Identifying opposition against increased carbon tax and reduced red meat consumption

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1   Introduction

Adopting and implementing climate policies that lead to reduced emissions is necessary to reach the climate change mitigation targets. Policies can address climate change in many ways, such as regulations, taxes, economic incentives, information campaigns, supporting technological innovations, and so on. It is critical to understand in which ways people prefer to address climate change, as policy proposals to reduce carbon emissions are more likely to be successful when they have public support. This is obvious when the policy relies on individuals' voluntary efforts to act in certain ways. However, public support also matters for the implementation of other kinds of environmental policy proposals (Tjernström and Tietenberg 2008, Anderson, Böhmelt, and Ward 2017, Levi, Flachsland, and Jakob 2020). Sometimes policies obtain support after their implementation despite initial resistance (Jagers and Hammar 2009, 222). In other words, policies do not necessarily need support from a majority to be successful. Indifference suffices.

However, it can be difficult to implement climate policies when they provoke strong public opposition. Public support and resistance towards a specific policy are affected by numerous factors, such as how the policy is designed and individual characteristics (Tobler, Visschers, and Siegrist 2012, Stoutenborough, Bromley-Trujillo, and Vedlitz 2014, Rhodes, Axsen, and Jaccard 2017, Swim and Geiger 2021). Consequently, it is necessary to examine support for specific policy proposals and not just climate policies in general. Different policies will likely have support among different segments of society. It is important to pay attention to the resistant groups for each policy. Knowledge about the individual characteristics that affect support and opposition towards different climate policies can inform strategies to increase support for climate policies, be it through information campaigns or through policy design.

This paper examines influencing factors for support for two specific policies that vary on several dimensions in their design: increasing the carbon tax and eating less red meat. From the individual's point of view, supporting an increased carbon tax is a question of supporting a government initiative, while eating less red meat means altering one's lifestyle. The policies are part of the Norwegian government's white paper (report to the Storting) on the Climate Plan for 2021-2030 (Meld. St. 13 (2020-2021)), which describes how to reduce carbon emissions in the period 2021-2030 in line with Norway's climate targets. Increasing the carbon tax and encouraging people to eat less red meat are among the most substantial policy proposals in the Climate Plan. Given the policies' importance for reaching Norway's climate change mitigation goals, and the importance of public support for successful climate policy implementation, it is imperative to explore how the Norwegian population perceives these policies, and among which parts of the population the policies will meet support and resistance. The research question is

therefore: *"How do individual characteristics affect carbon tax support and willingness to eat less red meat?"*

To answer this research question, the study employs novel survey data collected through the Norwegian Citizen Panel (N=2001) to examine public support for an increase in the carbon tax and the public's willingness to reduce consumption of red meat. The study investigates how individual characteristics (attitudes and sociodemographic background) affect support opposition towards these policies. This approach is important in mapping which kinds of climate change mitigation actions are favored and opposed by particular societal segments.

The results show that opposition against both policies is more likely to be triggered among individuals who are less worried about climate change, place themselves to the political right, have lower trust in politicians, live in more rural areas, are less educated, and men. Younger individuals are less likely to support the carbon tax increase, while older individuals are less willing to reduce red meat consumption. Income does not predict support for neither of the two policies. Furthermore, those who already eat more red meat than the Norwegian dietary advice recommend are less willing to reduce their consumption of red meat. Future policies and information campaigns should be designed in ways that take these factors into account, for example by aiming to optimize support among the groups that are skeptical of these policies or by facilitating climate-friendly choices for the groups that are more willing to take these choices.

The study is organized as follows. Section 2 provides some background information on the Norwegian Climate Plan, before reviewing the literature on different policy designs, as well as previous studies on what affects support for carbon tax and willingness to eat less meat. Section 3 describes the data collection, survey design and methods. Section 4 presents the study results. Subsequently, section 5 discusses these results against previous studies and their implications. Finally, section 6 provides a short conclusion.

## 2	Background

2.1. The Climate Plan

The right-wing Solberg government presented its white paper "Norway's Climate Action Plan for 2021-2030" (Meld. St. 13 (2020-2021)) in January 2021. This document laid out how the Norwegian government intended to turn its climate commitments into efficient domestic policies. A key element of the plan is the specific policies to cut emissions that are not part of the emissions trading system (ETS) by 45 % between 2005 and 2030. To reach this target, non-ETS emissions must be reduced by at least 16.6 million tonnes CO_2eq over the ten-year period. In all, it is estimated that the policies proposed in the Climate Plan will cut emissions by 20 million tonnes CO_2eq (Meld. St. 13. (2020-2021), 21-22). About half of these reductions will be made by increasing the carbon tax and reducing consumption of red meat. Over the ten-year period, increasing the carbon tax amounts to 7.5 million tonnes CO_2 eq reductions (Meld. St. 13 (2020–2021), 52), and reducing the consumption of red meat amounts to 2.9 million tonnes CO_2 eq (Meld. St. 13 (2020-2021), 135). The sections below describe these policy proposals in more detail.

2.2 Increasing the carbon tax

The climate plan proposes to increase the carbon tax from NOK 590 (€ 58) to NOK 2,000 (€ 195) per tonne CO2eq up to 2030. The aim is to provide stronger financial incentives to choose climate-friendly solutions (Meld. St. 13 (2020–2021), 24). Norway was among the first countries to introduce a carbon tax in 1991 (OECD 2022) and carbon tax is the main instrument in the Norwegian climate policy, alongside to the ETS. These instruments put a price on emissions and provide an incentive for all households and companies to reduce emissions and develop and make use of climate-friendly solutions (Meld. St. 13 (2020–2021), 14).

In order to keep the overall level of taxation stable, the carbon tax increase will be offset by corresponding reductions in other taxes for the groups affected, such as reductions in road use duty. If the Government continues to compensate for increases in the carbon tax rate up to 2030 by reducing road use duty, this could make the overall reduction in emissions about 3 million tonnes CO2eq smaller. The precise arrangements will be determined within the Parliament's annual budget (Meld. St. 13 (2020–2021), 53). A first step was taken in 2022, when the general tax rate on non-ETS emissions was increased by 28% in real value. Norway's nominal carbon tax rate is currently among the highest in Europe, NOK 766 (€ 74) per tonne CO2-eq as of 2022, covering 83% of national emissions (OECD 2022).

