The Electoral Consequences of Nuclear Fallout: Evidence from Chernobyl

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Abstract

What are the political effects of a nuclear accident? Following the 1986 Chernobyl disaster, environmentalist parties were elected to parliaments in several nations. This paper uses Chernobyl as a natural experiment creating variation in radioactive fallout exposure over Sweden. I match municipality-level data on cesium ground contamination with election results for the anti-nuclear Green Party, which was elected to parliament in 1988. After adjusting for pre-Chernobyl views on nuclear power, the results show that voters in high-fallout areas were more likely to vote for the Greens. Additionally, using the exponential decay property of radioactive isotopes, I show a persistent, long-term effect of fallout on the green vote. However, the Chernobyl-related premium in the green vote has decreased substantially since the 1980s. Detailed individual-level survey data further suggests that the results are driven by a gradually decreasing resistance to nuclear energy in fallout-affected municipalities.

JEL classification codes: D72, P16, Q48, Q53
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1. Introduction

Nuclear energy is a widely debated topic. Advocates of nuclear power argue that it provides high power output combined with virtually zero emissions. Opponents tend to prefer solar and wind power, as well as stressing the environmental impact of used nuclear fuel. Concomitant with this debate, one of the major trends in Western politics in recent years is the growth of green movements. Following the 2019 election to the European Parliament, the Greens-EFA became the fourth largest political group. In the United States, the Green New Deal was widely debated in the run-up to the 2020 presidential election. Some find the environmentalist opposition to nuclear power puzzling, considering its low carbon footprint (Shellenberger 2019). Others argue that a combination of the the high fixed costs associated with building new reactors, the availability of cheaper substitutes, as well as the risk of accidents, prevents a new nuclear renaissance (Davis 2012). Although modern nuclear power is considered safe, many opponents of nuclear power stress the perceived risk of accidents as the chief reason for their anti-nuclear stance (Sundström and McCright 2016; Huhtala and Remes 2017). Similarly, following the 2011 Fukushima accident, green voting increased among voters living in close proximity to nuclear facilities (Schumacher 2014; Goebel et al. 2015).

However, less is known about the relationship between direct exposure to nuclear accidents and voting. This contrasts the extensive literature on other aspects of pollution. Exposure to air pollution contributes to lower birthweight and shorter stature among infants (Currie and Walker 2011; Rosales-Rueda and Triyana 2019), whereas early-life exposure to pollution has negative outcomes on future education outcomes and labor force participation (Currie et al. 2009; Isen et al. 2017). In areas with close proximity to a toxic industrial plant, housing prices and productivity levels are lower, and mortality rates are higher (Currie et al. 2015; Ebenstein et al. 2015; He et al. 2019). While numerous studies focus on the adverse effects of pollution, another strain of the literature points toward the economic benefits of pollution-generating activities. Oil and gas investments generate significant economic effects, including increased real wages, lower unemployment rates, and higher fertility rates (Feyrer et al. 2017; Allcott and Keniston 2018; Kearney and Wilson 2018). Similarly, closing of nuclear reactors is associated with decreasing housing prices (Bauer et al. 2017).

In this article, I use a natural experiment generated by the most disastrous nuclear accident in history, the 1986 Chernobyl disaster, to evaluate the impacts on the anti-nuclear vote. More specifically, I use between-municipality variation in radioactive fallout over Sweden caused by Chernobyl in order to examine the causal effect of exposure to fallout on voting, focusing on votes for the Green Party, which was elected into parliament in 1988, two years after the incident. The rise of the Swedish Green Party mirrors a similar development in other Western nations in the years following Chernobyl.

For the identification strategy, I use an important property of radiation deposition, namely that virtually all of the Chernobyl releases were spread though rainfall (Clark and Smith 1988). Hence, due to differences in precipitation levels, there were large variations between municipalities in terms of concentrations of fallout. Most of the fallout was in the form of three radioactive isotopes: iodine-131, tellurium-132, and cesium-137. The isotopes of iodine and tellurium have a half-life of eight and three days, respectively. Cesium-137, on the other hand, is considerably more stable, with a half-life of approximately thirty years. This implies that cesium fallout over a geographical area will have significant adverse impact for decades. Immediately after the reactor fire at Chernobyl was extinguished, Swedish authorities conducted large-scale aerial measurements of cesium-137 fallout in each municipality. I provide the first estimate of how direct exposure to nuclear fallout affects voting.

Controlling for other factors, the results suggest that the increase in the Green Party vote share was higher in municipalities with higher cesium fallout levels. The positive impact on the green vote was particularly noticeable in municipalities with very high levels of fallout exposure. Alternatively, since rainfall is highly predictive of radioactive fallout, instrumenting municipality-level cesium fallout with local precipitation levels confirms the OLS results. Both the OLS and IV results are robust to a variety of alternative specifications.

Was the increase in the green vote only of ephemeral nature, or did the Chernobyl disaster have long-term voting implications as well? Recent research supports the idea that certain temporary shocks may have long-term political implications. For example, a 1975 revision of the U.S. Voting Rights Act had persistent effects on minority voter participation even several decades after its enactment (Ang 2019). Similarly, a major demographic change–Swedish mass emigration to the United States during the late 1800s–led to significant long-term effects on political outcomes in Sweden, in particular an upswing for left-wing movements (Karadja and Prawitz 2019). A regional stimulus program enacted by the German government following severe flooding in 2002 increased voter support for the incumbent party in affected areas, however, most of the gains vanished in the following election (Bechtel and Hainmueller 2011). With this literature in mind, did the effect on the Green Party vote disappear after the 1988 election, or is there still a "Chernobyl premium" in the green vote, 30 years after the accident?

Using the exponential decay property of radioactive isotopes, I construct a panel with the remaining level of fallout for each election year from 1988 to the most recent parliamentary elections in 2018 for each municipality. This data is matched with the corresponding Green Party vote shares for each election. The intuition behind the exponential decay property as a process describing voting behavior is twofold. First, the relative importance of Chernobyl is likely to decrease with time, both with decreasing media interest for the accident and its implications, as well as the emergence of other political issues. Consistent with this idea, Figure 1 illustrates the number of times the word "Chernobyl" appeared in Swedish media, showing a clear spike in 1986 followed by a gradual decline in subsequent years. [1] Second, restrictions on food consumption and animal hunting in fallout-affected areas were in place for several years after the accident. In rural areas in particular, this posed a substantial strain on the day-to-day lives of voters. However, as ground contamination levels declined, such restrictions were increasingly lifted. [2]

The results from our panel model suggest a significant and positive relationship between remaining fallout and the green vote share, suggesting that green voting is higher today in heavily affected areas. This result underscores that Chernobyl had profound long-term impacts not only on public health and the local environment, but on political outcomes as well. However, these results also suggest that Chernobyl is a relatively minor driver of green voting today compared to the elections immediately after the accident. It further implies that the green vote will continue to decline as time progresses. This finding is consistent with theoretical research suggesting that voter memory can be modelled as a time-decaying process (Zhong et al. 2016; Jędrzejewski and Sznajd-Weron 2018).

To evaluate the mechanisms behind the changes in the green vote, I use the results from an annual, nationwide survey, where the respondents are selected randomly, matched with data on fallout levels in respondents' home municipalities. I argue that the effect on the green vote is driven by a change in attitudes to nuclear power in municipalities with high levels of cesium deposition. Specifically, even after controlling for pre-1986 attitudes to nuclear power, there was significantly lower support for nuclear power in fallout-affected areas during the years following the accident. However, beginning in the late 1990s, this fallout-driven heterogeneity in attitudes towards nuclear power began gradually eroding. By the time of the 2018 election, there was no significant difference in attitudes towards nuclear power depending on exposure to cesium in 1986. Concomitant with the decrease in aversion towards nuclear power in fallout-affected areas, the relative importance of nuclear power for Green Party approval ratings has slowly diminished over time. However, there is still a significant relationship between respondents' views on nuclear power and their approval of the Greens.

The paper makes a number of contributions. First, the natural experiment induced by regional variation in Chernobyl fallout levels has been used in several other studies, albeit answering different questions than the one posed in this paper. For instance, more exposed Ukrainians exhibit higher depression rates, lower subjective well-being, and lower labor

[1] The temporary spikes in 2015 and 2016 can be explained, respectively, by the Nobel Prize in Literature being awarded to investigative journalist Svetlana Alexievich, and the 30-year anniversary of the disaster.

[2] In some Swedish regions highly affected by radioactive fallout, regulations still prohibit hunting of certain animals suspected to be contaminated with cesium, and cancer incidence rates are still higher in regions with considerable radioactive exposure (Alinaghizadeh et al. 2016). Hence, the return to pre-Chernobyl outdoor life in fallout-affected areas is conditional on lower contamination levels.

market participation rates (Lehmann and Wadsworth 2011; Danzer and Danzer 2016). Moreover, children born in Swedish regions with high fallout exposure performed worse in secondary school (Almond et al. 2009). Lower doses of radiation over a prolonged time period, suffered by many nations following atmospheric tests of nuclear weapons during the 1950s and 1960s, have similar negative impacts on public health. For instance, in utero exposure to fallout is associated with lower IQ scores, lower education attainment, and an overall increase in mortality (Black et al. 2019; Myers 2019). This article adds to the literature by evaluating, instead, the political impacts of the Chernobyl disaster and in what way exposure to fallout affected voter outcomes.

Second, this article adds to the wider social science literature on how exposure to environmental changes affects short-term policy preferences. Whereas nuclear accidents are very rare, other forms of environmental disasters are not, and as a consequence of global warming, these are expected to be more prevalent in the future. Although wildfire exposure in California increases voter support for pro-climate measures (Hazlett and Mildenberger 2020), other papers suggest that both voters and politicians tend to be less interested in rigid environmental policy in oil-and gas-dependent regions (Nelson 2002; Cooper et al. 2018). Similarly, several studies have found that unexpected temperature fluctuations increases voter concerns about climate change (Egan and Mullin 2012; Herrnstadt and Muehlegger 2014; Bergquist and Warshaw 2019). In this paper, I argue that the Chernobyl disaster was a major factor behind the rise of a new political movement. Although the Swedish Green Party was one of the first environmentalist parties to enjoy success in national elections, the nuclear power debate following Chernobyl provided a boost for green parties in several European nations. [3]

Finally, the result regarding the long-term electoral impacts of Chernobyl expands our understanding of how temporary shocks can generate persistent changes in political preferences. Recent work has shown how a sudden institutional change in Indonesia strengthened the political power of Islamist groups, and had lasting effects on public support for *sharia* laws (Bazzi et al. 2020). Similarly, the 2015 refugee crisis in Europe increased far-right support in several countries, illustrating how a short-term exogenous shock can be a contributing factor to the growth of new political movements (Hangartner et al. 2019; Steinmayr 2020). The global growth of green parties following Chernobyl is another example of how such an unexpected event can have long-term implications. The results in this paper suggest that direct exposure to Chernobyl fallout lead to significant changes in voter preferences, similar to the long-term electoral impact of other temporary shocks. This result, thus, provides new insight into the origins of the environmentalist movement.

The rest of the paper is structured as follows. Section 2 summarizes the Chernobyl

[3] Following the disaster, green parties were elected into national parliaments in Austria (1986), Sweden (1988), Netherlands (1989) and East Germany (March 1990). In the December 1990 elections in reunified Germany, green parties received 8 out of 662 seats.

disaster, and provides a brief background to the green movement in Sweden and elsewhere. Section 3 describes the data. Section 4 presents the empirical strategy, as well as providing the results regarding the short-term political effects. Section 5 considers the long-term impact of Chernobyl on electoral outcomes, and Section 6 concludes.

