The two hypotheses will be tested and the results will be analysed after each regression. Thereafter, an overall discussion will follow together with the conclusion in the last section.

3.2.1 Robust standard errors

When doing an OLS regression analysis, the method of robust standard errors can be used instead of standard errors. This method weighs in differences in the data (UCLAB). For example heteroscedasticity, when the variance in the residuals are not constant for each observation, and lack of normality, when the residuals are not normally distributed (Lewis-Beck and Lewis-Beck, 2015:24). The robust standard errors take these variations into account, and thus would be a preferable option when pursuing OLS regression analysis, why it is used in this thesis.
4. Results and analysis

4.1 OLS regression analysis

The first regression analysis in this thesis examines the effect of the relative burned area measured in percent on the difference in the government’s election outcome between the parliamentary election in 2014 and 2018, measured in percentage points, and thus explores the first hypothesis. Table 1 shows the bivariate regressions results. The $R^2$ shows a proportional value of the variation in the dependent variable that can be explained by the independent variable (Teorell and Svensson, 2007:175). However, it should not be interpreted as a grade of how well the independent variable is explaining the dependent one, but instead as a measure of how well estimated the regression line is to the real values (Teorell and Svensson, 2007:177). As this thesis aims to identify the causal effect of the treatment on the election outcome, the $R^2$ does not have much importance and will not be given too much attention in this thesis.

Table 1. Bivariate regression analysis of the effect of the wildfires on the change in vote shares for the government, S and MP.

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) Government’s change in vote share with Ljusdal</th>
<th>(2) Government’s change in vote share without Ljusdal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative burned area</td>
<td>-0.240 (1.220)</td>
<td>-6.327*** (1.548)</td>
</tr>
<tr>
<td>Observations</td>
<td>289</td>
<td>288</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.000</td>
<td>0.019</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In the first column (1), the regression analysis is performed with all 289 observations and show no statistically significant results, while the second column (2) shows a significant result when one observation is dropped. The observation dropped is the outlier Ljusdal. In Figure 1, a scatterplot with an OLS line is presented in order to explore the values of the different municipalities more visibly. The y-axis is the vote share difference for the government between the national election in 2014 and the one in 2018, while the x-axis is the relative amount of burned area, whereas the dots are the municipalities.
Figure 1. Scatterplot and OLS line with detected outlier.

What is made clear is that one municipality, Ljusdal, had a significantly higher amount of burned area, close to 2%, while the other affected municipalities are at the highest of 0.5% burned area around. This observation is thus identified as an outlier, and since there was an exceptionally large wildfire in Ljusdal (Eirefelt, 2018) it is established that it is not due to an measurement error. As one method in social sciences to deal with the outliers is to drop them from the dataset, in order to make the regression analysis more representative for the whole population, this is done in the second regression analysis and shown in the second column (2). The result of this regression analysis, without the outlier Ljusdal, is now statistically significant on a significance level of 1%. The vulnerability of the OLS regression line is then clear, as the results do differ significantly when the outlier is dropped. The interpretation of the second column would be that for each unit of the independent variable, the relative burned area, the dependent variable decreases with 6.327 units in average. That means that for 1 percent higher relative burned area in the municipality, the vote shares for the government decreases with 6.327 percentage points in average.
4.2 Robust regression

However, as we know that the observation for Ljusdal was not a measurement error, it would surely be preferable to keep it in the analysis, if possible without it affecting the results of the estimated regression coefficient. Therefore, another method to deal with an outlier is tried, which is a robust regression. This is a method were the outliers are weighed, and depending on how large the residual is, i.e. how far away from the predicted value the actual value is, the robust regression either drops the observation from the data or weigh it in (UCLAa). Table 2 shows the results of a robust regression (1) compared to an OLS regression where the outlier is dropped (2). In both of the regression analyses the observations are 288, which means that the outlier was automatically dropped by the statistics program, Stata in this case, in the robust regression. The results of the two different methods to handle the outlier does not differ remarkably, and both results are still significant on a 1% significance level. Thus, both methods reach the same result and drop the outlier. With these findings, the method of OLS regression with robust standard errors, will be used in what follows in this thesis.