2.3 Reducing red meat consumption

The Climate Plan also proposes to persuade the Norwegian population to change their food habits so that they are as far as possible in line with dietary advice from the Directorate of Health (Meld. St. 13 (2020–2021), 128). The Directorate of Health's advice is to eat maximum 500 grammes of red meat products and processed meat such as meatballs and sausages per week (Meld. St. 13 (2020–2021), 135). This recommendation corresponds to two-three dinners and some lunchmeat. According to the Directorate of Health, red meat refers to meat from pork, beef, lamb/mutton and goat (Helsedirektoratet 2020).

The aim of promoting the dietary advice is to reduce the demand for red and processed meat. These food types are associated with high carbon emissions. If farmers adapt to the reduction in demand, they will produce less of these food types, resulting in reduced emissions (Meld. St. 13 (2020–2021), 128). The Climate Plan argues that demand must be reduced first, before restructuring production in the agricultural sector, in order to avoid carbon leakage through rising imports (Meld. St. (2020-2021), 24). The persuasive efforts to reduce demand consist of collecting and sharing information on healthy and climate-friendly food habits in cooperation between public, private and voluntary stakeholders (Meld. St. 13 (2020–2021), 127-128).

The Climate Plan describes how Norwegian politicians want to reduce emissions. The question remains as to how these proposals are perceived by the public. Given all the differences between these climate policies, there is reason to expect some differences in their support. The following sections discuss how policy design and individual factors may influence public support for policy measures.

2.4 Policy design

Policies aimed to reduce CO2emissions can be designed in different ways. As pointed out by Ejelöv et al. (2022, 534), there is not one established way of categorizing environmental policies. One frequently employed category is the distinction between push and pull policies (Steg, Dreijerink, and Abrahamse 2006, De Groot and Schuitema 2012, Drews and Van den

Bergh 2016, Swim and Geiger 2021, Ejelöv et al. 2022) or similar concepts such as level of coerciveness (Steg, Dreijerink, and Abrahamse 2006, De Groot and Schuitema 2012, Drews and Van den Bergh 2016), degree of compulsoriness (Rhodes, Axsen, and Jaccard 2017), voluntary actions, soft regulations and hard regulations (Attari et al. 2009), soft and hard actions/policies (Tolppanen and Kärkkäinen 2021, Schulze 2021), supportive measures and restrictions (Tobler, Visschers, and Siegrist 2012) or incentives and disincentives (Steg, Dreijerink, and Abrahamse 2006, Swim and Geiger 2021).

De Groot and Schuitema (2012, 101) explain that pull measures encourage the desired behavior and increase the benefits and opportunities of performing "correctly", while push measures discourage the undesired behavior or increase the disadvantages of this behaviour. Drews and Van den Bergh (2016, 859) describe push measures as typically consisting of regulations and taxes, whereas pull measures can consist of subsidies and moral suasion. Accordingly, the carbon tax can be considered a push measure, whereas persuading the population to eat less red meat can be considered a pull measure. Pull measures tend to be rated more favorably than push measures (Steg, Dreijerink, and Abrahamse 2006, Attari et al. 2009, Rhodes, Axsen, and Jaccard 2017, Swim and Geiger 2021).

Another distinction can be made depending on whether the policy targets businesses or individual households (Swim and Geiger 2021). The carbon tax is a market-based measure which is intended to affect both individual households and companies (Meld. St. 13 (2020–2021), 13), whereas the proposal to reduce consumption of red meat in line with the dietary advice is directed towards individuals (Meld. St. 13 (2020–2021), 128). When it comes to climate action, a greater extent of responsibility is usually attributed to business and industry than to individuals (European Commission 2021). These general attitudes seem to be translated into support for specific policies. At least, Swim and Geiger (2021) find that policies targeting businesses were rated more favorably than those targeting individuals. Similarly, public policy support is lower for taxes directed towards private consumption than for taxes directed towards industry (Harring, Jagers, and Matti 2019).

Besides, the carbon tax is solely motivated by climate change, whereas the proposal to eat less red meat is also driven by health concerns, which might provide extra motivation (Stoll-Kleemann and Schmidt 2017). Combining health and environment messages has a stronger effect on reducing meat consumption compared to providing information on one aspect only (Wolstenholme, Poortinga, and Whitmarsh 2020).

Based on this, increasing the carbon tax is expected to be less popular than reduced meat consumption, since push measures are usually less popular than pull measures and since the policy is only motivated by climate change mitigation. At the same time, reducing meat consumption targets individuals specifically, which is usually less popular than policies that target businesses.

Prior surveys find that neither carbon taxes nor red meat reduction are very popular measures in Norway. A majority of Norwegian voters would prefer lower carbon taxes (Sælen and Kallbekken 2011), although the carbon tax has more public support in Norway than in other countries (Umit and Schaffer 2020). Meat curtailment tends to be among the least preferred personal options to counter climate change (Niva et al. 2014, Sanchez-Sabate and Sabaté 2019). People are generally unwilling to reduce meat consumption (Latvala et al. 2012, Hielkema and Lund 2021), also when asking about red meat specifically (Stea and Pickering 2019). Indeed, only 29 % of the Norwegian population wish to reduce their consumption of beef, 21 % their consumption of pork, and 11 % their consumption of lamb/mutton (Bugge and Alfnes 2018).

When asked about willingness to eat meat at most twice a week, 50 % of Norwegians reported that they would not be willing to do so (Niva et al. 2014).

Despite the importance of policy design, willingness to address climate change tends to be positively correlated among all types of climate-friendly actions (Tobler, Visschers, and Siegrist 2012, de Boer and Aiking 2022). At the same time, the relationship between individual characteristics and support depends on the policy or action in question (Stoutenborough, Bromley-Trujillo, and Vedlitz 2014, Rhodes, Axsen, and Jaccard 2017). The next section will discuss whether individual characteristics are expected to predict both carbon tax support and willingness to eat less red meat in the same directions.

2.5 Individual characteristics

Previous studies report different results regarding which characteristics are consistently associated with support across policy types. Rhodes, Axsen, and Jaccard (2017) identify climate change concern, trust in university and IPCC scientists and female gender as consistent predictors. Stoutenborough, Bromley-Trujillo, and Vedlitz (2014) also find that climate change concern and trust in experts is consistently predictive, but not gender. In addition, liberal ideology and strong ecological values were consistently predictive.

