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Citation for the original published paper (version of record):

Ewald, J., Sterner, T., Sterner, E. (2022). Understanding the resistance to carbon taxes: Drivers and barriers among the general public and fuel-tax protesters. *Resources and Energy Economics*, 70.  
<http://dx.doi.org/10.1016/j.reseneeco.2022.101331>

N.B. When citing this work, cite the original published paper.



ELSEVIER

Contents lists available at ScienceDirect

## Resource and Energy Economics

journal homepage: [www.elsevier.com/locate/ree](http://www.elsevier.com/locate/ree)

# Understanding the resistance to carbon taxes: Drivers and barriers among the general public and fuel-tax protesters



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## ARTICLE INFO

### Article history:

Received 29 June 2021

Received in revised form 26 March 2022

Accepted 18 August 2022

Available online 22 August 2022

### JEL Classifications:

Q51

Q54

Q58

Q59

### Keywords:

Political acceptability

Climate change

Carbon tax

Fairness

Protest

## ABSTRACT

Carbon taxes are generally well accepted in countries with significant experience thereof but there is still public resistance to raising them. We study attitudes toward carbon taxation and other environmental policy instruments in Sweden. We survey a national sample of the population as well as members of a large political movement that protests fuel taxes. Our results show that the motivations in both groups are alike: educational level, rural versus urban domicile, political orientation, and especially trust in government correlate with opinions on carbon taxes; household income does not appear to matter. Lack of trust in government and lack of belief in the Pigouvian mechanism appear as especially important motivations for protesters' opposition. We find support for revenue refunding, but greater support, in both groups, for earmarking for climate use.

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## 1. Introduction

The transition to a fossil-free society is urgent, but we lack consensus on which instruments to use. Economic theory suggests emissions pricing as the most cost-effective policy to deal with climate change since the price provides a constant and automatic incentive to adapt.<sup>1</sup>

The economists' consensus on pricing carbon is facing opposition from at least three sources. Naturally the fossil fuel and energy-intensive consumer lobbies, but also from political scientists and the regular public. Policymaking is rarely a technocratic exercise in which experts provide ready-to-implement policies. Instead, it is often the result of a struggle between competing interests in which lobbying, ideology, and various constraints play important roles. Perhaps the biggest hurdle for carbon taxes, and the reason many carbon pricing schemes are so weak, is the combination of strong opposition and lack of public support for

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<sup>1</sup> Since Pigou (1920), it is accepted that pollution externalities should be internalized. This so-called polluter-pays principle is supported by a consensus of prominent economists through joint statements ("Economists' Statement on Carbon Dividends"; Climate Leadership Council, 2019) and articles (Laffont and Tirole, 1996; Nordhaus, 2011; Tirole, 1988, 2010; Weitzman, 2014; Akerlof et al., 2019).

carbon taxes. Well-organized and concentrated special interests—often businesses and industry—that can conduct successful lobbying activities have a strong influence on the political feasibility of a tax (Inchauste and Victor, 2017; Oates and Portney, 2003; Olson, 1965). Some social scientists have recently argued forcefully that the whole idea of pricing emissions might work for marginal changes but that the necessary transformation of society requires multiple policy combinations tailored to each sector (Cullenward and Victor, 2020).

Our interest in this paper concerns opposition from the public. Though less organized and less influential than industry, households also have political power to determine policy through their right to vote (Kallbekken and Sælen, 2011). Widespread public resistance to carbon taxes will be expressed at the ballot box, and politicians who seek reelection will choose policies that attract voters, even at the expense of efficiency. Efficiency and equity may be secondary to the primary challenge of gaining political acceptability. One may argue that all focus must be on winning political support, and if there is some loss of efficiency through changing instrument design, then that is a necessary sacrifice. The skepticism about the severity of climate change, which grew during the late 2000s, seems to be due partly to increasing politicization of the topic and to changing economic environments and media coverage (Whitmarsh and Capstick, 2018).