2. Background

2.1. The Chernobyl disaster

On April 26, 1986, an explosion in reactor 4 of the Chernobyl nuclear power plant caused the release of large amounts of radioactive particles. The blaze burned for ten days, sending a plume of radiation across Europe. Although the first radioactive cloud reached Sweden on April 27, the most significant rainfall was on the night between April 28 and 29. A nuclear accident leads to the release of many different radioactive particles. For example, an air filter measurement of radiation outside Stockholm on April 28–30, showed that iodine-131 was the most active nuclide, followed by tellurium-132, cesium-137, cesium-134, and barium-140 (Bengtsson 1986). However, the isotopes of iodine, tellurium, and barium are highly unstable, with half-lives of less than two weeks, implying that the long-term effects on public health from contamination of these particular nuclides is likely to be small. This contrasts cesium-134, with a half-life of 2.1 years, and in particular cesium-137, with a half-life of 30 years. Although Sweden is relatively distant from Chernobyl, it received approximately 5% of total cesium fallout released during the disaster (Moberg 1991).

To mitigate the risks to public health, restrictions limiting food consumption were enacted immediately after the meltdown in areas heavily affected by fallout. Restrictions were mostly in the form of threshold limits for consumption of meat, berries, fish and mushrooms, severely impacting day to day life in rural areas. The restrictions caused significant damage to animal life, as thousands of reindeer and other wild animals had to be destroyed due to contamination. The restrictions for reindeer consumption were particularly devastating for Sweden's indigenous Sámi population, which is heavily dependent on reindeer herding. During the fall of 1986, 27,000 out of 36,000 already butchered animals were disposed of due to cesium contamination. In 1987, the government raised the threshold limit for reindeer meat in an attempt to mitigate the situation, however, the market had essentially collapsed by that time (Skielta 2016). Overall, around 200,000 reindeer have been discarded in Sweden since 1986 (Rydenfalk 2016). As an additional side effect and regardless of formal restrictions, many people were too afraid to even go out in the open. There are numerous anecdotal accounts of this phenomenon. As one farmer from Delsbo in Gävleborg County, one of the most hard-hit areas in Sweden, describes it (Mörtberg 2016):

> ”Before Chernobyl, my wife used to pick blueberries, lingonberries and raspberries. But we quit that immediately. It probably took us ten years before we dared to do that again. And we did not start mushroom hunting until five years ago [in 2011]”

Notwithstanding the restrictions on food consumption, the impact on public health was significant. While the adverse health effects were considerably more pronounced in Ukraine, several studies suggest a positive relationship between fallout exposure in Sweden and cancer incidence (Tondel et al. 2006; Alinaghizadeh et al. 2016). The Swedish Radiation Safety Authority estimates that in the 50-year period following 1986, approximately 300 excess cancer deaths will occur in Sweden due to exposure to Chernobyl fallout (Hult 2011). As a safety precaution, threshold limits for food consumption continue to be in place in some regions in mid Sweden as of 2020.

Although several Swedish regions were significantly impacted by the disaster, there was considerable geographical variation in exposure to fallout. In the most affected areas, ground deposition was close to that outside the Chernobyl exclusion zone, whereas other parts of Sweden were essentially spared (Almond et al. 2009). Data from measurements in 1994 suggest that cesium-137 ionizing radiation levels of residents in the most heavily affected areas are as much as 30 times higher than the national average (Moberg and Persson 1996). Importantly, regional variation in fallout exposure provides a natural experiment enabling us to assess the political consequences of the disaster.

2.2. Nuclear power and politics in Sweden

The first nuclear reactor in Sweden opened in 1954. The purpose was not, however, to produce electricity. Instead, the experimental reactor was seen as crucial for Sweden's nuclear weapons program, which was deemed necessary for national defense following the first Soviet atomic bomb test in 1949 (Berggren 2010, p. 270). However, the dominant party at the time, the Social Democrats, was highly split on the issue, a sizable fraction of the party being against the program. Over time, the focus shifted towards civilian nuclear power, and by 1977, Sweden had six reactors in operation.

Although peaceful nuclear power was fairly uncontroversial during the 1960s and early 1970s, the 1979 Three Mile Island accident in Harrisburg, Pennsylvania, led to a surge in anti-nuclear activism in the Western world. At this time, Sweden was governed by a center-right government for the first time since the 1930s. The government consisted of three parties with highly divergent views on nuclear power: the pro-nuclear Moderate Party, the Center Party, which was against, and the People's Party somewhere in between. [4] Amid the public debate following Harrisburg, the nuclear power issue caused internal

[4]The Center Party was the first major party in Sweden to demand that nuclear power be abolished (Asp and Holmberg 1984, p. 34). However, the contrast vis-à-vis the MP was considerable: The Center Party was originally an agrarian party focusing on farmer interests, with energy policy being just one issue amongst others. Moreover, it had been in government on several occasions and was, thus, more of an ”establishment” party, and consequently, less radical than the MP with respect to nuclear power.

government disagreement. To mitigate this, as well to accommodate public pressure to abandon nuclear power altogether, a nonbinding referendum on the future of nuclear power in Sweden was held in 1980.

Somewhat nonstandard for a referendum, there were three options available to voters: Options 1 and 2 favored gradual abolishment of nuclear power, whereas Option 3 favored abolishment within ten years. The chief difference between Options 1 and 2 was that the latter specified that nuclear plants be owned by the government, whereas the former did not. Hence, Option 1 was supported by the center-right Moderate Party, and Option 2 was supported by the center-left Social Democrats, as well as the People's Party. Option 3 was supported by the Center Party, the Communists as well as a sizable faction within the Social Democrats. Importantly, neither Option 1 nor 2 specified exactly *when* nuclear power was to be abolished, only that it would be abolished sometime in the future. Option 2 won a plurality (39.1%), followed by Option 3 (38.7%) and Option 1 (18.9%), with 3.3% of the votes cast blank. Following the referendum, parliament voted to abolish nuclear power by 2010 (Holmberg 2015). However, this decision did not prevent the commissioning of reactors already under construction. In fact, six reactors were commissioned between 1981 and 1985, increasing the total number of reactors to 12 at four sites. Although nuclear power was to be completely abolished by 2010, as of 2020, there are still seven reactors in operation in Sweden. [5]

One year after the referendum, the Swedish Green Party (*Miljöpartiet*, MP) was formed. From its founding, the party has been highly sceptical of nuclear power, advocating a transition to renewable energy sources. Its national vote share in the 1982 parliamentary elections was 1.7 percent, followed by 1.5 percent in 1985 and 5.5 percent in 1988. Sweden has a system of proportional representation, meaning that a party with x percent of the national vote share obtains approximately x percent of the seats. In order to claim any seats in parliament, a party must receive a higher vote share than the election threshold of 4%. Hence, it was not until the 1988 election–the first following Chernobyl–that the MP won seats in the national parliament. Besides Chernobyl, political scientists regard the sudden mass death of thousands of harbor seals (*Phoca vitulina*) along the Atlantic coast of Sweden in 1988 as contributing factor to the success of the MP. It was initially thought to be related to marine pollution, the regulation of which was a major issue for the MP. [6] Consequently, the 1988 election is sometimes called the "environment election" (*miljövalet*).

The breakthrough of the MP mirrored a similar development in other Western nations. In 1983, the West German Green Party won representation in the *Bundestag*, becoming the first major green party represented in a national parliament. Besides the Three Mile

[5] In 2010, the then-center-right government changed the legislation, enabling construction of new rectors.

[6] It was later concluded that the mass death of seals was caused by the virus *Phocine morbillivirus*, and was unrelated to pollution or eutrophication.

Island and Chernobyl incidents, the 1980s saw an increase in public awareness of other environmental issues, most notably regarding the depletion of the Earth's ozone layer (Christoff 1994). Moreover, the re-escalation of the Cold War in the early 1980s provided a boost for green movements, since most green parties emphasized both environmental and peace issues (Rüdig 2019). By the end of the 1980s, green parties had established themselves in most of the countries in the European Community.[7]

In recent years, the global upswing of green parties has accelerated due to mounting cross-country concern regarding the impact of climate change. In Sweden, however, the vote share of the MP has hovered around four to six percent since the early 1990s, as seen in Figure 2. Akin to its Green sister parties in other European countries, the MP is progressive in social issues, particularly with respect to immigration. It had a supply-and-confidence agreement with the Social Democratic government during 2002–06, and have been junior members in a centre-left coalition with the Social Democrats since 2014.

3. Data

3.1. Radiation data

In order to estimate Chernobyl fallout exposure in each municipality, I rely on the aerial measurements of ground deposition of cesium conducted in May and June 1986. Aerial measurements of cesium fallout commenced May 9, and lasted until June 3, producing a detailed map of ground deposition of cesium-137 (Bennerstedt et al. 1986). The map is shown in Figure 3, illustrating the significant geographical variation in fallout levels observed following the accident. The northernmost parts of Sweden were essentially spared, as was most of southern Sweden. Instead, the highest concentration of ground cesium deposition was in coastal areas in the central parts of the country. The estimates were presented as intervals, and the measure of ground contamination is in kilobequerels per square meter (kBq/m^2). A problem with the aerial measurements of cesium deposition is that at the time of the Chernobyl disaster, there were traces present of cesium fallout from atmospheric nuclear weapons testing in the 1950s and 1960s. To avoid confounding, ground deposition of the shorter-lived cesium-134 was measured in lieu of cesium-137, since the atmospheric nuclear weapons tests almost exclusively produced cesium-137. Values for cesium-137 were subsequently approximated using a known ratio between cesium-134 and cesium-137 activity in the core of the destroyed reactor.

In all, there were 284 municipalities (*kommuner*) in Sweden at the time of the Chernobyl disaster. These were divided into 24 counties (*län*). In 191 out of 284 municipalities,

[7] In the 1989 European parliament election, green parties received 30 out of 518 seats, forming their own parliament group for the first time.

it is immediately clear in which fallout zone the municipality is located. Consequently, in 93 out of 284 cases, there is within-municipality variation in cesium-137 ground deposition levels, since the municipality is covered by several fallout zones. An example is given in Figure 4, which illustrates the fallout zones of Gotland municipality using the same color scheme as the map in Figure 3. It is divided into three areas of roughly equal size, one with 0–2 kBq/m^2 of fallout, one with 2–3 kBq/m^2, and one with 3–5 kBq/m^2. I assign the lowest value in the interval as the point estimate of fallout for each zone, that is, 0, 2 and 3 kBq/m^2, respectively. Using these point estimates, it is fairly straightforward to calculate numerical values of ground cesium deposition in municipalities. I use two different approaches. The first approach takes the cesium deposition level in the highest zone as the point estimate for the municipality. It follows that 3 kBq/m^2 is the estimate of the maximum ground deposition, since the zone with the highest rate of ground deposition is the one with 3–5 kBq/m^2 of cesium located in the southern part of the island. As an alternative measure, I use ArcGIS to calculate the average ground deposition level for each municipality, weighting the relative size of each fallout zone within the municipality. This measure is provides more conservative estimates of ground deposition levels. Returning to our previous example with Gotland municipality, the estimate of the average ground deposition is 1.87 kBq/m^2.

There are a number of concerns regarding the reliability of the fallout measures. First, the results of the aerial measures are given on an interval scale, which is a less precise measure. Moreover, it is difficult to precisely estimate the average ground deposition in some municipalities as this requires averaging over several fallout zones. To correct for these uncertainties, I instrument the two measures of fallout with municipality precipitation levels. Ground cesium levels are highly correlated with precipitation levels, since up to 99% of Chernobyl deposition of cesium-137 was due to rainfall intercepting the plume (Mattsson and Vesanen 1988). I use precipitation data from 248 Swedish weather stations collected by the U.S. National Centers for Environmental Information beginning on April 27, and ending on May 7, when the reactor fire was extinguished. [8] Then, the cumulative precipitation level for each municipality (RAINFALL_i, measured in inches) is utilized as an instrument for the two aerial radiation measurements. Figure 5 illustrates the correlation between rainfall and average ground deposition. Since rainfall is the chief predictor of ground deposition, the correlation is strong and positive, as expected.

3.2. Election data and survey design

In order to test whether exposure to radioactive fallout affected electoral outcomes, our main explanatory variable of interest is the evolution of the MP vote share in parlia-

[8] Again, due to the large variations in municipality area, a small number of municipalities in northern Sweden have more than one weather station, which may give conflicting estimates of rainfall. In this case, the weather station closest to the municipal seat is used.

mentary elections. Specifically, for the short-term estimates in Section 4.1, I use the municipality-level percentage point difference in the MP vote share between 1985 and 1988, denoted ΔMP_i, as the dependent variable. The turnout rate for the 1988 parliamentary elections was 86.0%, which is a relatively high figure by international standards. Online Appendix B provides further details into the data sources and definitions for all variables in the empirical analysis.