In this section, I review how attitudes (climate concern, political orientation, and political trust) and sociodemographic background (income, urban/rural residence, education, age, and gender) might predict support for carbon tax and willingness to eat less red meat. In addition, I discuss the relationship between current meat consumption and willingness to eat less red meat. In order to include more studies, the review also comprises studies that measure various kinds of willingness to pay for carbon and studies that measure willingness to eat less meat in general, not only red meat specifically.

Concern about climate change. Most studies find that concern about climate change is positively associated with carbon tax support (Kallbekken and Sælen 2011, Baranzini and Carattini 2017, Davidovic, Harring, and Jagers 2020). However, one study finds that concern about climate change does not affect people's willingness to support CO_2 restrictions (Tobler, Visschers, and Siegrist 2012). Meat reduction is also positively affected by concern about climate change (de Boer and Aiking 2022), and individuals who are concerned about climate change are more willing to show climate-friendly low-cost behaviours, such as reducing meat consumption to maximum three times a week (Tobler, Visschers, and Siegrist 2012).

Political orientation. Several studies find that individuals who place themselves more to the left on the political scale are more likely to support increased carbon taxes (Thalmann 2004, Hammar and Jagers 2006, Harring and Jagers 2013, Kallbekken, Garcia, and Korneliussen 2013, Davidovic, Harring, and Jagers 2020). Correspondingly, in the US, Democrats are more likely to support increased carbon taxes than Republicans and Independents (Kotchen, Turk, and Leiserowitz 2017). However, other studies find that political orientation only plays a minor role (Rotaris and Danielis 2019) or that it has no statistically significant effect on carbon tax support at all (Baranzini and Carattini 2017). Left-wing political orientation is also positively associated with meat reduction (Hielkema and Lund 2021).

Trust in politicians. Trust in government or politicians is an important predictor of carbon tax support (Kallbekken and Sælen 2011, Kallbekken, Garcia, and Korneliussen 2013, Harring and Jagers 2013, Baranzini and Carattini 2017, Rafaty 2018, Umit and Schaffer 2020). Trust in politicians is not usually a characteristic included in studies on willingness to eat less meat. However, trust in societal actors such as politicians and scientists has a positive effect on

policy support in general (Drews and Van den Bergh 2016). Hammar and Jagers (2006, 621) explain the positive effect of trust in politicians on support for a tax increase in the following way: "if I am inclined to trust politicians, I probably also trust the policies that the politicians decide upon and implement". This logic suggests that trust in politicians increases support for all kinds of climate policies that politicians propose, including reducing consumption of red meat.

Income. Several studies find that people with higher income are more likely to support increased carbon tax (Kotchen, Turk, and Leiserowitz 2017, Rotaris and Danielis 2019, Davidovic, Harring, and Jagers 2020), while other studies find no statistically significant effect of income (Thalmann 2004, Harring and Jagers 2013). In contrast, having a higher income negatively contributes to intentions to reduce meat consumption (Hunter and Röös 2016).

Urban/rural residence. Most studies find that individuals living in urban areas are more likely to support increased taxes on fossil fuels than those in rural areas(Thalmann 2004, Harring and Jagers 2013, Rotaris and Danielis 2019, Umit and Schaffer 2020), although one study finds that carbon tax support is not affected by where someone lives (Hammar and Jagers 2006). Living in an urban area also positively affects meat reduction (de Boer and Aiking 2022).

Education. Most studies find that individuals with more education are more likely to be supportive of carbon taxes (Thalmann 2004, Hammar and Jagers 2006, Carattini, Carvalho, and Fankhauser 2018, Rotaris and Danielis 2019, Davidovic, Harring, and Jagers 2020). However, one study finds no statistically significant effect of education (Kotchen, Turk, and Leiserowitz 2017). Higher education has also been found to positively predict various measures of meat reduction (Stea and Pickering 2019, Graça, Godinho, and Truninger 2019, de Boer and Aiking 2022). Yet, others find no statistically significant effect of educational level on willingness to reduce meat consumption (Tobler, Visschers, and Siegrist 2011, De Boer, Schösler, and Aiking 2014).

Age. Previous results regarding the relationship between age and carbon tax support are conflicting. Some studies find that younger age is associated with more willingness to pay carbon taxes (Rotaris and Danielis 2019), but other studies suggest that the relationship is not linear. Hammar and Jagers (2006) find that the 31-60 age group is more negative to a carbon tax than other age groups. In contrast, Carattini, Carvalho, and Fankhauser (2018) report that young generations and older individuals are less likely to support increased carbon tax. Additionally, several studies find no statistically significant effect for age on support for increased carbon tax (Thalmann 2004, Baranzini and Carattini 2017, Kotchen, Turk, and Leiserowitz 2017).

Concerning willingness to eat less meat, several studies find that younger individuals tend to be more willing (Verain, Dagevos, and Antonides 2015, Graça, Godinho, and Truninger 2019, Malek, Umberger, and Goddard 2019, Hielkema and Lund 2021), while other studies find that age does not influence willingness to reduce meat consumption (Tobler, Visschers, and Siegrist 2011, De Boer, Schösler, and Aiking 2014). A systematic review of transitions to more plant-based diets also observe that the effect of age is unestablished (Graça, Godinho, and Truninger 2019).

Gender. Previous studies provide conflicting results on the effect of gender on carbon tax support. While some find that women are more willing to pay for carbon taxes (Rotaris and Danielis 2019), others find that men are more likely to support carbon taxes (Carattini, Carvalho, and Fankhauser 2018, Davidovic, Harring, and Jagers 2020). Many studies find no statistically significant effect for gender (Thalmann 2004, Hammar and Jagers 2006, Baranzini and Carattini 2017, Kotchen, Turk, and Leiserowitz 2017).

Being female is consistently associated with more willingness to reduce meat consumption (Hayley, Zinkiewicz, and Hardiman 2015, Verain, Dagevos, and Antonides 2015, Hunter and Röös 2016, Hartmann and Siegrist 2017, Graça, Godinho, and Truninger 2019, Graça et al. 2019, Malek, Umberger, and Goddard 2019, Hielkema and Lund 2021, de Boer and Aiking 2022). One study even finds that gender was clearly the strongest predictor of respondents' willingness to reduce meat consumption (Tobler, Visschers, and Siegrist 2011).