We focus in this paper on attitudes to carbon taxation. Although just over a fifth of the world's emissions is covered by some form of carbon price, that price is generally low (Stavins, 2020; World Bank, 2020). A big exception is the fuel taxes in the transport sector in Europe, Japan, and some other regions and countries. Regardless of how they came to be and what they are called, we can view them as sectoral carbon taxes, even though they are not exactly proportional to carbon emissions. In Sweden, the total taxes on gasoline at the end of 2021 amounted to €0.95/litre or \$4.35/gallon - about two-thirds of the final price. The Swedish carbon tax is \$120/ton of CO<sub>2</sub>, but with energy taxes and the value-added tax (VAT), the total tax is equivalent to over \$400/ton CO<sub>2</sub>. This price (and tax) level is fairly typical of Europe. The *mouvement des gilets jaunes* (the yellow vests protest) in France was sparked by plans to raise this level of taxation even further (in combination with poor design and communication; Carattini et al., 2019). The French experience is not unique. Plans to raise fuel taxes, or even just to abolish fuel price subsidies, have met strong resistance and riots in many countries, even in Iran or Nigeria and others where prices were very low and ending subsidies was a sensible policy, it is still very important to put in place policies to protect citizens from price rises to avoid a backlash (Atansah et al., 2017).

Sweden is an interesting case to study: People have many years of experience. The carbon tax was introduced in 1991, and the tax is applied broadly—not just to transport fuels but, in principle, to all goods except heavy industry that falls under EU jurisdiction and the EU ETS; airline emissions (on international flights) are also exempt because of international treaties (Sweden's carbon tax is sometimes criticized for having many exceptions, but this is partly a misunderstanding<sup>2</sup>). Moreover, Sweden has relatively high levels of trust, low levels of corruption, and citizens express high levels of concern about climate change (Söderpalm and Wennö, 2019). The carbon tax was introduced gradually, as part of a tax reform that was broadly popular (because it lowered taxes, such as very high marginal income taxes, wealth taxes, and inheritance taxes). Its level was raised gradually so that people could adjust. It has been quite effective in lowering emissions (Andersson, 2019; Criqui et al., 2019) and its rationale is generally accepted: roughly 60% of the Swedish population is in favor of using price instruments that target fossil fuels to reduce climate change, versus an average 32% in the other EU member states (European Social Survey, 2016).

Although fuel or carbon taxes are an expression of fairness in one dimension: that of the polluters pay principle, there are many other dimensions and aspects of fairness and protesters may well have other reasons to think of these policies as unjust (Andor et al., 2018; Sommer et al., 2020). In fact, studies of fuel payments across the income distribution show that fuel taxes are nearly neutral (in European countries) and even progressive (in low-income countries), see for instance Sterner (2012). Still, the protest movements in many countries argue that it is unfair for the ordinary motorist to pay several hundred USD while “big industry” pays a much lower price in the EU Emissions Trading System (ETS) and the rich who travel on long international flights by air pay no carbon tax at all. The protest movements appear to play a very central role in shaping the debate.

There is thus some resistance, not least to further increases in fuel taxation, and to understand the motivations for this resistance, we survey not only a sample of the Swedish population but also a group of protesters. Six months after the yellow vests movement erupted in France in the fall of 2018, a protest petition was launched in Sweden against petrol taxes.<sup>3</sup> It quickly received more than half a million signatures—a significant number in a country of ten million people. Although the Swedish protesters have been rather restrained compared with their French counterparts, the movement indicates at least some fairly strong latent opposition. If even Sweden has a protest movement, other countries' efforts to introduce or increase carbon taxes may be more likely to face resistance. It is clear that protest movements play an important role in picking up, amplifying, expressing, and forming general opinions which makes them important to study (Douenne and Fabre, 2022; Mehleb et al., 2021).

<sup>2</sup> A few other exemptions—for greenhouses, fishing vessels, and mining—have mostly been phased out. Tax base erosion, however, implies that uses that are taxed (like oil heating) diminish rapidly, thereby shrinking the share of emissions covered. Because Sweden has many large industries covered under the EU ETS, its share of industrial emissions not subject to the carbon tax is correspondingly large compared with other countries. This also reduces the percentage covered by the tax.