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Government’s change in vote share, robust regression</td>
<td>Government’s change in vote share, OLS regression</td>
</tr>
<tr>
<td>Relative burned area</td>
<td>-6.768*** (2.489)</td>
<td>-6.327*** (1.548)</td>
</tr>
<tr>
<td>Observations</td>
<td>288</td>
<td>288</td>
</tr>
<tr>
<td>R²</td>
<td>0.025</td>
<td>0.019</td>
</tr>
</tbody>
</table>

Standard errors in parentheses in column (1) and robust standard errors in parentheses in column (2)

*** p<0.01, ** p<0.05, * p<0.1

4.3 Government parties separated

Furthermore, two bivariate OLS regression analyses are done on each of the two government parties, S and MP, separately to see if and how the punishment differed for the parties. This
test aims to examine the second hypothesis. The regressions are done both with and without Ljusdal, and the results are shown in Table 3.

**Table 3. Bivariate regression analyses on the effect of the wildfires on the change in vote shares for the government parties S and MP separately.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Change in vote shares for S (1)</th>
<th>Change in vote shares for S (2)</th>
<th>Change in vote shares for MP (3)</th>
<th>Change in vote shares for MP (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S with Ljusdal</td>
<td>S without Ljusdal</td>
<td>MP with Ljusdal</td>
<td>MP without Ljusdal</td>
</tr>
<tr>
<td>Relative burned area</td>
<td>-0.219 (1.377)</td>
<td>-6.811*** (2.095)</td>
<td>-0.0213 (0.248)</td>
<td>0.484 (1.190)</td>
</tr>
<tr>
<td>Observations</td>
<td>289</td>
<td>288</td>
<td>289</td>
<td>288</td>
</tr>
<tr>
<td>R²</td>
<td>0.000</td>
<td>0.017</td>
<td>0.000</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The effect is statistically significant on a 1 % significance level for S but not for MP. This suggests support for Hypothesis 2, that S got a harder punishment than MP. In these results, MP barely got any punishment at all, and when looking at the two without Ljusdal, (2) and (4), the regression coefficient for S got slightly higher than for the government together while the regression coefficient for MP turned positive. This suggests no support for punishment of the Green Party from the electorate. This could be explained, as mentioned above, by the fact that S had a vast majority of the government, and as most of the ministers are from this party they were also more visible and mentioned in the media during the crisis response. Nonetheless, both government parties will be used in the following OLS regression analysis to follow theory and the formed hypotheses accurately.

### 4.4 Control for unaffected municipalities

As discussed above, the design of natural experiments with a randomly assigned treatment, all other explanatory factors are implicitly controlled for. Thus, no control variables are necessary to establish the foregoing significant effect. One could however argue that the relation that is found can of a coincidence follow a relation due to another explanatory variable. This would mean that an unknown factor affected the election turnout in the same way as that of the wildfires. If variables to control this were to be included, they would need theoretical and
empirical evidence to have effect on election outcomes to be relevant. Surely, there are numerous reasons for why people vote as they do and to include all possible explanatory variables would hence be too spacious to include in this thesis.

Instead, the control variable consisting of the municipalities not affected by the wildfires, is included in the regression analysis. The number of municipalities with less than 1 hectare burned area is 86, and are thus given the value 0 and operationalized as unaffected. The binary control variable makes it possible to control for all other unknown explanatory factors on the election turnout that could co-vary with the effect of the fires. As is seen in Table 4, when the binary variable is included in the regression analysis in second column, the result does not change noticeably. The regression coefficient is slightly smaller than in the first column (1). This marginal change suggests that there is no other unknown factor correlating in the same way as the treatment of the wildfires. The control makes the causal effect isolated from any other co-varying factor that, which ensures that it is not captured in the regression analysis in the second column (2). Here, the adjusted $R^2$ is used. The adjusted $R^2$ takes the added variable into account and is thus a more correct measure when having more than one independent variable (Teorell and Svensson, 2007:201).