Meat consumption frequency. Individuals who have a high consumption of meat have been found to be less willing to reduce their consumption (Hunter and Röös 2016, Neff et al. 2018, Sanchez-Sabate and Sabaté 2019). There is no reason to expect an effect of meat consumption on carbon tax support.

Table 1. Hypothesized effect direction and references.

	Increased carbon tax	Eat less red meat
Attitudes		
Climate concern	➢ Positive (Kallbekken and Sælen 2011, Baranzini and Carattini 2017, Davidovic *et al.* 2020) ➢ No effect (Tobler et al. 2011)	➢ Positive (de Boer and Aiking 2022; Tobler et al. 2011)
Left-right	➢ Negative (Thalmann 2004, Hammar and Jagers 2006, Harring and Jagers 2013, Kallbekken *et al.* 2013, Kotchen et al. 2017, Rotaris and Danielis 2019, Davidovic *et al.* 2020) ➢ No effect (Baranzini and Carattini 2017)	➢ Negative (Hielkema and Lund 2021).
Trust in politicians	➢ Positive (Fairbrother *et al.* 2019, Kallbekken and Sælen 2011, Harring and Jagers 2013, Kallbekken *et al.* 2013, Baranzini and Carattini 2017, Rafaty 2018, Umit and Schaffer 2020)	➢ Probably positive (Drews and van den Bergh 2015, Hammar and Jagers 2006)
Socio-demographic background		
Income	➢ Positive (Kotchen *et al.* 2017, Rotaris and Danielis 2019, Davidovic *et al.* 2020) ➢ No effect (Thalmann et al. 2004, Harring and Jagers 2013)	➢ Negative (Hunter and Röös 2016)
Urban/rural residence	➢ Negative (Umit and Schaffer 2020; Rotaris and Danielis 2019; Thalmann 2004; Harring og Jagers 2013) ➢ No effect (Hammar and Jagers 2006)	➢ Negative (de Boer and Aiking 2022)

Education	➢ Positive (Rotaris and Danielis 2019; Davidovic, Harring og Jagers 2019; Hammar og Jagers 2006; Carattini et al. 2017; Thalmann 2004). ➢ No effect (Kotchen, Turk, and Leiserowitz (2017)	➢ Positive (Stea and Pickering 2018, Graca et al. 2019, de Boer and Aiking 2022) ➢ No effect (Tobler, Visschers and Siegrist 2011; de Boer, Schösler and Aiking 2014)
Age	➢ Negative (Rotaris and Danielis 2019) ➢ No effect (Baranzini and Carattini 2017; Thalmann 2004; Kotchen, Turk and Leiserowitz 2017)	➢ Negative (Malek et al. 2019; Graca, Truninger et al. 2019; Hielkema and Lund 2021; Verain et al. 2015) ➢ No effect (Toblers, Visschers and Siegrist 2011; de Boer Schösler & Aiking 2014)
Gender (female)	➢ Positive (Rotaris and Danielis 2019) ➢ Negative (Carattini et al. 2017; Davidocic, Harring og Jagers 2019) ➢ No effect (Baranzini and Carattini 2017; Kotchen, Turk and Leiserowtiz 2017; Hammar and Jagers 2006; Thalmann 2004)	➢ Positive (Hielkema and Lund 2021; Verain et al. 2015; Malek et al. 2019; Tobler, Visschers and Siegrist 2011; European Commission 2013, 102; Hartmann and Siegrist 2017; Graca, Godinho &Truninger 2019; Graca, Truninger et al. 2019; Hunter and Röös 2016; Hayley et al. 2015; de Boer and Aiking 2022).
Behaviour		
Meat consumption frequency		➢ Negative (Sanchez-Sabate and Sabate 2019; Hunter and Röös 2016, Neff et al. 2018)

Table 1 summarizes the hypothesized effect direction of the individual characteristics discussed in this review. As can be seen, the review generally identified more studies on carbon tax support than on willingness to eat less red meat. For most of the individual characteristics, there are some studies which observe an effect in while others do not. However, there are two notable exceptions which create clear expectations: trust in politicians has consistently been found to be a predictor of carbon tax support and numerous studies consistently find that women are more willing to eat less meat. The effect of gender on carbon tax support stands out as the only individual characteristic where previous studies provide conflicting expectations. Some find that women are more supportive, some find that men are more supportive, and several find no gender effect.

This review has shown that the relationship between individual characteristics and support for various climate policies still warrant more research. In particular, there are few studies on willingness to reduce red meat. This review only identified one such study (Stea and Pickering 2019). The present study contributes with additional knowledge about predictors of support and opposition towards increasing the carbon tax and eating less red meat. I derive the following research question from the literature: "how do individual characteristics affect carbon tax support and willingness to eat less red meat?" This question will be tested on the novel data that I have collected. These data have the advantage of being representative of the Norwegian population. Furthermore, they examine support for two specific policies, which enables

detection of different predictive characteristics for different policies. In addition, the data measure attitudes towards an actual proposal discussed in public debate, as opposed to a hypothetical scenario constructed by researchers. The advantage is that responses are more likely to be based on respondents' attitudes to the policy in question, and not just attitudes to related issues (Kyselá, Ščasný, and Zvěřinová 2019).

3　　　Material and methods

3.1. Data collection

To measure and explain support for two of the climate policies proposed by the Norwegian government in order to reach the national climate policy goal, increasing the carbon tax and encouraging people to eat less red meat, the study relies on survey data from the Norwegian Citizen Panel (2022). This is an online survey where participants above the age of 18 are randomly recruited from the Norwegian population register. The data for the present study were collected in round 22, fielded in November 2021, and consist of 2001 respondents.

Table 2 provides a summary of the sample characteristics. While reasonably representative of the Norwegian population, the sample suffers from a systematic overrepresentation of respondents with higher education, as well as respondents aged 60 years and above. To enhance the sample's representativeness, I use a calculated set of weights based on age, gender, region and educational level. For more details on the data collection and the weighting procedures, see the methodology report (Skjervheim et al. 2021).