In addition to the election data, I use survey data from the annual *SOM*[9] survey in order to evaluate respondents' views on nuclear power, and whether exposure to Chernobyl fallout affected those views. The survey takes the form of a paper questionnaire, and I use survey data from 1987 to 2018. As the name suggests, the questions survey respondents' views on politics, society, and media. A question on respondents' views on nuclear power has been asked every year, which allows us to investigate differences in attitudes towards nuclear power, both between municipalities, and between time periods.

The SOM survey has two key features making it suitable for our analysis. First, the respondents are chosen randomly among the Swedish adult population (aged 16–85), which is important for inference. Secondly, the relatively large sample size – around 3,500 observations per year – allows for municipality-level breakdown of attitudes towards nuclear power. However, many small municipalities will typically have relatively few or no observations for a given year. To overcome this obstacle, I use the fact that the exact wording of the question on nuclear power has been changed several times: in 1996, 2000, 2005, and 2011. Hence, the question rephrasing years are used as cut-off points for creating subsamples. That is, the first subsample consists of the years 1987–1995, the following covers the period 1996–99, the third subsample is for the years 2000–04, and so on. In this way, we obtain a larger set of observations for each municipality. Despite the rephrasings, we can still broadly classify respondents as being either in favor of, or opposed to, nuclear power. This allows us to construct the variable $\text{Support nuclear power}_i$ for municipality i as the share of respondents supporting the long-term use of nuclear power in Sweden. Matching survey data with fallout data allows us to examine whether there was a change in respondents' attitudes towards nuclear power between subsample periods. Online Appendix C provides additional details on the structure of the questionnaire for each subsample period, as well as the exact wording of the questions and answers available to respondents.

3.3. Data on municipal characteristics

In addition to the political outcome variables, I use a number of municipality-specific controls included to avoid any confounding from underlying local effects. These include the 1988 values for population, area, median disposable household income, employment

[9] Shorthand for "Society, Opinion, Media" (*Samhälle, Opinion, Medier*).

rate, share of college graduates, the 1980 referendum vote share of Option 3 (abolishment within ten years), as well as the previous election (1985) vote share of the MP. Moreover, I include a set of geographic controls. First, a binary variable equal to unity if the municipality is in a county with a nuclear power plant. Second, a dummy equal to one if the municipality is in the same county as Stockholm or Gothenburg [10]. Finally, as a geographical control, I use lands fixed effects, with Svealand (central Sweden) as the baseline category. [11] The latter is included to account for large variations in political attitudes between the northern and the southern parts of Sweden, the reasons for which are chiefly historical and not easily captured by our municipal controls (Blomgren 2012) [12]. Table A.1 of Online Appendix A presents the summary statistics for all variables used in the empirical analysis. Online Appendix B provides additional details on definitions and data sources for the variables used in the empirical analysis.

4. Short-term political effects

4.1. The impact of fallout on the green vote

In order to assess the impact of the Chernobyl disaster on the MP vote, I proceed as follows. The outcome variable of interest is the percentage point change in the MP vote share between 1985 and 1988, ΔMP_i for municipality i. Our independent variable of interest is the ground deposition of cesium in the corresponding municipality, $\textsc{Fallout}_i$. I thus estimate the following model using OLS:

$$\Delta \text{MP}_i = \beta_0 + \beta_1 \text{Fallout}_i + \boldsymbol{\beta}' \boldsymbol{X}_i + \varepsilon_i \tag{1}$$

where β_0 is a constant, $\boldsymbol{X}_i$ is a vector of municipality-specific controls, and ε_i is an error term. The coefficient of interest is β_1, which should be positive if the Chernobyl disaster caused a shift in voter preferences toward environmentalism. The results of this regression are presented in Table 1. The first column gives the results when municipal fallout is approximated using the maximum level of ground cesium contamination. The second column uses the average ground contamination. Subcolumn (1) uses all municipality-

[10] Akin to progressive parties in other nations, the MP is stronger among urban middle-class voters, however, the municipality population variable is unable to fully capture this effect. For instance, six out of 26 municipalities in Stockholm County have populations of less than 30,000, and only three have more than 100,000 inhabitants.

[11] Similar to how the United States is divided into four census regions, namely the Northeast, Midwest, West and South, Sweden is similarly divided into three historical lands (*landsdelar*), representing the northern, central, and southern part of the country, respectively. See Online Appendix B for additional details.

[12] In general, the northern parts of Sweden are typically left-leaning, whereas the southernmost counties are more right-wing.

level controls, except for the lagged (last election) MP vote share level. [13] Subcolumn (2) includes the lagged MP vote share in addition to the municipal controls.

The results suggest that ground deposition of cesium is positively related to MP voting. As shown in Panel A, one unit increase in the average ground cesium deposition level increases MP votes by approximately 0.01 percentage points. The magnitude of this coefficient is lowered by one-half when considering maximum fallout. Both coefficients are statistically significant at the 5% level.

Considering that a unit increase in ground deposition represents a relatively modest change, an alternative approach is to construct a dummy variable taking the value one if ground deposition of cesium was greater than zero as the main independent variable of interest. Panel B gives the results of this regression. Holding other variables constant, the MP vote share was approximately 0.15 percentage points higher in contaminated municipalities, compared to unaffected municipalities. Finally, Panel C uses a dummy for high fallout instead of the continuous measure, with "high" being defined as ground contamination exceeding 37 kBq/m^2, which is a cut-off often used by to define an area as contaminated. [14] In municipalities where the average level of contamination was above 37 kBq/m^2, MP voting was around 0.6 percentage points higher than in municipalities where the average contamination was below this threshold. This coefficient is significant at the 1% level.

In Tables A.2–A.4 of Online Appendix A, I investigate the results of the model described by (1) with the difference in the MP vote share replaced by the difference in the vote shares of the incumbent Social Democrats, the pro-nuclear Moderate Party, as well as the anti-nuclear Center Party. There is a negative relationship between fallout and both the Social Democratic and Moderate Party vote shares. However, the result is only statistically significant when considering the ground deposition dummy, as seen in Panel B. In municipalities with at least some level of ground contamination, the Social Democratic vote share decreased by around half a percentage point. Similarly, the vote share of the pro-nuclear Moderate Party declined by around 0.3 percentage points in municipalities with fallout exposure compared to those without. For the soft nuclear-sceptic Center Party, there was instead a linear and negative relationship between fallout exposure, which was not exacerbated in high-fallout areas.

Overall, the MP captured voters both from the center-left and center-right. The pro-nuclear Moderate Party was disproportionately penalized in hard-hit municipalities. Moreover, although the Center Party was against nuclear power, its vote share declined as nuclear-sceptic voters shifted towards the MP, which was likely to be seen as the "new kid on the block" and was more radical with respect to nuclear power.

[13]Since there were only 279 municipalities by the time of the 1980 referendum (as opposed to 284 in 1986), this is the number of observations in our model.

[14]This follows from an alternative measure of contamination (*curie*, Ci), where 1 Ci/km^2 = 37 kBq/m^2 (Maskalchuk 2012).

4.2. IV estimates

As discussed previously, an alternative approach instead of using the estimated levels of ground deposition is to instrument the maximum and average ground depositions of cesium with rainfall levels during the period immediately after Chernobyl. I use the cumulative precipitation level between April 27 and May 7 as an instrument for ground deposition of cesium, and estimate the following 2SLS model:

$$\text{Fallout}_i = \alpha_0 + \alpha_1 \,\text{Rainfall}_i + \boldsymbol{\alpha}' \boldsymbol{X}_i \; + \varepsilon_{1i} \tag{2}$$

$$\Delta\text{MP}_i = \beta_0 + \beta_1 \,\widehat{\text{Fallout}}_i + \boldsymbol{\beta}' \boldsymbol{X}_i \; + \varepsilon_{2i} \tag{3}$$

where ε_{1i} and ε_{2i} denote the errors in the first and second stage regressions, respectively. The results are presented in Table 2. The first stage is highly significant both for maximum and average ground deposition, suggesting that municipality-level rainfall is a strong predictor of both measurements of ground deposition of cesium. The second stage results give approximately twice as large coefficient estimates compared to OLS. As the average level of ground deposition of fallout increases by one unit, the MP vote share increases by around 0.02 percentage points. Again, controlling for the MP vote in the 1985 election reduces the magnitude of both coefficients slightly, although the results are still significant at the 5% level. Overall, these results, together with the OLS estimates provided in Section 4.1, suggest that the 1986 Chernobyl disaster provided a significant boost for the MP in the 1988 election.

If rainfall following Chernobyl disproportionately affected high-precipitation areas, it would bias the IV results. To check if this is the case, I use reported precipitation rates during the rest of the year for each weather station to establish whether rainfall during the rest of 1986 can predict rainfall in the period immediately after Chernobyl. The correlation between rainfall following Chernobyl and rainfall during the rest of 1986 is close to zero, and statistically insignificant. [15]

4.3. Robustness and alternative explanations

1. Robustness checks

In the following section, I perform a number of robustness checks on the main outcomes. First, Table A.5 of Online Appendix A reports the results when re-estimating the OLS results presented in Section 4.1, as well as the IV estimates in Section 4.2, using the

[15] Of the 248 weather stations, 219 have full-year values for precipitation. Spearman's rank correlation is equal to −0.0365 with a p-value of 0.5909 for the null hypothesis that rainfall following Chernobyl (between April 27 and May 7) and rainfall during the rest of 1986 are independent. A simple linear regression where rainfall following Chernobyl is regressed on a constant and rainfall during the rest of 1986 yields a slope coefficient estimate of −0.0005 with a standard error of 0.0029, and an associated t-statistic of −0.18.

log-transformed ground contamination measurements. Regardless of whether the log-transformed or raw measurements are used, the conclusions are identical, namely that higher fallout exposure increased voting for the MP.

To address the concern that the Chernobyl accident affected the 1988 values of the municipality-specific controls, Table A.6 of Online Appendix A presents the results when using the pre-Chernobyl (1985) values of the municipal characteristics. There is no significant impact on the coefficient estimate $\widehat{\beta}_1$, neither when using the maximum nor when using the average ground deposition.

As a test of the identification strategy, Table A.7 of Online Appendix A gives placebo estimates, re-estimating (1) with the MP vote share difference between the 1982 and 1985 elections as the dependent variable. Since the 1982–85 term terminated one year before Chernobyl, the coefficient estimate for fallout should be zero. As expected, both the continuous measure of ground deposition of cesium, as well as the corresponding dummies in Panels B and C are close to zero, and statistically insignificant.

2. Potential alternative mechanisms

The following section attempts to rule out a number of potential alternative explanations behind the surge in MP voting between 1985 and 1988.

1988 seal virus epidemic. As discussed previously, the other major environmental issue in the 1988 election was the sudden death of thousands of harbor seals along the western coast of Sweden. Although there is no data on precisely how many cadavers were found in each municipality, I consider instead a binary variable equal to unity if the municipality is located along the coastline of the counties affected by the virus outbreak. [16]

Table A.8 of Online Appendix A shows the results when re-estimating our main model. Panel A includes only the coastal municipality variable and the municipal controls, while Panels B and C augment the model by including the maximum and average fallout levels, respectively. The coefficients for maximum and average ground deposition change only marginally when including the coastal municipality dummy, and are still highly significant. Hence, it does not alter our conclusions regarding the impact of fallout on the green vote. This result is also consistent with recent research downplaying the role of the seal epidemic in explaining the growth of the MP in the late 1980s (Ljunggren 2010).

Ethnic effects. Another challenge to the validity of our results is the economic damage from the collapse of the reindeer meat industry following the disaster. Since this disproportionally impacted the indigenous Sámi population, the results regarding the fallout-driven impact on the MP vote could be difficult to generalize to a broader setting

[16] Online Appendix B provides additional details on the construction of this variable.

if it is driven by one particular ethnic group. Since Sweden does not keep statistics on ethnicity, I construct a binary variable taking the value one if there is a so-called Sámi village (*sameby*) in the municipality, and zero otherwise. A Sámi village is a is a geographical area where reindeer herding is conducted. [17] Only individuals of Sámi descent can join such a village, and in order to conduct reindeer herding, a person has to be a member (3 § Swed. law 1971:437). Membership is similar to membership in a club. In all, there are 20 municipalities with at least one Sámi village, mostly in the northeastern parts of the country.