<sup>3</sup> On its website, the protest organization states that it strives for a society where “motoring is not overtaxed and where all Swedish citizens feel free to live and work where they want without being penalized by high fuel taxes.” Its formation was inspired by the yellow vests movement in France. It has staged demonstrations, although not on the scale seen in France and without any violence, and attracts a big following: Thousands of members visit its Facebook page daily.

This paper explores the determinants of opinion on carbon taxation in Sweden and in particular the role of revenue re-funding versus earmarking. To understand the drivers of the opposition to carbon taxes, we analyze and compare the opinions of the Swedish general population and the Swedish protest movement. We focus on the roles of education, income, rural residence, trust in government, political orientation, and belief in the Pigouvian mechanism.

## 2. Previous literature on public acceptance of carbon taxes

Understanding the resistance to carbon pricing and how, if possible, to increase public acceptance in this area is necessary for the fulfillment of the Paris Agreement and is the subject since almost two decades of a growing number of papers (see for instance the special issue introduced by [Dresner et al., 2006](#)). There are already excellent reviews to which we will refer extensively, in particular [Carattini et al. \(2018b\)](#) but also [Maestre-Andrés et al. \(2019\)](#) and others ([Bergquist et al., 2022](#); [Drews and Van den Bergh, 2016](#); [Klenert et al., 2018](#)).

The public may have many reasons for holding a different opinion than economists, ([Caplan, 2007](#); [Mankiw, 2009](#)). It is well documented that people prefer subsidies for green alternatives to taxes on fossil products, see [Drews and Van den Bergh \(2016\)](#) for a discussion of individual explanations and [Cherry et al. \(2012\)](#) for a discussion of cultural aspects. [Carattini et al. \(2018b\)](#) suggest five concerns that the public may have concerning carbon taxes:

1. High personal costs. For many, the first-order concern may be fear of personal consequences expected from carbon taxes. This has been shown for motorists ([Hammar and Jagers, 2007](#)), see also ([Savin et al., 2020](#)). It is natural that the public may take a partial rather than general equilibrium view leading them to feel that taxation of a fossil product is worse for their economy than subsidies for a green alternative. They would thus be ignoring the fact that subsidies must be paid for (perhaps through other taxes) while fossil taxes give revenue that can lead to *lowering* of other taxes (with a constant stream of public goods and transfers).
2. Regressivity. Many studies show a stated preference in favor of progressive designs (e.g. [Brännlund and Persson, 2012](#)). Whether or not carbon taxes are regressive is an empirical matter as are the corresponding distributional properties of alternative instruments, but the argument may be equally effective and is often used even in contexts where it is not at all true like for transport fuel taxes in low-income countries ([Sterner, 2012](#)).<sup>4</sup>
3. Damage to the wider economy. Carbon taxes are sometimes resisted with the argument that they will lead to unemployment, inflation, or the exodus of industries to other countries. Several of these concerns have been studied in various contexts, see for instance [Carattini et al. \(2017\)](#). Fear of damage to competitiveness has in some cases led to exceptions for industry – exceptions which may later, paradoxically be a new source of critique for “unfairness” when taxes are not the same across the board.
4. Lack of efficiency. A common critique is that carbon taxes are not effective ([Klok et al., 2006](#)). These critics do not believe in the Pigouvian mechanism that higher prices will lead to lower use. They may feel that current habits for personal transportation and heating are not luxuries but necessities. Studies show that this is partly true in the short run. In the long run, technological and behavioral changes imply much higher elasticities ([Baranzini and Carattini, 2016](#); [Carattini et al., 2017](#); [Kallbekken and Sælen, 2011](#)). It is clear however that people have a hard time understanding the Pigouvian mechanism ([Kallbekken et al., 2011](#)).
5. Self-interest of the state. Citizens may suspect that politicians are raising taxes for their own purposes. This is closely related to the issue of trust in the state. Political trust is positively correlated with support for environmental taxes (see [Criqui et al., 2019](#); [Fairbrother, 2019](#); [Fairbrother et al., 2019, 2021](#); [Hammar and Jagers, 2006, 2007](#)).