Table 2. Sample characteristics

	Sample distributions (N=2001)
Gender	
Male	987 (49 %)
Female	1014 (51 %)
Year of birth	
1959 or earlier	902 (45 %)
1960-1989	962 (48 %)
1990 or later	137 (7 %)
Education	
No higher education	672 (34 %)
Higher education	1288 (66 %)
Residence	
City	435 (26 %)
Suburb	317 (19 %)
Small/medium sized town	463 (28 %)
Village	264 (16 %)
Sparsely inhabited area	174 (11 %)

3.2. Survey design

The specific wording of each policy variable is provided below, with weighted results in parentheses. Unweighted results are presented in table A1-A3 in the appendix.

The survey question on *carbon tax* read as follows: "In the spring of 2021, the government proposed to gradually increase the carbon tax. The purpose of the tax is to make it worthwhile for companies to reduce emissions, and for consumers to choose goods and services produced with lower emissions. How far do you agree or disagree that the carbon tax should be increased?" Respondents could indicate their level of agreement on a 7-point bipolar scale with the values "strongly agree" (22 %), "agree" (30 %), "somewhat agree" (20 %), "neither agree nor disagree" (12 %), "somewhat disagree" (5 %), "disagree" (5 %), and "strongly disagree" (6 %).

In order to get an idea about *current consumption of red meat*, and thereby the potential of future reductions, respondents were first asked: "How often do you usually eat red meat for dinner? Red meat is meat from pork, beef, lamb/mutton and goats." The respondents were asked to choose one of the following six values: "Every day" (1 %), "4-6 days a week" (15 %), "2-3 days a week" (46 %), "1 day a week or less" (31 %), "I do not eat red meat but I eat lean meat" (3 %), or "I do not eat meat (vegan, vegetarian, pescetarian or similar)" (3 %). This question is treated as an explanatory variable in the analysis.

Only those who indicated that they eat red meat were asked the subsequent question about *willingness to eat less red meat*: "In the spring of 2021, the Norwegian government set a target for the population to follow the dietary advice from the Norwegian Directorate of Health, as part of the "Climate Plan for 2021-2030". The dietary advice recommends limiting the amount of red meat to 500 grammes per week per person. If people follow this advice, it will reduce the demand for meat, thereby reducing emissions from meat production in agriculture. How willing are you to eat less red meat than you do today?". Respondents could indicate their willingness on a 5-point unipolar scale with the following values: "Not willing at all" (13 %), "not very willing" (18 %), "fairly willing" (27 %), "willing" (29 %), and "very willing" (14 %).

The attitude variables include *concern about climate change* (five values from "not at all concerned" to "very concerned"), *political orientation.* ("In politics people often talk about the "left wing" and the "right wing." Below is a scale where 0 represents those who are on the far left politically, while 10 represents those who are on the far right. Where would you place yourself on such a scale?" (eleven values)), and *trust in politicians* ("Generally speaking, how much confidence do you have in Norwegian politicians?" (five values from "not at all" to "a very high degree")).

Socio-demographic variables included respondents' gross annual *income* ("<150 000", "150 001 - 300 000", "300 001 - 400 000", "400 001 - 500 000", "500 001 - 600 000", "600 001 - 700 000", "700 001 - 1 000 000", and ">1 000 000"), *area of residence* ("What description best fits the area you live in? We are thinking about Norwegian conditions here." (The variable takes five values: "A city", "a suburb or the outskirts of a city", "a small or medium sized town", "a village", and "a sparsely inhabited area")), highest completed *education* ("no higher education" and "higher education"), *year of birth* ("born 1959 or earlier", "1960–1989" and "1990 or later"), and *gender* ("male" and "female").

3.3. Methods

First, I conducted descriptive analyses of carbon tax support, meat consumption frequency and willingness to eat less red meat. Then, I assessed factors associated with carbon tax support and willingness to eat less red meat using multivariable linear regressions in which support for the policy proposals was modeled as a function of concern about climate change, political orientation, and trust in politicians. To show the extent to which the results are driven by

inclusion or exclusion of socio-demographic variables, I report models with and without control variables. These variables include the respondents' income, urban/rural residence, education, year of birth, and gender. In addition, current consumption of red meat is included as a predictor of willingness to eat less red meat. Since the dependent variables are ordered, I have also estimated the effects using an ordered logit model (see table A4 in the appendix), which returned almost identical results.

All statistical analyses were performed in R Studio version 4.1.3 (R Core Team 2022). Several R packages were used, including the haven (Wickham and Miller 2021), stargazer (Hlavac 2022), sjmisc (Lüdecke 2018), MASS (Venables and Ripley 2002), dplyr (Wickham et al. 2022).

4 Results

Support for increased carbon tax and willingness to reduce meat consumption are positively correlated (Pearson's r = .52, see also crosstabulation A7 in the appendix), which means that those who agree with the carbon tax increase are more likely to be willing to eat less red meat.

Table 3 presents the regression table for predictors of carbon tax support and willingness to reduce meat consumption. Models 1 and 3 show that the attitude variables are associated with carbon tax support and willingness to eat less red meat in the same directions. Concern about climate change and trust in politicians are positively associated with support for both policies, while being on the political right is negatively associated with support for both policies. Models 2 and 4 confirm that these associations are statistically significant also when controlling for sociodemographic variables.

There is no statistically significant effect of income on neither carbon tax support nor willingness to eat less red meat.

The effect of living in a rural rather than urban area is statistically significant for both policies. Compared to living in a city, living in a village or a sparsely inhabited area (statistically significant at the 99 % level) is negatively associated with carbon tax support. Similarly, living in a small/medium sized town (statistically significant on the 95 % level), a village or a sparsely inhabited area are negatively associated with willingness to eat less red meat.

There is a statistically significant, positive effect of education on both policies.

Age is positively associated with carbon tax support, but negatively associated with willingness to eat less red meat. Compared to those who are born in 1990 or later, those born between 1960 and 1989 are more positive towards increasing the carbon tax (statistically significant at the 99 % level). Those born in 1959 or earlier are also more supportive than the youngest age group (statistically significant at the 95 % level), but the effect is somewhat smaller than for those born between 1960 and 1989. In contrast, compared to those who are born in 1990 or later, being born in 1959 or earlier is negatively associated with willingness to eat less red meat (statistically significant on the 95 % level).