**Table 4. Regression analysis on the effect of the wildfires on the change in vote shares for the governmental parties S and MP, controlled for unknown explanatory variables.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Government’s change in vote</td>
<td>Government’s change in vote</td>
</tr>
<tr>
<td></td>
<td>share without Ljusdal</td>
<td>share without Ljusdal, control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for binary variable</td>
</tr>
<tr>
<td>Relative burned area</td>
<td>-6.327***</td>
<td>-6.246***</td>
</tr>
<tr>
<td></td>
<td>(1.548)</td>
<td>(1.479)</td>
</tr>
<tr>
<td>Binary variable</td>
<td>-0.0457</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.315)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>288</td>
<td>288</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.019</td>
<td>0.012</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

This result in the second column (2) would thus be interpreted that in average, for each higher percentage point in the relative burned area, the vote shares for the government parties decrease with 6.246 percentage points.
5. Discussion and conclusion

The aim of this thesis was to understand if the voters held the government accountable for the crisis response following the Swedish wildfires 2018, by either punishing or rewarding it in the national election the same year. In order to explore this, the research question was posed: *To what extent did the wildfires and the government’s crisis response affect how the electorate voted in the following election?* The results of the regression analyses suggest a causal relation between the relative burned area and the change in vote shares for the government, for each municipality. The reached conclusion is that the electorate punished the government, to the extent of a decrease with 6.246 percentage points in the government’s vote shares for each percentage point higher relative burned area.

Building on theories and previous research on voting behaviour and election studies, and specifically retrospective voting in the context of natural disasters, this thesis contributes cumulatively by examining a new case within this field by examining the exceptional wildfire season in Sweden 2018 and the following election to the Swedish parliament. Through the design of natural experiment and method of simple regression analysis, the two posed hypotheses are tested and found statistically significant support. Firstly, the electorate did punish the government for the crisis response following the wildfires. The OLS regression analysis shows a significant result on a 1% significance level, when the outlier Ljusdal is dropped from the set. The robust regression analysis suggests similar results, also without the municipality of Ljusdal. When including the control variable in the regression analysis, the causal effect is isolated and the regression coefficient on -6.246 is still significant on a 1% significance level. How and why the voters in Ljusdal voted in the election would be interesting to examine more closely in future research, as a crucial case in the matter of the most affected municipality. However, in this thesis, the aim was to examine and generalize to the whole population why it was necessary to drop Ljusdal for a more representative image of the voting behaviour. Secondly, the government parties were not targeted equally as the Social Democratic Party got a harder punishment since the results suggest that the Green Party was not punished at all. The Social Democrats did have a vast majority in the government and held the heavy minister posts that were most visible in the media, which most likely are reasons for why they were punished and not the Green Party.

The Swedish wildfires 2018 provides an interesting case when examining retrospective voting as they occurred closely to the nation election. In some aspects, the election was too close to the events as some of the effects from the fires were not visible yet, why the
retrospective evaluations might have suggested another result if one were to examine another
election as the accountability mechanism. The study might also have reached other results if
another operationalisation of how people were affected had been used. For example if the
economic losses had been used as a variable of how people were affected of the fires. This
would perhaps be a better and more precise measure on how the wildfires affected people, but
as the economic losses on forest are quite complicated to calculate and not directly visible, this
is rather a subject for future research.

The design used in this thesis follows the logic of a natural experiment. While this
design does not need control variables to isolate a causal relation between two variables,
another design including control variables could be done if the aim were to find or compare
other explanatory variables for the election outcome. For the purpose of this thesis however, as
well as in previous research, the use of the natural experiment design was strong and suitable
to examine retrospective voting in the context of natural disasters and ensure a causal relation.

The regression analyses are useful tools when exploring relations of this kind. When
doing both an OLS regression and a robust regression analysis, and finally isolating the relation
for unknown covarying factors, the causal relation is found robust and significant. As already
discussed, however, the OLS regression analyses suggests a perfectly linear relation, which is
most likely not the case when it comes to the wildfires effect on the election turnout. Thus, the
found relation in this thesis does not aim to give a perfect explanation on exactly how the
wildfires affected the election turnout, but instead gives an idea of the relation and find
statistically significant result that they did.