This array of issues helps us understand the attitudes to taxes which may depend on several factors. For instance, it has been shown that the acceptability of a tax decreases with the tax *level* – particularly in the absence of earmarking ([Sælen and Kallbekken, 2011](#); [Brännlund and Persson, 2012](#); [Gevrek and Uyduranoglu, 2015](#); [Carattini et al., 2017](#)). It seems however also that public acceptance of a tax may increase with experience ([Murray and Rivers, 2015](#)). Thus, if the instrument has been used for some time perhaps people learn to live with it and better understand some of its advantages and/or to accept the disadvantages. There are a couple of examples of carbon taxes being raised gradually. Sometimes this appears to have created acceptance – In Sweden a factor of 5 over 30 years, in British Columbia a threefold increase in 7 years, and considerable increases in fuel taxes in the UK under Margaret Thatcher (the fuel price escalator). On the other hand, the recent French increase in Carbon taxes was perhaps somewhat too fast (more than 12-fold from 7€ 2014 to a plan for 86€ in 2022) which combined with other features which seemed to have engendered opposition. There is a considerable literature evaluating gradual

<sup>4</sup> The issue of actual progressivity is not our focus but is relevant. Some literature finds carbon pricing to be mainly regressive ([Baranzini et al., 2000](#); [Grainger and Kolstad, 2010](#)), while [Feindt et al. \(2021\)](#) find progressivity for most EU countries but regressivity at the level of the whole EU itself. Regressivity must be seen in context: In recent decades, inequality has increased. As shown by [Andersson and Atkinson \(2020\)](#), this increase may itself make fuel taxes more regressive, since transportation fuel is a relative luxury good for low-income compared to high-income households. Carbon taxes may thus have been more progressive when introduced in relatively egalitarian Scandinavian countries in the 1990s than they are today. Furthermore, there are, in addition to the usual issues, also issues of horizontal inequity, see [Cronin et al. \(2019\)](#) which actually finds that carbon taxes are progressive even in the USA – but finds that horizontal inequity can be very hard to deal with and that the number of people who lose even in a progressive reform may be considerable which is the most important determinant of acceptance.

introduction of taxes and also experiments to judge how acceptability varies with knowledge, the reader is referred again to the review by [Carattini et al. \(2018b\)](#).

Another set of factors that have considerable influence on political acceptability concerns the modalities of its introduction. This includes the political process and context in which the reform is decided, legislated, and enforced, including for instance its naming.<sup>5</sup> Lobbies may for instance strongly use and reinforce popular concerns ([Thalmann, 2004](#)). We will in this paper focus mainly on the use of the tax revenues and we turn therefore to the literature specifically on this aspect. Broadly speaking there are three or four, partly overlapping, broad categories within which tax revenues can be used: budgetary and or fiscal reform, refunding, and ear marking used in both reviews by [Carattini et al. \(2018b\)](#) and [Maestre-Andrés et al. \(2019\)](#).

**Budgetary.** The standard economists' recommendation is that the tax should go into the general budget and its proceeds used in the same way as other taxes. If one assumes (as traditional economists often do) that the starting point is optimal then this might be reasonable. If one assumes that there are other taxes that are distortionary then there might even be an opportunity for a win-win. This "Double Dividend" would imply a gain both in environmental terms and in economic efficiency and has been the subject of a massive literature (see [Bovenberg, 1999](#), for a survey).

In practice, this is the way many environmental taxes in Europe are used. However, when a tax is being introduced there is often an element of political salesmanship and packaging going on. If a carbon tax is introduced as part of a package with several reforms (as was the case in Sweden 1991) then of course acceptance could be enhanced by explicitly using the carbon tax to finance reductions in other taxes (or potentially to increase the availability of public goods). Naturally, the popularity of such reforms will depend on the individual political and historical context of each country. There is however a literature showing that cutting other taxes is not very popular and that people often fail to see (or believe in) the connection between the tax being raised and the lowering of other taxes (see [Beuermann and Santarius, 2006](#); [Carattini et al., 2018b](#); [Dresner et al., 2006](#); [Klok et al., 2006](#); [Thalmann, 2004](#)).