Being female is positively associated with both policies.

Finally, table 2 shows that those who currently eat red meat for dinner four days a week or more are less willing to eat less red meat, compared to those who currently eat red meat for dinner 3 days a week or less.

Table 3. Predictors of carbon tax support and willingness to eat less red meat

Predictors of policy support

Dependent variable:

	Increase carbon tax		Eat less red meat	
	(1)	(2)	(3)	(4)
Climate concern	0.896***	0.841***	0.433***	0.347***
	(0.034)	(0.034)	(0.028)	(0.028)
Left-right	-0.077***	-0.071***	-0.061***	-0.049***
	(0.015)	(0.015)	(0.012)	(0.012)
Trust in politicians	0.408***	0.336***	0.251***	0.178***
	(0.041)	(0.041)	(0.034)	(0.034)
Income		0.024		0.015
		(0.020)		(0.016)
Suburb		0.018		-0.129
		(0.104)		(0.083)
Small/medium sized town		-0.097		-0.169*
		(0.095)		(0.076)
Village		-0.475***		-0.319***
		(0.105)		(0.084)
Sparsely inhabited area		-0.398**		-0.330***
		(0.123)		(0.099)
Education		0.525***		0.371***
		(0.077)		(0.062)
1960-1989		0.305**		-0.086
		(0.117)		(0.098)
1959 or earlier		0.257*		-0.252*
		(0.119)		(0.099)
Gender (female)		0.254***		0.388***
		(0.070)		(0.056)
Red meat 4 days or more				-0.336***
				(0.069)
Constant	0.786***	0.652**	0.911***	1.373***
	(0.177)	(0.205)	(0.145)	(0.173)
Observations	1,638	1,579	1,546	1,492
R²	0.458	0.507	0.274	0.362
Adjusted R²	0.457	0.503	0.273	0.357
Residual Std. Error	1.238 (df = 1634)	1.192 (df = 1566)	0.972 (df = 1542)	0.921 (df = 1478)
F Statistic	460.532*** (df = 3; 1634)	134.268*** (df = 12; 1566)	194.058*** (df = 3; 1542)	64.601*** (df = 13; 1478)
Note:				* p<0.05; ** p<0.01; *** p<0.001

Note: Estimated regression coefficients, standard errors in parentheses. Linear regressions. Data weighted by age, gender, region, and educational level.

5   Discussion

Understanding citizen perceptions of climate policies can inform strategies to increase public support. This study offers some insights on the various factors influencing public responses to two specific climate policy proposals in Norway. The findings indicate that both increasing the

carbon tax and eating less red meat seem to have broad support among the population. I further assessed individual characteristics of support and opposition for these policies. Despite their different designs, regression analyses indicate that many of the individual characteristics are consistent of support across both policies. Apart from age, all variables included in this study predicted support for both policies in the same directions. Carbon tax support and willingness to eat less red meat are predicted by higher concern about climate change, left-wing political orientation, higher political trust, residing in an urban rather than rural area, having a higher level of education and being female. However, carbon tax is predicted by higher age, while willingness to eat less red meat is predicted by lower age. Income had no effect on neither carbon tax support nor willingness to eat less red meat. In addition, already eating red meat for dinner three times a week or less, in line with the dietary advice, is a strong predictor of willingness to eat less meat.

In this study, 72 % of the respondents either "somewhat agree", "agree", or "strongly agree" with increased carbon taxes. The level of support for reducing red meat consumption is similar. Among the respondents in this survey, 70 % indicated that they are either "fairly willing", "willing" or "very willing" to eat less red meat. The broad public support for both policies in this study is in contrast to previous studies showing that there is considerable resistance against increased carbon taxes (Sælen and Kallbekken 2011, Umit and Schaffer 2020) and reduced meat consumption (Latvala et al. 2012, Niva et al. 2014, Bugge and Alfnes 2018, Sanchez-Sabate and Sabaté 2019, Stea and Pickering 2019, Hielkema and Lund 2021), These parts of the results should therefore be interpreted with caution. It is possible that the public has changed its mind but it is also possible that the results are affected by how the survey items were worded. The survey questions did not mention the costs of the carbon tax, as it is difficult to predict what they will be. The climate plan emphasizes that the overall tax level will remain the same for car drivers. Still, the carbon tax will most likely entail increased costs for consumers, and not explicitly stating the personal costs of a policy may result in a bias towards overly favorable responses (Drews and Van den Bergh 2016, Kyselá, Ščasný, and Zvěřinová 2019).

The two survey items are not directly comparable, since they have different scales. Also, it is questionable how willing those who respond "fairly willing" are, and how this response should be interpreted. Still, it is somewhat surprising that both policies have similar levels of support among the population, given their different design on significant dimensions. The carbon tax was expected to be less popular than red meat reduction, since push measures usually yield lower support than pull measures (Steg, Dreijerink, and Abrahamse 2006, Attari et al. 2009, Rhodes, Axsen, and Jaccard 2017, Swim and Geiger 2021) and since the carbon tax is only motivated by climate change mitigation. Combining climate change mitigation with appeals to health benefits, like the reduction of red meat policy does, tends to increase support (Stoll-Kleemann and Schmidt 2017, Wolstenholme, Poortinga, and Whitmarsh 2020). These apparent advantages of the meat reduction policy can have been evened out by its single focus on individual behavior, whereas the carbon tax is directed towards both individuals and companies. Policies targeting individuals typically receive lower support than policies targeting the industry (Harring, Jagers, and Matti 2019, Swim and Geiger 2021).

Support for the concrete policies can stem from different segments of society. However, this does not seem to be the case for carbon tax support and willingness to eat less red meat. Not only is support for the two policies positively correlated, their support is also predicted by mostly the same characteristics, despite their differences on several design dimensions. This corroborates previous studies which also find that different ways of addressing climate change are positively correlated (Tobler, Visschers, and Siegrist 2012, de Boer and Aiking 2022).

Some of the variables, or similar variables, that were consistently predictive across policies in this study have been found in other studies as well. Rhodes, Axsen, and Jaccard (2017) also identified concern about climate change and female gender as positively associated with support across policy types, but not trust in government, urban/rural residence and level of education. Stoutenborough, Bromley-Trujillo, and Vedlitz (2014) found that concern about climate change, liberal ideology, and trust in experts consistently predicted policy support across policies, while education and gender did not. As in the present study, age and income were not consistent predictors (Stoutenborough, Bromley-Trujillo, and Vedlitz 2014).