Panel A of Table A.9 of Online Appendix A shows the results when regressing the MP vote share difference on the Sámi village municipality dummy and the municipal controls utilized previously, while Panel B further includes the maximum ground deposition. Panel C is similar to Panel B, using the average ground deposition in lieu of the maximum ground deposition. Both coefficients are statistically insignificant, and the ground deposition coefficient is only marginally impacted by the inclusion of the Sámi village variable. This suggests that our results on the impact of fallout on MP voting are not biased towards municipalities with significant indigenous presence.

The role of immigration. Many argue that immigration has been the most divisive political issue in Western countries in the last years. However, already the late 1980s and early 1990s saw significant refugee waves to Sweden, driven primarily by the gradual implosion of Yugoslavia and the political deterioration in the Middle East. Numerous recent papers have examined the role between immigration and political outcomes, focusing both on the growth of right-wing populist movements as well as the collapse of established parties (Halla et al. 2017; Dustmann et al. 2019; Edo et al. 2019). If higher immigration rates have a positive impact on parties sceptical towards immigration, we would expect the opposite effect on progressive parties with urban constituents, such as the MP.

To evaluate the impact of immigration on the MP vote, and whether this confounded our findings regarding the role of fallout, one approach would be to regress the change in the MP vote share on the immigration rates during the 1985–88 period. Since immigration rates are typically assumed to be endogenous with respect to political outcomes, I use data from a national refugee placement program enacted in 1985 and abolished in 1994, under which all refugees in Sweden were randomly allocated to municipalities. [18] According to this scheme, the allocated refugee rate between 1985 and 1988 serves as an

[17] Formally, a Sámi village is a legal entity in which the only prohibited economic activity is reindeer herding.

[18] Although municipality participation in the program was voluntary, virtually all participated by 1991. The Swedish refugee placement program has been utilized in other studies, although focusing on different questions than the one in this paper (Edin et al. 2003; Dahlberg and Edmark 2008; Dahlberg et al. 2012).

instrument for the increase in the share of immigrants during the same period, denoted ΔIM. [19]

Panel A of Table A.10 of Online Appendix A presents the 2SLS results with the MP vote share difference between 1985 and 1988 regressed on a constant, the immigration rate instrumented by the refugee inflow rate, and the same set of municipal controls utilized in estimating equation (1). Overall, I find little evidence that immigration significantly impacted the MP vote share. Although the coefficient estimate for the immigration rate is negative, suggesting that a higher immigration rate had a dampening impact on the MP growth rate, the result is not statistically significant. Panel B augments the model with the average ground deposition. The coefficient estimate for fallout is similar to the that presented in Table 1, and is significant at the 10% level.

5. Long-term political effects

One important aspect of nuclear accidents are their long-term implications. Whereas other natural disasters, for instance hurricanes and flooding, typically have severe consequences in the short-term, their long-term impacts can be remedied by appropriate measures from society. While the release of nuclear fallout causes little physical damage, adverse effects in the form of contaminated soils, lower well-being and higher cancer rates can be substantial for decades in areas affected by fallout. However, as ground fallout levels return to normal, these adverse health effects will be significantly mediated. Can we draw a similar conclusion regarding the anti-nuclear vote? In other words, the following section tries to answer whether it is possible estimate to how large a share of the municipal-level MP vote is due to local exposure to Chernobyl fallout, taking into account that radiation exposure is gradually declining.

5.1. Panel estimates

In order to answer whether the Chernobyl premium on the MP vote persisted over several elections, I start by describing the process by which cesium exposure decreases over time. A quantity N of radioactive particles decays according to the differential equation $\dot{N} = -\lambda N$, where $\dot{N}$ denotes the derivative with respect to time of N, and λ is a particle-specific constant called the *decay constant*. For cesium-137, the value of the decay constant is approximately equal to 0.023. [20] Solving this equation and rearranging, and evaluating at time $t = 0$ yields

$$N(t) = N_0 e^{-\lambda t} \tag{4}$$

[19]Here, ΔIM is defined as the percentage point increase in the share of individuals with either non-OECD citizenship, or Turkish citizenship.

[20]Calculated as $\lambda = \ln(2)/t_{1/2}$, where $t_{1/2}$ is the half-life. For cesium-137, $\lambda = \ln(2)/30.17 \approx 0.023$.

where the left-hand side is the number of particles remaining at time t. Using this formula and letting N_0 be the level of deposition of cesium recorded by the aerial observations in 1986, it is straightforward to calculate the remaining level of ground contamination for each election year. Reverting to our previous notation by letting $N(t) = \textsc{Fallout}_t$ and adding the cross-sectional dimension, the explanatory variable of interest, $\textsc{Fallout}_{it}$, can be interpreted as the remaining level of cesium-137 fallout in municipality i at time t. This allows us to estimate the model

$$\text{MP}_{it} = \gamma_i + \gamma_1 \text{Fallout}_{it} + \boldsymbol{\gamma}'\boldsymbol{X}_{it} + \mu_t + u_{it} \tag{5}$$

where $t = 1985, \ldots, 2018$, γ_i is a municipality fixed effect, μ_t is an election year fixed effect, and u_{it} is an idiosyncratic error term. The left hand side of the above equation represents the MP vote share for each municipality at every election. [21] The starting point is 1985, which was the election year preceding the Chernobyl disaster. At this time, fallout of cesium-137 is assumed to be zero for all municipalities. Due to the exponential decay property, the percentage change in ground contamination over time is the same for all municipalities. However, in municipalities with high fallout exposure, the absolute change in cesium contamination can be considerable, enabling lifting of restrictions.

The results are presented in Table 3. In Panel A, ground contamination of cesium is estimated using the maximum fallout method, whereas the ground contamination in Panel B corresponds to the average level of ground deposition. The first results column includes no controls. The middle column includes an election year fixed effect, whereas the rightmost column is the full model as specified by equation (5), including all municipality characteristic controls, except for the time-invariant geographical dummies and the area of the municipality. The inclusion of the election year fixed effect is of importance, since different elections tend to focus on different issues. Hence, if environmental policy is sidelined in the election campaign, green voting is likely to decrease, and vice versa. The coefficient estimates in column (2) of Table 3 are around 0.006 for maximum ground deposition and 0.009 for average ground deposition. As a numerical example, if average ground deposition decreases from 40 to 20 kBq/m^2, the premium on the MP vote is expected to decline by around 0.2 percentage points. The coefficient estimates decrease slightly when including the time-varying municipal controls.

To summarize, the change in MP support between elections is heavily dependent on election-specific effects, which is also a plausible explanation to the significant decrease in MP vote shares between 1988 and 1991. However, the results also suggest that there is a persistent Chernobyl premium in the MP vote related to the remaining level of ground contamination. This premium is decreasing over time, as ground deposition returns to normal.

[21] Starting in 1994, Sweden has used four-year terms, instead of three-year terms.

5.2. Evidence on mechanisms

Did the positive effect on MP voting mirror a change in attitudes towards nuclear power in fallout-affected areas? If the increased MP voting in response to fallout exposure from Chernobyl was a result of concern about the adverse health effects, we would expect public opinion to be more sceptical towards nuclear power after the accident. Another question arising is whether the decreasing MP vote share premium is similarly reflected in a change in attitudes toward nuclear power over time. To answer these questions, I use the results from the SOM survey described in Section 3.2, allowing us to examine more closely the relationship between MP voting, fallout exposure and attitudes to nuclear power.

1. Relationship between fallout exposure and support for nuclear power

I start by considering the municipality-level relationship between fallout exposure and support for nuclear power. Denoting each of the subsample periods by j, where the five subsamples are as defined in Section 3.2, namely 1987–1995, 1996–1999, 2000–2004, 2005–2010, and 2011–2018, we can calculate the share of residents supporting nuclear power in each subsample period, and estimate

$$\text{Support nuclear power}_i^j = \beta_0^j + \beta_1 \text{Fallout}_i + \boldsymbol{\beta}' \boldsymbol{X}_i^j + u_i^j \qquad (6)$$

where $\textsc{Fallout}_i$ is the level of fallout as measured in 1986. If the positive effect of Chernobyl contamination on the green vote reflected a change in attitudes towards nuclear power, we would expect a negative coefficient estimate $\widehat{\beta}_1$, since voters in fallout-affected areas would be less inclined to support nuclear power, at least in the years immediately following the disaster. In this specification, it is crucial to control for 1980 referendum results, as we would expect lower support for nuclear power in municipalities with high vote shares for Option 3 regardless of fallout exposure. The remaining time-dependent controls for population, employment shares, income, and share of residents with tertiary education are calculated as averages over each subsample period.

To avoid small-sample problems, I restrict the sample to include only municipalities with at least 30 observations in each subsample. In total, this gives us 43,461 respondents and 61 municipalities. Table 4 provides the results. Panel A uses the average ground deposition of cesium as the dependent variable. [22] In the 1987–95 subsample, there is a negative relationship between exposure to fallout and support for nuclear power. Panel B gives the results when using the ground deposition dummy. In fallout-affected municipalities, support for nuclear power was approximately 2.5 percentage points lower than in areas with no fallout exposure. However, in the later subsamples, this effect becomes

[22] Using maximum ground deposition yields similar results. Results are available on request.

numerically smaller and statistically insignificant, which is in line with our predictions. The overall conclusions hold when using IV with average ground deposition instrumented by cumulative rainfall, as seen in Panel C.

Notably, when using the continuous measure in Panel A, support for nuclear power is higher in areas with larger ground contamination in the two final subsample periods. This coincides with a decline in the explanatory power of the model, plausibly reflecting that 1986 fallout exposure has been a less important determinant of attitudes towards nuclear power in recent years, compared to the years immediately after the disaster.

As a robustness check, Table A.11 of Online Appendix A reports the results when re-estimating equation (6) using 20 observations as the cut-off for including municipalities. This increases the total number of observations included to 50,874, and the number of municipalities to 92. The coefficient estimates change only marginally, and the overall conclusions presented above are robust to this change.

2. Individual-level relationship between support for nuclear power and MP voting

So far, I have focused on the relationship between fallout exposure and MP voting on the municipality level, and whether the MP increase between 1985 and 1988 was driven by an increase in anti-nuclear sentiments in fallout-affected regions. A related question is whether this mechanism–that is, the relationship between attitudes to nuclear power and green voting–is equally persistent over time. A recurring set of questions in the SOM survey concerns respondents' views on the political parties represented in parliament. For each party, the respondent is asked to rate each party using a scale from -5 to 5, where -5 is "disapprove strongly" and 5 is "approve strongly." If it is the case that individuals opposed to nuclear power are more likely to vote for the MP, we would expect opponents of nuclear power to rate the MP more favorably, and vice versa. Defining the variable $\text{MP APPROVAL}_k \in [-5, 5]$ as the approval rating that individual k assigns to the MP, we can estimate

$$\text{MP approval}_k^j = \beta_0^j + \beta_1 \text{Support nuclear power}_k^j + u_k^j \tag{7}$$

using OLS for each subsample period j. Since we now analyze individual-level data, SUPPORT NUCLEAR POWER is a binary variable taking the value unity if the individual supports nuclear power, and zero else. [23] Table 5 presents the results, with Panel A showing the results using no controls, whereas Panel B includes municipality fixed effects. We see that individuals classified as supporting nuclear power during 1987–95 rate the MP, on average, around 1.8 units lower on the -5 to 5 scale, compared to individuals not supporting nuclear power. This decreased to around 1.6 units lower during the 2005–10 period. Finally, in the 2011–18 subsample, the relationship between support for nuclear power and MP approval is considerably lower than in previous periods. During

[23] The same definition of "supporting nuclear power" is used as previously.

this period, an individual supporting nuclear power had around 0.7 units lower approval of the MP. This likely reflects a declining interest in the politics of nuclear power in the electorate, as well as the 2015 refugee crisis shifting the political debate. This hypothesis is further supported by the explanatory power of the model being lower in the later subsamples, suggesting that nuclear power was a less important determinant of MP approval towards the end of time period considered. However, even in the final subsample, the relationship between support for nuclear power and MP disapproval is statistically significant at the 1% level. Including municipality fixed effects has a negligible impact on the size of the coefficients.