**Refunding.** If the resistance to carbon taxes comes from concern 1 or 2 in our list above – i.e. concern for costs to self or to others with low income then a natural use of the revenues would be to refund them to all or some citizens or possibly to use them in a way that is very clearly targeted to the benefit of said groups. This option has even given rise to a large "movement" in favor of "fee and dividend" and a few actual instances of implementation (for instance in the Canadian provinces of Alberta and British Columbia). Suggestions are usually either in terms of (equal) lump-sum payments to all citizens or some progressive allocation of more money to groups that have either lower income or are more exposed, for instance to the effects of a policy ([Baranzini et al., 2000](#); [Metcalf, 2020](#)). Low-income groups appear to prefer progressive allocation ([Carattini et al., 2017](#)). However, there does not seem to be solid support for using revenue for redistribution, perhaps because of perceived difficulties in so doing (see [Maestre-Andrés et al., 2019, 2021](#)).

Some articles go a step further and strive to address concerns through the provision of information concerning the effects of a tax (including information on co-benefits) on the respondent or the wider distributional effects. Such information can make respondents significantly more positive about refunding, particularly if this is done progressively ([Carattini et al., 2017](#)). On the other hand, details of co-benefits and interaction between local pollution, congestion, and climate change can lead to very complicated policies for say the transport sector ([Axsen and Wolinetz, 2021](#)). Many reactions to policies are context-specific and hard to generalize from one country to another ([Jagers et al., 2021](#)).

**Earmarking** is another way to address the lack of trust in politicians that they will use the funds appropriately and particularly deals with the fourth cause for concern in our list above: the perceived lack of effectiveness of carbon taxation. Its potential to increase acceptability has been studied in a range of articles ([Baranzini and Carattini, 2016](#); [Clinch and Dunne, 2006](#); [Dresner et al., 2006](#); [Gevrek and Uyduranoglu, 2015](#); [Kallbekken and Aasen, 2010](#); [Kallbekken and Sælen, 2011](#)). It is natural to believe that earmarking revenues, particularly for popular uses will drive home and reinforce the credibility of the environmental goals of the tax. This is however context-dependent and most effective for those who want climate policy but lack faith in the Pigouvian mechanisms.

**Information provision and other contextual variables.** In Switzerland, a carbon tax initiative where the tax revenues would have been used to cut VAT was massively defeated in 2015. [Carattini et al. \(2017\)](#) provide an ingenious combination of analyzing the actual voting with a choice experiment and find that the defeat was due to a combination of disbelief in the Pigouvian mechanism together with concern for distributional and competitiveness issues. Earmarking was perceived as a positive in this context, but the authors found that the provision of information concerning the environmental effectiveness of carbon taxes reduced the perceived need for earmarking. The issue of how the effectiveness of taxes in changing behavior is perceived is likely to be one of the important determinants in the "demand" for earmarking. Several articles have investigated this through natural or laboratory experiments in which for instance some subjects are given information about the tax mechanism. One recent paper that explicitly studies both the mechanisms involved and the importance of background variables (although in the context of congestion rather than carbon pricing) finds that learning through trials can be very effective in promoting policy acceptance ([Janusch et al., 2020](#)). [Baranzini et al. \(2021\)](#) also find that the provision of information can alleviate the tradeoff between efficiency and political acceptability, in the context of congestion charges.<sup>6</sup>

<sup>5</sup> Some authors study the issue of labeling – whether an instrument will be more acceptable if marketed as a tax, fee, contribution etc. We do not study this issue. Since Sweden has a tax since 30 years the issue does not seem to be central.