When it comes to how the individual characteristics predicted carbon tax and willingness to eat less red meat, the effect of the attitudinal variables is in line with most previous studies. As in most other studies, concern about climate change is positively associated with support for increased carbon tax (Kallbekken and Sælen 2011, Baranzini and Carattini 2017, Davidovic, Harring, and Jagers 2020) as well as with willingness to eat less red meat (de Boer and Aiking 2022). However, Tobler, Visschers, and Siegrist (2012) found no effect of concern about climate change when they measure support for a group of policies restricting CO2 emissions, of which CO2 taxes are one policy.

Similarly, this study confirms the negative association between placing oneself to the right politically and support for carbon tax, which was found in all of the reviewed studies (Thalmann 2004, Hammar and Jagers 2006, Harring and Jagers 2013, Kallbekken, Garcia, and Korneliussen 2013, Davidovic, Harring, and Jagers 2020), except for one which found no statistically signifant effect of political positioning (Baranzini and Carattini 2017). There is also a negative association between the policital right and willingness to eat less red meat, in line with the findings of Hielkema and Lund (2021).

The positive effect of trust in politicians on support for increased carbon tax was also as expected, and in line with all previous studies (Kallbekken and Sælen 2011, Harring and Jagers 2013, Kallbekken, Garcia, and Korneliussen 2013, Baranzini and Carattini 2017, Rafaty 2018, Umit and Schaffer 2020). In reviewing the literature, no data was found on the association between trust in politicians and willingness to eat less meat. However, trust in politicians is positively associated with policy support (Drews and Van den Bergh 2016). Truly, there was a positive association between trust in politicians and willingness to eat less red meat.

The sociodemographic variables had several statistically significant coefficients. Previous research has produced somewhat conflicting results regarding the effect of several of these variables. The findings in this study are consistent with some previous studies and inconsistent with others.

Level of income had no influence on neither support for increased carbon tax nor willingness to eat less red meat in this study. This is in line with some previous studies on carbon tax support (Thalmann 2004, Harring and Jagers 2013), but contrasts others which have found a positive association with carbon tax support (Kotchen, Turk, and Leiserowitz 2017, Rotaris and Danielis 2019, Davidovic, Harring, and Jagers 2020). The finding also differs from a previous study on willingness to eat less meat which found a negative association with income meat consumption (Hunter and Röös 2016).

The finding that respondents living in rural areas are more negative towards both policies match earlier studies on carbon tax support (Thalmann 2004, Harring and Jagers 2013, Rotaris and Danielis 2019, Umit and Schaffer 2020), except for one study which finds no effect (Hammar and Jagers 2006). The finding is also in line with a previous study on willingness to eat less meat (de Boer and Aiking 2022).

The positive effect of education on support for both policies corroborates most previous studies on carbon tax (Thalmann 2004, Hammar and Jagers 2006, Carattini, Carvalho, and Fankhauser 2018, Rotaris and Danielis 2019, Davidovic, Harring, and Jagers 2020), except one which reports no effect of education (Kotchen, Turk, and Leiserowitz 2017). The positive association between education and willingness to eat less met has also been observed in previous studies (Stea and Pickering 2019, de Boer and Aiking 2022), but several studies find no such association (Tobler, Visschers, and Siegrist 2011, De Boer, Schösler, and Aiking 2014).

This study finds that age predicts carbon tax support, in contrast to many studies which find no such effect (Thalmann 2004, Baranzini and Carattini 2017, Kotchen, Turk, and Leiserowitz 2017). Compared to those born in 1990 or later, the older age groups are more likely to support an increased carbon tax. Contrary to previous studies, it is not the older who are more negative (Rotaris and Danielis 2019), nor the age group 31-60 years old (Hammar and Jagers 2006). In fact, this age group appears to be the most positive in this study, in line with the findings of Carattini, Carvalho, and Fankhauser (2018). While this study found a positive effect of age on carbon tax support, there was a negative effect of age on willingness to eat less red meat. This finding has also been reported by previous studies (Verain, Dagevos, and Antonides 2015, Malek, Umberger, and Goddard 2019, Hielkema and Lund 2021). Still, others find no effect of age on willingness to eat less meat (Tobler, Visschers, and Siegrist 2011, De Boer, Schösler, and Aiking 2014).

The results show that being female is associated with carbon tax support. This is in line with the findings of Rotaris and Danielis (2019) but contrasts other studies which find that men are more supportive of a carbon tax (Carattini, Carvalho, and Fankhauser 2018, Davidovic, Harring, and Jagers 2020), as well as the many studies which find no effect of gender on carbon tax support (Thalmann 2004, Hammar and Jagers 2006, Baranzini and Carattini 2017, Kotchen, Turk, and Leiserowitz 2017). The observed positive association between being female and willingness to eat less red meat is in agreement with all previous studies (Tobler, Visschers, and Siegrist 2011, Hayley, Zinkiewicz, and Hardiman 2015, Verain, Dagevos, and Antonides 2015, Hunter and Röös 2016, Hartmann and Siegrist 2017, Graça, Godinho, and Truninger 2019, Graça et al. 2019, Malek, Umberger, and Goddard 2019, Hielkema and Lund 2021, de Boer and Aiking 2022).

Finally, the negative association between red meat consumption and willingness to eat less red meat is also in agreement with previous studies (Hunter and Röös 2016, Neff et al. 2018, Sanchez-Sabate and Sabaté 2019).

The government relies on both strengthening the climate change mitigation policy and on individual consumption efforts in its Climate plan. Public support increases the chance of these policies' successful implementation. This study indicates that there is such support among the general population. However, this study also shows that the level of support varies between different segments of the population. Since public opposition can hinder a policy's successful implementation, this study is concerned with which groups are more likely to oppose the policies. The findings indicate that these policies will both meet resistance among individuals who are less concerned about climate change, individuals with lower trust in politicians, individuals residing in rural areas, individuals with lower levels of education, and men. It is important to acknowledge the role of these factors. Future research should explore why these groups are more opposed towards these climate policies, as well as what can be done to make to make climate policies more attractive among these segments of the population.