A potential concern for our econometric framework is that when using a linear regression model, the distance between the categories in the outcome variable are all assumed to be equal. This can be problematic when the outcome variable is a rating scale score. [24] Relaxing this assumption, Table A.12 of Online Appendix A re-estimates the above equation using an ordered logit model. All coefficient estimates are slightly lower in absolute values, however, the overall conclusions are similar, with the impact of pro-nuclear views on MP approval ratings being considerably lower from 2005 onward.

To summarize this section, at the time of the 2018 election, there was still a small premium on the MP vote from Chernobyl exposure. However, the relationship between remaining Chernobyl exposure and MP voting is considerably less pronounced today than it was in the 1988 election. A potential mechanism explaining this finding is that the negative relationship between support for nuclear power and regional fallout exposure has gradually diminished since the 1980s. In addition, the importance of nuclear power in determining the approval rating for the MP among individual voters has decreased substantially in recent years. This result is consistent with the idea outlined previously in the paper, namely that the increase in MP support following Chernobyl was diluted as voter memory of the accident faded, Chernobyl-related restrictions were lifted, and with the emergence of other polarizing political issues.

3. Voter information

A final question is related to the process through which process voters gather information regarding local fallout levels. If voters were uniformed about the levels of fallout in their home municipality, it is unlikely that we would see variation in MP voting across municipalities. One potential channel through which voters update their knowledge about regional fallout levels is through local media. In order to answer whether there was a variation in newspaper coverage based on fallout levels, I use data from scanned print versions of the universe of Swedish newspapers from 2013 onward; in all, approximately

[24] Often, respondents tend to place themselves in the ”middle” of the option set, in this case near zero. This problem is exacerbated when the number of options available to respondents is large (Scheaffer et al. 2012, p. 34).

250 newspapers. [25] I then regress the number of times the words "cesium" and "Chernobyl" appear in the most-circulated newspaper for each municipality on the maximum and average fallout levels, after adjusting for the number of days per week the newspaper circulates.

The results are presented in Table A.13 of Online Appendix A, suggesting that the words "cesium" and "Chernobyl" are significantly more common in local papers of municipalities with higher fallout exposure. This is particularly evident for "cesium", and in municipalities outside the largest urban areas. Given this, it is likely that there was a regional difference in newspaper coverage of Chernobyl in the months and years immediately after the accident as well. Considering that cesium fallout is associated with significant health hazards, we would expect the MP to have higher potential among informed voters. This would, thus, provide a plausible channel for explaining the variation in the MP vote share across municipalities. However, the decline of local print media in the last years, concomitant with the gradual dwindling of nuclear power as a determinant for MP support weakens the relationship between ground contamination and MP voting, even though local media interest in the accident remains high.

6. Concluding remarks

The breakthrough of the MP mirrored advances by green parties in other Western nations around the time following the Chernobyl disaster. This paper provides causal evidence that radioactive fallout from Chernobyl caused significant changes in voter preferences. The vote share of the MP increased in areas with significant ground contamination of cesium. Further, the results show that the premium on the green vote in fallout-effected areas has declined substantially since the late 1980s. I argue that a plausible mechanism for explaining these results is a gradually declining resistance to nuclear power in fallout-affected regions, concomitant with a nationwide decline in the relative importance of Chernobyl for MP approval ratings among individual voters.

Although the spread of cesium fallout ceased after less than two weeks, the Chernobyl accident had significant long-term political impact. Globally, the environmentalist movement benefited from mounting opposition to nuclear power. The findings in this paper, however, have broader implications for understanding the link between temporary non-political shocks and political outcomes. Recent research has illustrated how the 2008 financial crisis and its aftermaths was a salient factor in shifting the political debate, especially among younger generations (Milkman 2017). With global warming potentially becoming a major problem in the coming decades, the risk of natural disasters continues to pose a significant threat to global economic and health outcomes. Another major nu-

[25] Unfortunately, this data is not available for the years immediately after Chernobyl.

clear accident cannot be ruled out, either, and any such adverse event is likely to have a profound political impact.

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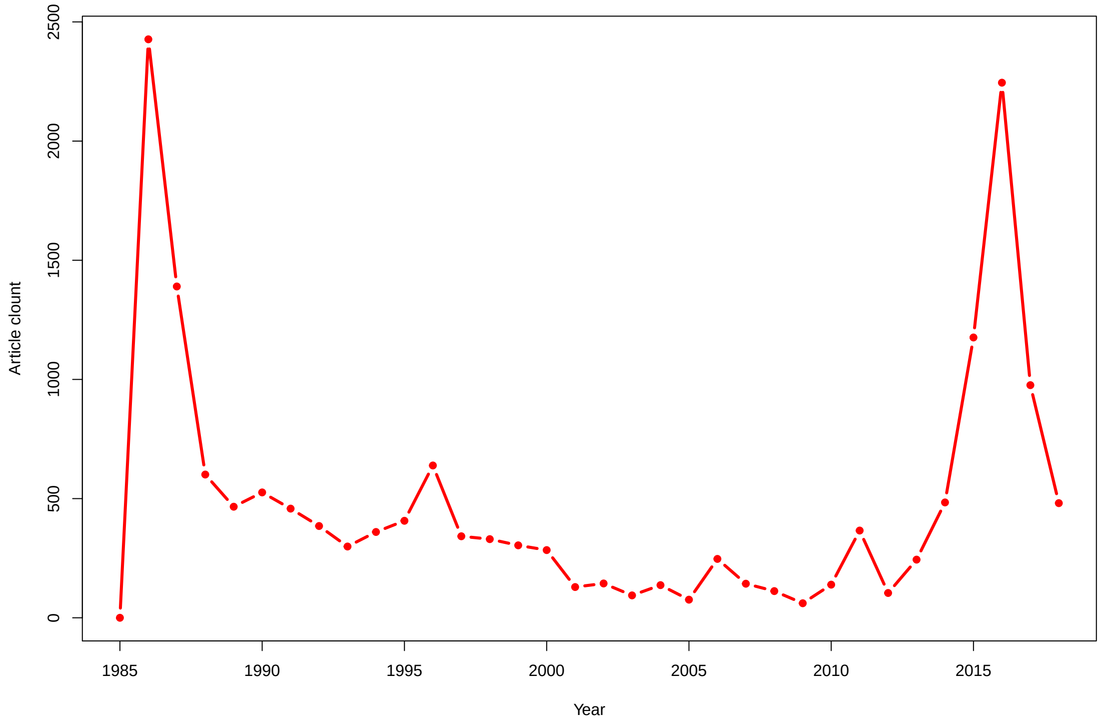


Figure 1: Count of the number of times the word ”Tjernobyl” (Chernobyl) appeared in Swedish written press, 1985–2018. *Data source:* National Library of Sweden.

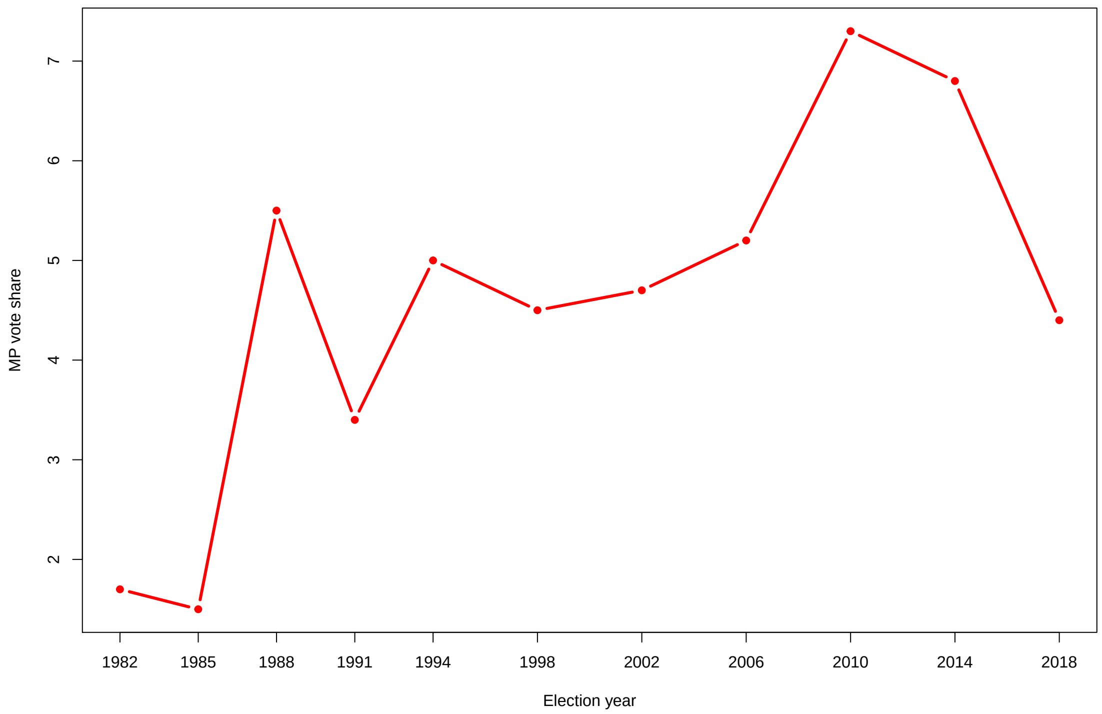


Figure 2: Plot of the MP vote share for each election year between 1982 and 2018. *Data source:* Swedish Statistics Agency.

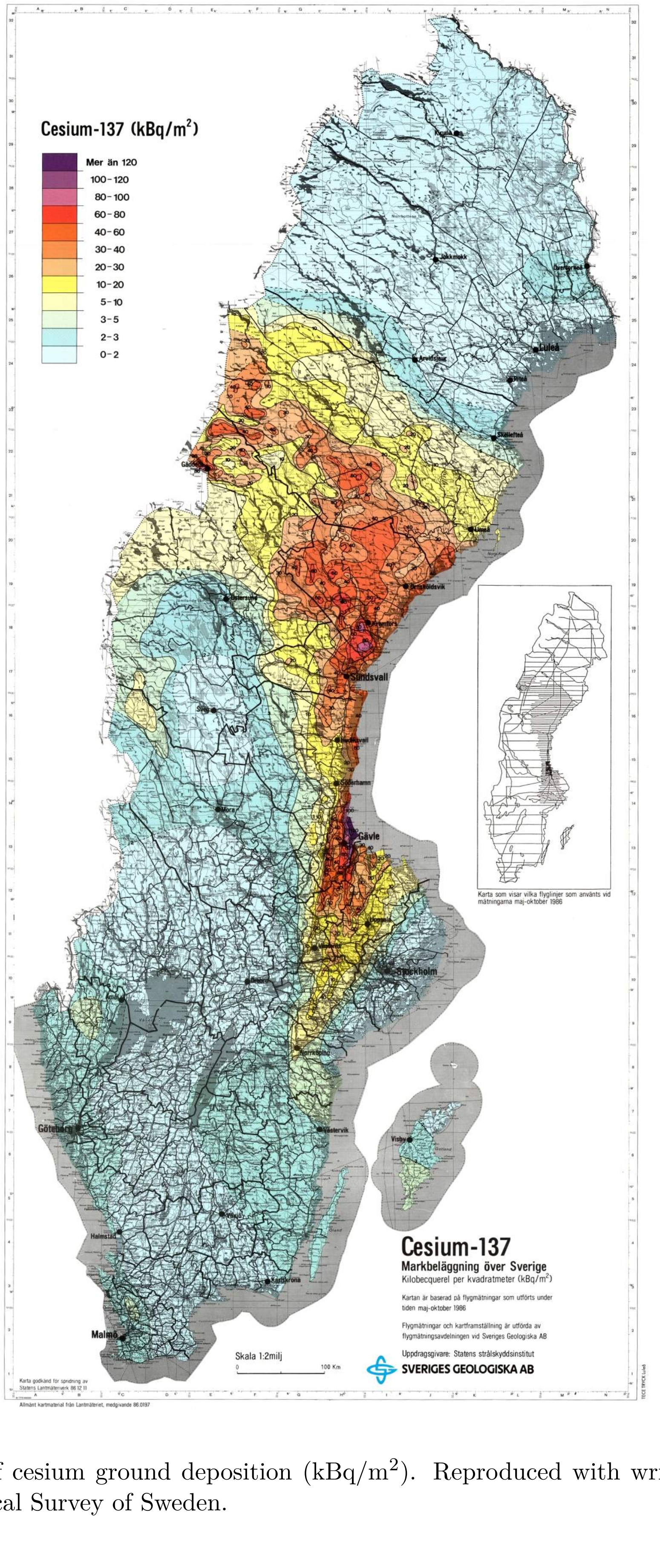


Figure 3: Map of cesium ground deposition (kBq/m^2). Reproduced with written permission from the Geological Survey of Sweden.