In sum, examining retrospective voting in the context of natural disasters is an
interesting subject within the fields of voting behaviour and election studies. With climate
change, extreme weather is occurring more often and, according to previous research as well
as this thesis, the crisis response to the natural disasters will have affect on how people vote
and therefore might become even more relevant to study in the future.
6. Bibliography


MSB:s statistikverktyg IDA. 2019. *Avbränd yta vid bränder i skog eller mark.* 
[https://ida.msb.se/ida2#page=fea50dc7-8149-493a-89f9-424863a2d75d](https://ida.msb.se/ida2#page=fea50dc7-8149-493a-89f9-424863a2d75d) (Accessed 19-12-19)


[https://sverigesradio.se/avsnitt/1112149](https://sverigesradio.se/avsnitt/1112149) (Accessed 19-12-17)
(Accessed 19-12-19)

http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START_MI_MI0803_MI0803A/Mark\n


Swedish Election Authority. 2014a. *Val till riksdagen - Röster*. Available at  

Swedish Election Authority. 2014b. *2014 riksdagsval per kommun*. Available at  


UCLAa. Robust Regression - Stata data analysis examples. *Institute for Digital Research & Education*.  
https://stats.idre.ucla.edu/stata/dae/robust-regression/ (Accessed 19-12-26)
UCLAb. Regression with Stata Chapter 4 - Beyond OLS. *Institute for Digital Research and Education.*
Appendix 1

Descriptive statistics of the variables used in the thesis in tables. The municipality of Malå is excluded in both tables.

Table 1. Descriptive statistics of the variables used in the data, excluding the municipality of Ljusdal.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Obs.</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government’s change in vote shares</td>
<td>288</td>
<td>-6.648</td>
<td>2.387</td>
<td>-20</td>
<td>0.280</td>
</tr>
<tr>
<td>S change in vote shares</td>
<td>288</td>
<td>-4.765</td>
<td>2.715</td>
<td>-18.430</td>
<td>2.150</td>
</tr>
<tr>
<td>MP change in vote shares</td>
<td>288</td>
<td>-1.883</td>
<td>0.755</td>
<td>-4.260</td>
<td>-0.190</td>
</tr>
<tr>
<td>Relative burned area</td>
<td>288</td>
<td>0.016</td>
<td>0.052</td>
<td>0</td>
<td>0.529</td>
</tr>
<tr>
<td>Binary variable for affected municipalities</td>
<td>288</td>
<td>0.701</td>
<td>0.458</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2. Descriptive statistics of the variables used in the thesis, including the municipality of Ljusdal.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Obs.</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government’s change in vote shares</td>
<td>289</td>
<td>-6.590</td>
<td>2.386</td>
<td>-20</td>
<td>0.280</td>
</tr>
<tr>
<td>S change in vote shares</td>
<td>289</td>
<td>-4.758</td>
<td>2.714</td>
<td>-18.430</td>
<td>2.150</td>
</tr>
<tr>
<td>MP change in vote shares</td>
<td>289</td>
<td>-1.884</td>
<td>0.753</td>
<td>-4.260</td>
<td>-0.190</td>
</tr>
<tr>
<td>Relative burned area</td>
<td>289</td>
<td>0.023</td>
<td>0.458</td>
<td>0</td>
<td>1.904</td>
</tr>
<tr>
<td>Binary variable for affected municipalities</td>
<td>289</td>
<td>0.702</td>
<td>0.458</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Appendix 2

List of the variables used in the thesis with measurement descriptions.

- **Government change in vote shares**: The change in vote shares are measured through the difference in percentage points for the two government parties, the Social Democratic Party and the Green Party, between the national election to the parliament in 2014 and 2018, for each municipality. Source: Swedish Election Authority.

- **S change in vote shares**: The change in vote shares are measured through the difference in percentage points for the Social Democratic Party between the national election to the parliament in 2014 and 2018, for each municipality. Source: Swedish Election Authority.

- **MP change in vote shares**: The change in vote shares are measured through the difference in percentage points for the Green Party between the national election to the parliament in 2014 and 2018, for each municipality. Source: Swedish Election Authority.

- **Relative burned area**: The relative burned area is measured in percent by calculating the relative amount of burned area in forest or land in hectare, for each municipality. Source: Statistics Sweden.

- **Dummy variable for affected municipalities**: The binary variable is measured between 0 and 1, where all municipalities with less than 1 hectare burned area and 0 percent relative burned area are given the value of 0, and all municipalities with more than 1 hectare burned area and more than 0 percent relative burned area are given the value of 1. Source: MSB-IDA portal.

The units of analysis for the thesis are the Swedish municipalities.