<sup>6</sup> Other relevant articles on experiments, or combinations of survey and choice experiment include [Dal Bó et al. \(2018\)](#), [Cherry et al. \(2014\)](#), and [Carattini et al. \(2018a\)](#).

The provision of correct information is but one part of the political process surrounding the introduction of a tax. Together with other contextual variables such as the degree of inequality, trust, and other socio-economic factors in a society these will be decisive for how a tax is actually perceived in society, as was shown rather dramatically in France by the yellow vests movement. Douenne and Fabre (2020, 2022) study the formation of beliefs and misconceptions about the carbon tax using surveys that allowed them to compare actual and perceived effects of the carbon tax on different population strata. They find that knowledge of climate change mechanisms is low among the protesters, 70% disapprove of a tax and dividend policy; 89% overestimate its negative impact on their purchasing power and most of them think it will be regressive as well as environmentally ineffective. They also show that causality runs in two directions so that negative attitudes to the tax are both explained by and explain the beliefs about how it operates. Mehleb et al. (2021) analyze the discursive profiles of the protesters which range from ability to pay and purchasing power through fairness to critiques of capitalism. They conclude that a carbon tax might have been acceptable if there was more prior consultation and if the tax targeted the rich and included earmarking of revenue for the energy transition.

In general, it is likely that there will be some differences between countries depending on their prior experience of taxes, their socioeconomic structures including climate demographics, industrial structure, degree of inequality, income level, and politics. Recently, a discrete choice experiment in Australia showed that acceptance increased with support to low-income households as well as earmarking for new technologies (rather than policies that change behavior).<sup>7</sup> In this context labeling and information had little effect (Hammerle et al., 2021).

### 3. Methodology

The literature shows that the public does not appreciate the Pigovian tax for its role in mitigating emissions. People often overestimate the costs to themselves and consider the tax regressive/unfair. They also underestimate its effects on emissions and focus mainly on the revenue. Several design features have been suggested and evaluated to increase acceptance, in particular earmarking and revenue recycling and also information on tax mechanisms and consultation with voters. Acceptance and the strength of protests will also depend on socioeconomic and other characteristics of each country. We believe Sweden is an interesting case to study since citizens do have extensive prior knowledge of how carbon taxes work, low emission levels, and also high levels of trust (and relatively speaking low levels of inequality by international standards). We therefore set out to study opinions concerning the main options for revenue use. Since distribution features so prominently in many papers, we study how these opinions vary between different strata of the population (by income and area of residence, among others). Since protest groups play an important role in the formation of opinions, we are especially interested in how opinions differ between protesters and a representative sample of the population. We believe that this is a unique contribution of this paper.

#### 3.1. Survey design, survey data, and representativeness

Our focus is on the resistance to carbon taxes and we believe that protest movements play an important role in shaping the debate and have a big potential impact on policy implementation. For this reason, we choose to have two separate survey panels. To analyze the general public opinion in Sweden, we use a representative online panel. The survey was carried out between February 28 and March 8, 2021, and we obtained 2481 responses, of which 401 were incomplete and therefore excluded. The questionnaire has four parts. In Section 1, we ask respondents about their perception of climate change and current policies as well as their attitudes toward carbon taxes and revenue collection. We ask how effective they think a range of instruments are and we ask them to rank them. In Section 2, we ask about the positive and negative features (focusing on fairness) of various instruments, in particular carbon taxes. Here we also ask how respondents think the revenue from a carbon tax should be used and their preferences for earmarking and other kinds of revenue recycling. In Section 3, we try another way to free our respondents from the everyday context by framing the question differently. We ask how the respondent would fund a transition to a sustainable future: we state that green investments are needed and let them choose how to fund them, whether through carbon taxes, other environmental taxes, a value-added tax, employer's contributions, income taxes, or a wealth tax.<sup>8</sup> Finally, in Section 4, we ask for the demographic and personal characteristics of the respondent. The complete survey is available in Supplementary Material.