In addition, this study shows that those who do not eat in line with the dietary advice are less willing to reduce their consumption of red meat. This finding has vital implications for

the eventual success of this part of the Climate Plan, as the proposed campaigns to reduce red meat consumption are only directed towards those who eat more red meat than the maximum recommendation of the dietary advice. However, since this group is less willing to eat less red meat than the rest of the population, it would probably be more effective to encourage reductions of red meat among those who already eat in line with the dietary advice. This is also a much larger group. Only 16 % of the respondents report that they eat red meat for dinner 4 days a week or more.

Previous studies have suggested that the general unwillingness to eat less meat can be explained by the fact that many have already reduced their meat consumption (Latvala et al. 2012) and that for individuals consuming red meat only 1-4 times per week there is less capacity for a reduction (Stea and Pickering 2019). In contrast, the results of this study show that those who eat little red meat are in fact more willing to reduce their intake.

The generalizability of this study to other countries is limited. Norway is an outlier when it comes to carbon tax support (Umit and Schaffer 2020). Willingness to reduce meat consumption is also influenced by ethnicity and culture (Schösler et al. 2015).

6   Conclusion

The aim of this study was to gain better insight into the individual factors that promote or hamper the implementation of the policies in the climate action plan in Norway. This study has examined public support and opposition towards two of the main policies in Norwegian climate action plan, which vary in their design: Increasing the carbon tax and reducing red meat consumption in line with the dietary advice. The results show that opposition against the two policies are predicted by many of the same factors. Individuals who are less concerned about climate change, belong to the political right, have low trust in politicians, live in rural areas, and have lower education are less likely to support both policies. Older individuals are less willing to reduce their red meat consumption but more supportive of the carbon tax. Income did not have an effect on policy support in this study. Furthermore, high consumption of red meat is negatively associated with willingness to eat less red meat. These findings partly replicate previous knowledge and improve our understanding of patterns of citizen support and opposition for increased carbon taxes and willingness to eat less red meat. These insights can inform strategies to increase support for climate policies.

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Appendix

Table A1.

How far do you agree or disagree that the carbon tax should be increased?	
Strongly agree	405 (20 %)
Agree	602 (30 %)
Somewhat agree	399 (20 %)
Neither agree nor disagree	246 (12 %)
Somewhat disagree	101 (5 %)
Disagree	104 (5 %)
Strongly disagree	123 (6 %)
Not answered	21 (1 %)
Total N	2001

Note: Unweighted data

Table A2.

How often do you usually eat red meat for dinner? (N=2001)	
Every day	13 (1 %)
4-6 days a week	260 (13 %)
2-3 days a week	919 (46 %)
1 day a week or less	672 (34 %)
I do not eat red meat, but I eat lean meat	64 (3 %)
I do not eat meat (vegan, vegetarian, pescetarian or similar)	44 (2 %)
Not answered	29 (1 %)

Note: Unweighted data

Table A3.

How willing are you to eat less red meat than you do today? (N=2001)	
Not willing at all	225 (11 %)
Not very willing	356 (18 %)
Fairly willing	534 (27 %)
Willing	519 (26 %)
Very willing	228 (11 %)
Not answered	139 (7 %)

Note: Unweighted data

Table A4. Predictors of carbon tax support and willingness to reduce red meat consumption

Predictors of policy support

Dependent variable:

	Support for carbon tax		Willingness to reduce	
	(1)	(2)	(3)	(4)
Climate concern	1.205***	1.200***	0.789***	0.686***
	(0.059)	(0.062)	(0.057)	(0.061)
Left-right	-0.111***	-0.115***	-0.096***	-0.078***
	(0.023)	(0.024)	(0.023)	(0.025)
Trust in politicians	0.526***	0.434***	0.431***	0.319***
	(0.063)	(0.066)	(0.066)	(0.069)
Income		0.046		0.011
		(0.031)		(0.033)
Suburb		0.077		-0.220
		(0.164)		(0.164)
Small/medium sized town		-0.262*		-0.309**
		(0.148)		(0.150)
Village		-0.689***		-0.594***
		(0.160)		(0.169)
Sparsely inhabited area		-0.613***		-0.563***
		(0.192)		(0.200)
Education		0.763***		0.704***
		(0.121)		(0.124)
1960-1989		0.435**		-0.188
		(0.182)		(0.196)
1959 or earlier		0.319*		-0.470**
		(0.184)		(0.198)
Gender (female)		0.234**		0.665***
		(0.107)		(0.114)
Red meat 4 days or more				-0.532***
				(0.141)
Observations	1,394	1,346	1,314	1,267
Note:				*p<0.1; **p<0.05; ***p<0.01

Notes: Ordinal logistic regression, weighted data.

Table A5. Crosstabulation carbon tax/willingness to eat less red meat

		How willing are you to eat less red meat than you do today?					
		Not willing at all	Not very willing	Fairly willing	Willing	Very willing	Total
How far do you agree or disagree that the carbon tax should be increased?	Strongly disagree	70 %	19 %	6 %	4 %	1 %	100 %
	Disagree	33 %	27 %	27 %	8 %	5 %	100 %
	Somewhat disagree	19 %	33 %	33 %	10 %	4 %	100 %
	Neither agree nor disagree	15 %	28 %	36 %	15 %	5 %	100 %
	Somewhat agree	9 %	26 %	35 %	22 %	8 %	100 %
	Agree	3 %	16 %	31 %	37 %	14 %	100 %
	Strongly agree	3 %	5 %	20 %	46 %	27 %	100 %

Table A6. Crosstabulation meat consumption/willingness to eat less red meat

		How willing are you to eat less red meat than you do today?					
		Not willing at all	Not very willing	Fairly willing	Willing	Very willing	
How often do you usually eat red meat	Every day	10 (77 %)	0	1 (8 %)	2 (15 %)	0	100 %
	4-6 days a week	58 (22 %)	61 (23 %)	73 (28 %)	55 (21%)	13 (5 %)	100 %
	2-3 days a week	102 (11 %)	177 (19 %)	313 (34 %)	235 (26 %)	92 (10 %)	100 %

for dinner?	1 day a week or less	55 (8 %)	118 (18 %)	147 (22 %)	227 (34 %)	123 (18%)	100 %

Note: Unweighted data.