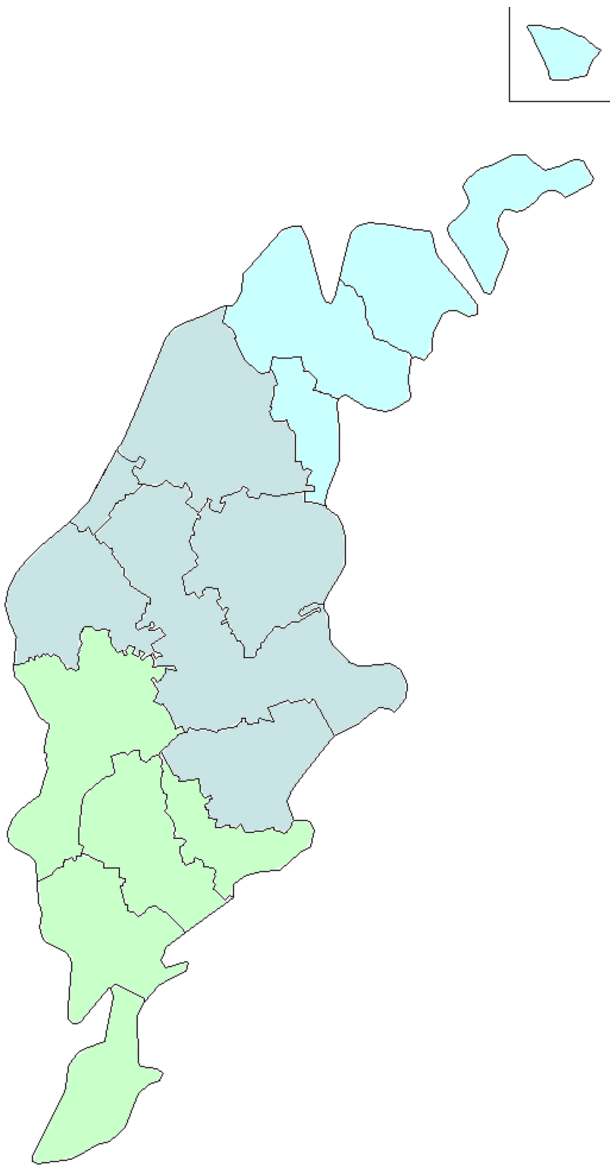
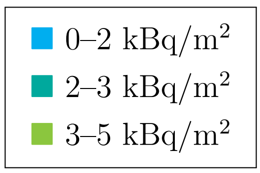


Figure 4: Variation in Gotland cesium deposition. *Data source:* Geological Survey of Sweden.



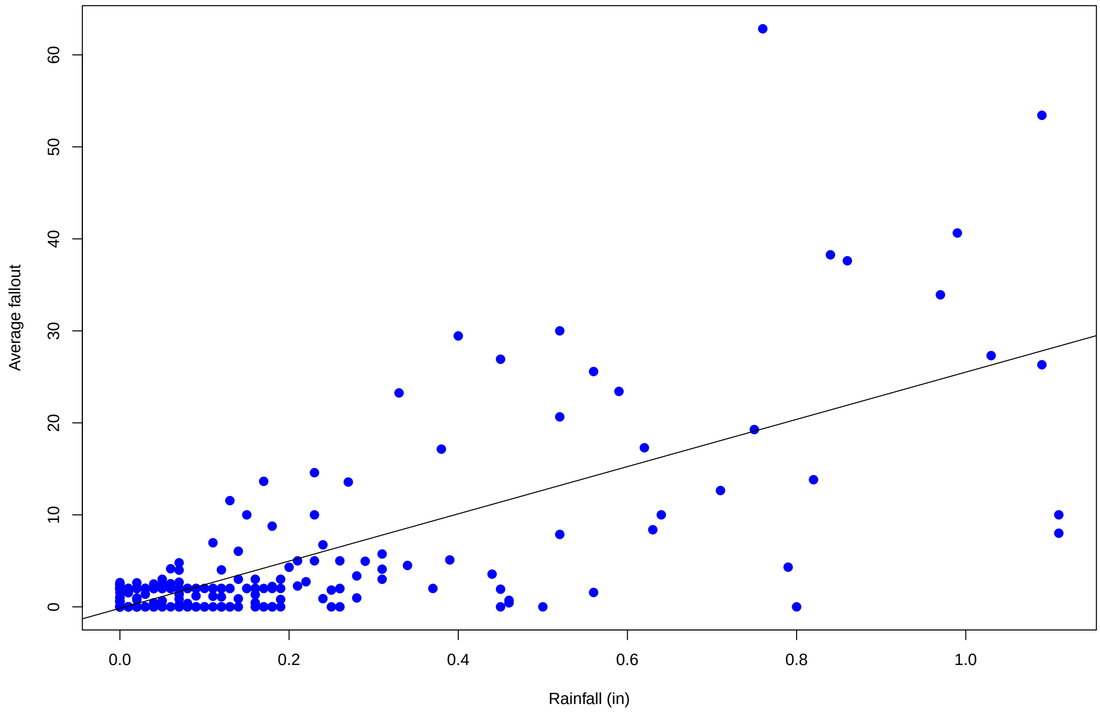


Figure 5: Scatter plot of the relationship between rainfall (in inches) on the horizontal axis and average ground deposition of cesium-137 (in kBq/m^2) on the vertical axis.

Table 1
The impact of fallout on the green vote

	Maximum ground deposition (1)	Maximum ground deposition (2)	Average ground deposition (1)	Average ground deposition (2)
Panel A. Continuous measure of ground deposition				
Fallout	0.0061**	0.0047**	0.0115**	0.0087**
	(0.0029)	(0.0023)	(0.0050)	(0.0041)
R^2	0.4466	0.5361	0.4480	0.5368
Panel B. Ground deposition dummy				
Fallout	0.180*	0.145*	0.180*	0.145*
	(0.094)	(0.084)	(0.094)	(0.084)
R^2	0.4483	0.5376	0.4486	0.5376
Panel C. High ground deposition dummy (>37 kBq/m^2)				
Fallout	0.192	0.214	0.834***	0.644***
	(0.189)	(0.143)	(0.248)	(0.200)
R^2	0.4421	0.5347	0.4543	0.5407
Municipal characteristic controls included	Yes	Yes	Yes	Yes
Lagged MP vote share included	No	Yes	No	Yes
Observations	279	279	279	279
Mean dep. var.	3.60	3.60	3.60	3.60

Note. Dependent variable: Percentage point change in MP vote share, 1985–1988. A constant is included in all regressions. Standard errors clustered by municipality in brackets. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 2
IV estimates

	Maximum ground deposition		Average ground deposition	
	(1)	(2)	(1)	(2)
First stage:				
Rainfall	34.535***	34.590***	22.780***	22.808***
	(6.189)	(6.125)	(3.823)	(3.835)
Second stage:				
Fallout	0.0159***	0.0107**	0.0240***	0.0163**
	(0.0059)	(0.0050)	(0.0089)	(0.074)
Municipal characteristic controls included	Yes	Yes	Yes	Yes
Lagged MP vote share included	No	Yes	No	Yes
Observations	279	279	279	279
Mean dep. var.	3.60	3.60	3.60	3.60
F statistic of excl. instruments	31.13	31.89	35.41	35.37

Note. Dependent variable: Percentage point change in MP vote share, 1985–1988. A constant is included in all regressions. Standard errors clustered by municipality in brackets. ** and *** denote significance at the 5% and 1% level, respectively.

Table 3
Panel estimates

	(1)	(2)	(3)
Panel A: Maximum ground deposition			
Fallout	0.0751***	0.0062**	0.0051*
	(0.0116)	(0.0024)	(0.0027)
Panel B: Average ground deposition			
Fallout	0.132***	0.0085**	0.0054
	(0.0196)	(0.0048)	(0.0046)
Election year FE included	No	Yes	Yes
Municipal characteristic controls included	No	No	Yes
Municipalities	284	284	284

Note. Dependent variable: MP vote share, 1985–2018. A constant is included in all regressions. Standard errors clustered by municipality in brackets. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 4

Fallout and support for nuclear power

	1987–1995 subsample	1996–1999 subsample	2000–2004 subsample	2005–2010 subsample	2011–2018 subsample
Panel A. Continuous measure of ground deposition					
Fallout	−0.0634*	0.0977	0.152	0.151**	0.245***
	(0.033)	(0.089)	(0.123)	(0.063)	(0.086)
R^2	0.5432	0.3648	0.4839	0.4509	0.2896
Panel B. Ground deposition dummy					
Fallout	−2.461*	−0.883	−0.861	−0.863	−1.170
	(1.412)	(1.725)	(2.690)	(1.742)	(2.650)
R^2	0.5635	0.3586	0.4713	0.4102	0.2162
Panel C. Continuous measure of ground deposition (IV estimates)					
Fallout	−0.134	−0.0461	0.407*	0.0992	0.139
	(0.085)	(0.148)	(0.230)	(0.115)	(0.187)
Municipal characteristics controls included	Yes	Yes	Yes	Yes	Yes
Lagged MP vote share included	No	No	No	No	No
Observations	11,115	4,144	5,306	14,461	8,435
Municipalities	61	61	61	61	61
Mean dep. var.	22.74	25.14	41.17	50.50	32.25

Note. Dependent variable: Percentage share of respondents supporting nuclear power. All municipalities with at least 30 observations per sample period included. Fallout is measured as the average ground deposition. A constant is included in all regressions. Standard errors clustered by municipality in brackets. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

TABLE 5
SUPPORT FOR NUCLEAR POWER AND MP APPROVAL

	1987–1995 subsample	1996–1999 subsample	2000–2004 subsample	2005–2010 subsample	2011–2018 subsample
Panel A. No control variables:					
SUPPORT NUCLEAR POWER	−1.801***	−1.711***	−1.752***	−1.636***	−0.684***
	(0.054)	(0.074)	(0.059)	(0.056)	(0.074)
R^2	0.0795	0.0806	0.1009	0.0857	0.0063
Panel B. Including municipality fixed effects:					
SUPPORT NUCLEAR POWER	−1.795***	−1.679***	−1.751***	−1.653***	−0.665***
	(0.054)	(0.076)	(0.060)	(0.057)	(0.075)
R^2	0.1029	0.1259	0.1389	0.1260	0.0469
OBSERVATIONS	14,222	6,482	8,106	9,180	12,058
MEAN DEP. VAR.	−0.060	−0.074	−0.755	−0.111	−0.109

Note. Dependent variable: MP approval rating. The model is estimated using OLS. A constant is included in all regressions. Standard errors clustered by municipality in brackets. *** denotes significance at the 1% level.

Online Appendix

A. Additional empirical results

Table A.1
Summary statistics

Fallout variables:	Mean	Std.dev.	Min	Max
Maximum ground deposition (kBq/m^2)	5.588	13.600	0	100
Average ground deposition (kBq/m^2)	3.615	8.805	0	62.836
Rainfall (in)	0.147	0.229	0	1.11
Election variables:				
ΔMP$^{1985-1988}$ (p.p.)	3.604	0.894	1.6	7.4
ΔMP$^{1988-1991}$ (p.p.)	−2.130	0.685	−4.3	−0.3
ΔS$^{1985-1988}$ (p.p.)	−0.655	1.433	−5.1	2.8
ΔM$^{1985-1988}$ (p.p.)	−3.244	0.931	−7.0	−1.0
ΔC$^{1985-1988}$ (p.p.)	−1.715	2.293	−11.8	5.2
MP vote share, 1985 (%)	1.390	0.473	0.3	3.1
MP vote share, 1988 (%)	4.994	1.216	2.1	10.5
S vote share, 1985 (%)	45.696	10.030	16.5	72.5
M vote share, 1985 (%)	18.758	7.426	5.9	55.4
C vote share, 1985 (%)	16.643	7.952	3.4	36.2
Option 3 vote share, 1980 (%)	40.823	8.584	17.644	64.129
Municipal characteristic controls:				
Population, 1988	29,784.82	52,719.16	2,950	669,485
Area (km^2)	1,442.76	2,504.20	2.604	19,446.78
Median household income, 1988 (SEK, thousands)	99.976	9.327	76.619	129.7
Employment rate, 1988	0.513	0.0330	0.420	0.609
Share of college graduates, 1988	0.0401	0.0229	0.0172	0.199
County with nuclear plant (indicator)	0.158	0.365	0	1
Urban area municipality (indicator)	0.301	0.461	0	1
Northern Sweden (indicator)	0.189	0.393	0	1
Central Sweden (indicator)	0.319	0.467	0	1
Southern Sweden (indicator)	0.488	0.501	0	1
Additional variables for robustness checks:				
Coastal municipality (indicator)	0.0797	0.271	0	1
Sámi municipality (indicator)	0.0598	0.238	0	1
Δ IM (p.p)	0.466	0.298	−0.105	1.714
Refugee inflow rate (%)	0.595	0.343	0	2.238

Note. Abbreviations: S = Social Democrats, M = Moderate Party, C = Center Party.

Table A.2
Effect on the Social Democrats

	Maximum ground deposition (1)	Maximum ground deposition (2)	Average ground deposition (1)	Average ground deposition (2)
Panel A. Continuous measure of ground deposition				
Fallout	−0.0082*	−0.0058	−0.0148	−0.0117
	(0.0047)	(0.0040)	(0.0096)	(0.0077)
R^2	0.5059	0.5689	0.5065	0.5698
Panel B. Ground deposition dummy				
Fallout	−0.526***	−0.476***	−0.526***	−0.476***
	(0.130)	(0.125)	(0.130)	(0.125)
R^2	0.5277	0.5880	0.5277	0.5880
Panel C. High ground deposition dummy (>37 kBq/m^2)				
Fallout	−0.115	−0.0037	−0.491*	−0.380
	(0.288)	(0.245)	(0.274)	(0.240)
R^2	0.5019	0.5667	0.5035	0.5678
Municipal characteristic controls included	Yes	Yes	Yes	Yes
Lagged Social Dem. vote share included	No	Yes	No	Yes
Observations	279	279	279	279
Mean dep. var.	−0.66	−0.66	−0.66	−0.66

Note. Dependent variable: Percentage point change in Social Democrat vote share, 1985–1988. A constant is included in all regressions. Standard errors clustered by municipality in brackets. * and *** denote significance at the 10% and 1% level, respectively

Table A.3
Effect on the Moderate Party

	Maximum ground deposition (1)	(2)	Average ground deposition (1)	(2)
Panel A. Continuous measure of ground deposition				
Fallout	0.0006	−0.0008	0.0001	−0.0025
	(0.0041)	(0.0032)	(0.0067)	(0.0052)
R^2	0.2883	0.3633	0.2882	0.3636
Panel B. Ground deposition dummy				
Fallout	−0.247**	−0.309***	−0.247**	−0.309***
	(0.106)	(0.102)	(0.106)	(0.102)
R^2	0.3023	0.3850	0.3023	0.3850
Panel C. High ground deposition dummy (>37 kBq/m^2)				
Fallout	0.1204	0.0281	−0.401*	−0.390*
	(0.244)	(0.188)	(0.238)	(0.214)
R^2	0.2889	0.3633	0.2912	0.3661
Municipal characteristic controls included	Yes	Yes	Yes	Yes
Lagged Moderate Party vote share included	No	Yes	No	Yes
Observations	279	279	279	279
Mean dep. var.	−3.24	−3.24	−3.24	−3.24

Note. Dependent variable: Percentage point change in Moderate Party vote share, 1985–1988. A constant is included in all regressions. Standard errors clustered by municipality in brackets. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

TABLE A.4
EFFECT ON THE CENTER PARTY

	Maximum ground deposition (1)	Maximum ground deposition (2)	Average ground deposition (1)	Average ground deposition (2)
Panel A. Continuous measure of ground deposition				
FALLOUT	−0.0110	−0.0078	−0.0243*	−0.0159
	(0.0083)	(0.0074)	(0.0126)	(0.0114)
R^2	0.2824	0.3745	0.2845	0.3752
Panel B. Ground deposition dummy				
FALLOUT	−0.0421	0.130	−0.0421	0.130
	(0.253)	(0.238)	(0.253)	(0.238)
R^2	0.2794	0.3730	0.2794	0.3730
Panel C. High ground deposition dummy (>37 kBq/m^2)				
FALLOUT	−0.764	−0.434	−0.0096	0.0511
	(0.505)	(0.449)	(0.455)	(0.334)
R^2	0.2837	0.3744	0.2793	0.3730
MUNICIPAL CHARACTERISTIC CONTROLS INCLUDED	Yes	Yes	Yes	Yes
LAGGED CENTER PARTY VOTE SHARE INCLUDED	No	Yes	No	Yes
OBSERVATIONS	279	279	279	279
MEAN DEP. VAR.	−1.71	−1.71	−1.71	−1.71

Note. Dependent variable: Percentage point change in Center Party vote share, 1985–1988. A constant is included in all regressions. Standard errors clustered by municipality in brackets. A constant is included in all regressions. * denotes significance at the 10% level.

Table A.5
The impact of fallout on the green vote: Log estimates

	Log maximum ground deposition (1)	(2)	Log average ground deposition (1)	(2)
Panel A. Continuous measure of ground deposition				
Log Fallout	0.0952**	0.0734**	0.0984**	0.0712*
	(0.0434)	(0.0365)	(0.0490)	(0.0416)
R^2	0.4490	0.5376	0.4478	0.5363
Panel B. IV estimates (second stage)				
Log Fallout	0.214***	0.143**	0.233***	0.155**
	(0.0752)	(0.0638)	(0.0816)	(0.0694)
Municipal characteristic controls included	Yes	Yes	Yes	Yes
Lagged MP vote share included	No	Yes	No	Yes
Observations	279	279	279	279
Mean dep. var.	3.60	3.60	3.60	3.60

Note. Dependent variable: Percentage point change in MP vote share, 1985–1988. A constant is included in all regressions. Standard errors clustered by municipality in brackets. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table A.6
The impact of fallout using pre-Chernobyl values of controls

	Maximum ground deposition (1)	Maximum ground deposition (2)	Average ground deposition (1)	Average ground deposition (2)
Panel A. Continuous measure of ground deposition				
Fallout	0.0060**	0.0046**	0.0113**	0.0086**
	(0.0029)	(0.0023)	(0.0050)	(0.0040)
R^2	0.4439	0.5344	0.4453	0.5351
Panel B. Ground deposition dummy				
Fallout	0.179*	0.146*	0.179*	0.146*
	(0.094)	(0.084)	(0.094)	(0.084)
R^2	0.4457	0.5360	0.4457	0.5360
Panel C. High ground deposition dummy (>37 kBq/m^2)				
Fallout	0.192	0.213	0.834***	0.644***
	(0.189)	(0.143)	(0.247)	(0.199)
R^2	0.4424	0.5348	0.4545	0.5407
Municipal characteristic controls included	Yes	Yes	Yes	Yes
Lagged MP vote share included	No	Yes	No	Yes
Observations	279	279	279	279
Mean dep. var.	3.60	3.60	3.60	3.60

Note. Dependent variable: Percentage point change in MP vote share, 1985–1988. Municipal controls are measured in 1985. A constant is included in all regressions. Standard errors clustered by municipality in brackets. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table A.7
Placebo tests

	Maximum ground deposition (1)	Maximum ground deposition (2)	Average ground deposition (1)	Average ground deposition (2)
Panel A. Continuous measure of ground deposition				
Fallout	−0.0002	0.0003	0.0011	0.0018
	(0.0015)	(0.0014)	(0.0022)	(0.0019)
R^2	0.2138	0.2854	0.2143	0.2866
Panel B. Ground deposition dummy				
Fallout	−0.0061	0.0073	−0.0061	0.0073
	(0.036)	(0.035)	(0.036)	(0.035)
R^2	0.2139	0.2854	0.2139	0.2854
Panel C. High ground deposition dummy (>37 kBq/m^2)				
Fallout	0.0195	0.0037	0.0166	0.0803
	(0.078)	(0.072)	(0.095)	(0.084)
R^2	0.2139	0.2853	0.2138	0.2862
Municipal characteristic controls included	Yes	Yes	Yes	Yes
Lagged MP vote share included	No	Yes	No	Yes
Observations	279	279	279	279
Mean dep. var.	−0.06	−0.06	−0.06	−0.06

Note. Dependent variable: Percentage point change in MP vote share, 1982–1985. A constant is included in all regressions. Standard errors clustered by municipality in brackets.

Table A.8
Impact of the 1988 seal virus epidemic

	(1)	(2)
Panel A. Only coastal municipality dummy		
Coastal municipality	0.360**	0.177
	(0.159)	(0.169)
R^2	0.4478	0.5342
Panel B. Maximum ground deposition and coastal municipality dummy		
Fallout	0.0062**	0.0043**
	(0.0029)	(0.0023)
Coastal municipality	0.362**	0.182
	(0.158)	(0.169)
R^2	0.4543	0.5380
Panel C. Average ground deposition and coastal municipality dummy		
Fallout	0.0114**	0.0087**
	(0.0050)	(0.0041)
Coastal municipality	0.359**	0.179
	(0.158)	(0.169)
R^2	0.4555	0.5387
Municipal characteristic controls included	Yes	Yes
Lagged MP vote share included	No	Yes
Observations	279	279
Mean dep. var.	3.60	3.60

Note. Dependent variable: Percentage point change in MP vote share, 1985–1988. A constant is included in all regressions. Standard errors clustered by municipality in brackets. ** denotes significance at the 5% level.

Table A.9
Including the Sámi municipality dummy

	(1)	(2)
Panel A. Only Sámi municipality dummy		
Sámi municipality	−0.0394	0.0724
	(0.266)	(0.227)
R^2	0.4403	0.5326
Panel B. Maximum ground deposition and Sámi municipality dummy		
Fallout	0.0063**	0.0051**
	(0.0030)	(0.0024)
Sámi municipality	0.0497	0.144
	(0.285)	(0.223)
R^2	0.4467	0.5368
Panel C. Average ground deposition and Sámi municipality dummy		
Fallout	0.0120**	0.0097**
	(0.0053)	(0.0044)
Sámi municipality	0.0798	0.172
	(0.254)	(0.223)
R^2	0.4484	0.5377
Municipal characteristic controls included	Yes	Yes
Lagged MP vote share included	No	Yes
Observations	279	279
Mean dep. var.	3.60	3.60

Note. Dependent variable: Percentage point change in MP vote share, 1985–1988. A constant is included in all regressions. Standard errors clustered by municipality in brackets. ** denotes significance at the 5% level.

Table A.10
Impact of immigration rates

	(1)	(2)
Panel A. Only immigration rates		
First stage:		
Refugee inflow rate 1985–1988	0.522***	0.521***
	(0.055)	(0.055)
F statistic of excl. instruments	90.48	90.15
Second stage:		
ΔIM	−0.371	−0.315
	(0.246)	(0.227)
Panel B. Average ground deposition and immigration rates		
First stage:		
Refugee inflow rate 1985–1988	0.524***	0.524***
	(0.055)	(0.055)
F statistic of excl. instruments	90.91	90.43
Second stage:		
ΔIM	−0.404	−0.339
	(0.249)	(0.229)
Fallout	0.0099*	0.0068*
	(0.0053)	(0.0041)
Municipal characteristic controls included	Yes	Yes
Lagged MP vote share included	No	Yes
Observations	251	251
Mean dep. var.	3.60	3.60

Note. Dependent variable: Percentage point change in MP vote share, 1985–1988. Fallout is measured as the average ground deposition. A constant is included in all regressions. Standard errors clustered by municipality in brackets. * and *** denote significance at the 10% and 1% level, respectively.

Table A.11

Fallout and support for nuclear power (sample size 30)

	1987–1995 subsample	1996–1999 subsample	2000–2004 subsample	2005–2010 subsample	2011–2018 subsample
Panel A. Continuous measure of ground deposition					
Fallout	−0.106*	0.0083	−0.0059	0.0550	0.301***
	(0.058)	(0.094)	(0.144)	(0.106)	(0.0682)
R^2	0.4895	0.3227	0.4479	0.4509	0.2896
Panel B. Ground deposition dummy					
Fallout	−2.917**	−2.140	−1.393	−1.402	0.535
	(1.290)	(1.742)	(1.992)	(1.387)	(1.749)
R^2	0.5100	0.3078	0.4510	0.4150	0.2162
Panel C. Continuous measure of ground deposition (IV estimates)					
Fallout	−0.230*	−0.0225	0.0592	0.0639	0.0497
	(0.120)	(0.160)	(0.270)	(0.134)	(0.190)
Municipal characteristics controls included	Yes	Yes	Yes	Yes	Yes
Lagged MP vote share included	No	No	No	No	No
Observations	13,226	4,960	6,221	16,498	9,969
Municipalities	92	92	92	92	92
Mean dep. var.	23.57	25.94	40.98	51.50	32.28

Note. Dependent variable: Percentage share of respondents supporting nuclear power. All municipalities with at least 20 observations per sample period included. Fallout is measured as the average ground deposition. A constant is included in all regressions. Standard errors clustered by municipality in brackets. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table A.12
Support for nuclear power and MP approval (ordered logit estimates)

	1987–1995 subsample	1996–1999 subsample	2000–2004 subsample	2005–2010 subsample	2011–2018 subsample
Panel A. No control variables					
Support nuclear power	−1.219***	−1.166***	−1.166***	−1.045***	−0.417***
	(0.038)	(0.053)	(0.042)	(0.037)	(0.042)
Pseudo R^2	0.0181	0.0182	0.0233	0.0190	0.0015
Panel B. Including municipality fixed effects					
Support nuclear power	−1.235***	−1.168***	−1.193***	−1.088***	−0.419***
	(0.039)	(0.055)	(0.044)	(0.040)	(0.044)
Pseudo R^2	0.0241	0.0296	0.0336	0.0292	0.0109
Observations	14,222	6,482	8,106	9,180	12,058
Mean dep. var.	−0.060	−0.074	−0.755	−0.111	−0.109

Note: Dependent variable: MP approval rating. The model is estimated using ordered logit. A constant is included in all regressions. Standard errors clustered by municipality in brackets. *** denotes significance at the 1% level.

Table A.13
Newspaper coverage

	"Cesium"		"Chernobyl"	
	(1)	(2)	(1)	(2)
Panel A. Maximum ground deposition				
Fallout	0.134***	0.217***	−0.464***	0.295***
	(0.029)	(0.025)	(0.168)	(0.089)
R^2	0.0211	0.3247	0.0038	0.0355
Panel B. Average ground deposition				
Fallout	0.232***	0.360***	−0.648**	0.480***
	(0.050)	(0.035)	(0.319)	(0.157)
R^2	0.0223	0.3052	0.0026	0.0215
Controls included	No	No	No	No
Observations	279	242	279	242
Mean dep. var.	15.01	11.26	99.36	63.78

Note. Dependent variable: Cumulative number of times the words "cesium" and "Chernobyl" appear in the most circulated newspaper in each municipality, from January 1, 2013, to December 31, 2019. Column (2) drops municipalities where the largest paper is either *Dagens Nyheter*, *Svenska Dagbladet*, *Göteborgs-Posten*, or *Sydsvenskan*, which have full national national coverage. A constant is included in all regressions. Standard errors clustered by municipality in brackets. ** and *** denote significance at the 5% and 1% level, respectively.

B. Data sources and variables construction

This section describes the construction of the variables used in the empirical analysis in additional detail.

B.1. Election and municipal characteristic data

Election variables. All election data is due to the Swedish Statistics Agency. This includes the historical vote shares of the MP and other parties, as well as the municipality-level results of the 1980 referendum.

Population. The population of the municipality, using data from the Swedish Statistics Agency.

Employment rate. The employment rate of individuals aged 16–64 residing in the municipality, using data from the Swedish Statistics Agency. For municipality i, it includes both individuals living and working in i, as well as those working in other municipalities, but living in i. This definition, thus, excludes individuals working in i, but living elsewhere.

Share of college graduates. The share of the population with at least three years of tertiary education, including individuals holding a PhD. The data source is the Swedish Statistics Agency.

Median disposable household income. The median disposable household income, including capital gains, using data from the Swedish Statistics Agency.

County with nuclear plant. At the time of the Chernobyl disaster, there were four nuclear plants in operation in Sweden: Barsebäck, Forsmark, Oskarshamn, and Ringhals plants. They were located in Malmöhus, Uppsala, Kalmar, and Halland counties, respectively. Hence, a municipality is coded one if it is located in either of these four counties, and zero else.

Urban area municipality dummy. As discussed previously, the population variable does not take into account that some municipalities around Stockholm and Gothenburg are relatively small in terms of population. The urban area dummy takes the value one if the municipality is either in Stockholm, Södermanland, or Gothenburg and Bohus counties.

Lands fixed effects. I use the three traditional "lands" of Sweden as geographic fixed effects. Northern Sweden (*Norrland*) consists of five counties, namely Gävleborg, Jämtland, Norrbotten, Västerbotten, and Västernorrland. By the time of the Chernobyl disaster, Central Sweden (*Svealand*) consisted of the counties of Kopparberg, Örebro, Stockholm, Södermanland, Uppsala, Värmland, and Västmanland. Finally, southern Sweden (*Götaland*) consisted of Älvsborg, Blekinge, Gothenburg and Bohus, Gotland, Halland, Jönköping, Kalmar, Kristianstad, Kronoberg, Malmöhus, Skaraborg, and Östergötland counties [26]. Northern Sweden is a stronghold for the center-left Social Democratic party, which also has a relatively low voter mobility, whereas southern Sweden has a lager share of center-right and right-wing voters (Wesslén 2015). I use Svealand as the baseline category. This land has the most diverse political views, comprising both left- and right-wing dominated municipalities.

B.2. Additional variables for robustness checks

Coastal municipality dummy. The virus epidemic affected most of the western coast of Sweden, specifically areas of the Kattegat and Skagerrak coastlines. The combined Kattegat and Skagerrak straits are occasionally known as the *Jutland sea*. In terms of counties, all coastal municipalities of Gothenburg and Bohus County and Halland County were affected, as was the western coast of Kristianstad County and a small part of Malmöhus County.

In all, 20 municipalities are classified as being on the western coast: Gothenburg, Kungälv, Lysekil, Munkedal, Orust, Sotenäs, Stenungsund, Strömstad, Tanum, Tjörn, Uddevalla, and Öckerö municipalities in Gothenburg and Bohus County, Falkenberg, Halmstad, Kungsbacka, Laholm, and Varberg municipalities in Halland County, Båstad and Ängelholm municipalities in Kristianstad County, and Höganäs municipality in Malmöhus County.

Sámi municipality dummy. Since Sweden does not gather census data on ethnicity, it is impossible to estimate exactly how many individuals of Sámi descent live in the country. However, we are not particularly interested in the effects on the Sámis as an ethnic group. Instead, we wish to estimate how many municipalities were affected by the Chernobyl-induced damage on the reindeer herding industry in 1986. For this reason, I use the "Sámi village" classification described previously, which has been used since 1886. The number of individuals of Sámi descent in Sweden has been relatively constant over the last decades, allowing us to approximate the number of municipalities where reindeer herding is practiced.

[26] On January 1, 1998, Älvsborg, Gothenburg and Bohus, and Skaraborg counties merged to form Västra Götaland County, and Kristianstad and Malmöhus counties merged to form Scania (*Skåne*) County. Neither of these changes, however, affected the land affiliation for individual municipalities.

There are 51 Sámi villages in Sweden today, spread out over 20 municipalities: Arjeplog, Arvidsjaur, Gällivare, Haparanda, Kiruna, Jokkmokk, Kalix, Pajala, Överkalix and Övertorneå municpalities in Norrbotten County, Åre, Berg, Krokom, Härjedalen, and Strömsund municipalities in Jämtland County, Malå, Sorsele, Storuman and Vilhelmina municipalities in Västerbotten County, as well as Älvdalen municipality in Kopparberg County.

Immigration data. The data on immigration and allocated refugees is the same as used in previous papers using the Swedish refugee placement program in the 1990s (cf. Dahlberg et al. 2012). The immigration rate (ΔIM) is the percentage point change in the share of non-OECD and Turkish citizens over an electoral cycle, in this case 1985–1988. The dataset covers 251 municipalities.

However, ΔIM is likely to be endogenous, since immigrants are heterogeneous with respect to countries of origin and education levels, plausibly affecting native attitudes. Hence, we use the refugee inflow rate, defined as the number of allocated refugees between 1985 and 1988 accepted by the municipality, divided by the average population of the municipality between 1985 and 1988, as an instrument for ΔIM. Importantly, under the placement program, refugees were not allowed to decide themselves where to settle. Instead, the Immigration Board (a government agency) allocated refugees to participating municipalities. This, thus, provides exogenous variation in the share of refugees between municipalities.

C. Survey construction

The following section describes in detail the formulation of the question related to nuclear power in each of the SOM surveys. Checked boxes denote the responses used to construct the variable SUPPORT NUCLEAR POWER.

1987–1995 version

What is your view on the use of nuclear power in Sweden?

- [ ] Abolish nuclear power immediately.
- [ ] Abolish nuclear power before 2010.
- [ ] Abolish nuclear power by 2010.
- [ ] Abolish nuclear power, but not that fast.
- [x] Use nuclear power, do not abolish it.
- [ ] I have no particular opinion on the matter.

1995–1999 version

What is your view on the use of nuclear power in Sweden?

- [ ] Abolish nuclear power by 2010.
- [ ] Abolish nuclear power, but use the 12 reactors we have until the end of their life cycle.
- [x] Use nuclear power and renew the 12 reactors we have, so that Sweden in the future will have 12 reactors in operation.
- [x] Use nuclear power and invest in more reactors than 12 in the future.
- [ ] I have no particular opinion on the matter.

2000–2004 version

What is your view on the long-term use of nuclear power in Sweden?

- [ ] Abolish nuclear power by 2010.
- [ ] Abolish nuclear power, but use the reactors we have until the end of their life cycle.
- [x] Use nuclear power and renew the current nuclear reactors, but do not build any new reactors.
- [x] Use nuclear power and invest in more reactors in the future.
- [ ] I have no particular opinion on the matter.

2005–2011 version

What is your view on the long-term use of nuclear power as a source of energy in Sweden?

☐ Abolish nuclear power as soon as possible.
☐ Abolish nuclear power, but use the reactors we have until the end of their life cycle.
☑ Use nuclear power and renew the current nuclear reactors, but do not build any new reactors.
☑ Use nuclear power and invest in more reactors in the future.
☐ I have no particular opinion on the matter.

2011–2018 version

What is your view on the long-term use of nuclear power as a source of energy in Sweden?

☐ Abolish nuclear power as soon as possible.
☐ Abolish nuclear power, but use the 10 reactors we have until the end of their life cycle.
☑ Use nuclear power and replace the current reactors with at most 10 new reactors.
☑ Use nuclear power and build more reactors than the current 10 in the future.
☐ No opinion.