Our second group is one that opposes fuel taxation, called the Petrol Protest 2.0—the closest equivalent in Sweden to the yellow vests movement in France.<sup>9</sup> So in addition to the national sample, we surveyed a sample from this protest movement. A survey identical to the national one was posted to the group's main website and drew 773 respondents. These respondents are

<sup>7</sup> Another recent study for Spain finds support increases from all revenue uses (compared to letting revenues go to budget) but earmarking for the environment seems to perform best. They also find however that both perceived effectiveness and fairness increase with information thus apparently reducing the need for earmarking or refunding (Maestre-Andrés et al., 2021). Sommer et al. (2020) find that carbon taxes are unpopular in Germany: Earmarking does increase acceptance but mainly among those who are pro-environment and trust the government. If use is restricted to refunding the Germans prefer lump-sum to progressive refunding.

<sup>8</sup> It should here be noted that the question order is not randomized and, thus, when the respondents are asked this question it has been preceded by questions on carbon taxation. Hence, there is a risk for experimenter effects and the results in regard to this question should be read in light of that.

<sup>9</sup> The protest movement's Swedish name is Bensinupproret 2.0 (sometimes also referred to as Bränsleupproret, i.e. "The Fuel Protest"). It is run by a nonprofit association called Föreningen Uppror (the Rebellion Association).

thus a self-selected group of opponents to high fuel prices. In addition to analyzing their survey answers, we have read the movement's public documents and followed the debate on its Facebook page. In our attempts at exploring social acceptability of carbon taxes, we have also incorporated some elements of a participatory research perspective (in line with the arguments by Gibbons, 1999) by discussing the results of the survey to the protest organization and its leader and spokesperson.<sup>10</sup> This helped us interpret the responses and place them in context as well as it aims to increase the transparency of the research process. In addition to this, to in a more structured way get additional insights into the discontent in the movement, we have performed an auxiliary analysis on the reasoning of the members of the protester's Facebook group. For this, we apply a simple *thematic analysis* (Braun and Clarke, 2006) on the first 100 posts (identified using Facebook's built-in search function and a set of keywords relating to the topics to be analyzed) that were posted during the months following the survey.

In contrast to our surveyed sample of protesters, the national sample was designed to be representative with respect to age, gender, and residence.<sup>11</sup> As Table 1 shows, the sample is indeed close to the national statistics except that individuals aged over 79 years are underrepresented and people with higher education and higher incomes are slightly overrepresented.<sup>12</sup> It also seems that people who trust government are somewhat underrepresented. The protest group is not representative of the population: we see a clear overrepresentation of males (74%) and middle-aged respondents (46% are between 40 and 59 years). A strikingly large proportion of this sample comes from the countryside and few from cities. Other differences are less striking. Perhaps surprising is that this group has relatively high education and high income—although this is partly explained by the overrepresentation of male and middle-aged respondents and maybe by self-selection into taking a fairly complex survey. However, in a large survey that the protest group conducted of their members, the results were similar to ours, with even more males (85%) and somewhat more young adults (39% under 39 years of age). The group also found more members with only secondary education. All in all, we can conclude that our survey is likely to be fairly representative of the protesters in some but not all respects. On the political left-right scale, the protesters do not deviate dramatically (the difference between the two samples is not statistically significant, using a Mann-Whitney-Wilcoxon two-sample test), but on one question they strongly differed from the general population: among the protesters, 63% lack trust in government, compared with 42% in our representative national sample.

### 3.2. Empirical strategy

We conduct our analysis of opinions in two steps. First, we plot the overall responses to our three main sets of survey questions and the results from our two samples (Section 4.1). We analyze the results with respect to (i) attitudes toward climate change and climate change policy, and (ii) attitudes about fairness and carbon tax revenue use. Here, we also compare the answers from the two samples (the general public and the protesters) using nonparametric testing. In particular, we use the Mann-Whitney-Wilcoxon (MWW) two-sample test for the different questions individually, to test the null hypothesis that the response distributions of the two populations are equal. To better understand “within-individual effects” and compare opinions of the respondents across questions, we analyze Spearman's par-wise rank correlations. We choose to start with these basic analyses of comparing unconditional statistics since we are dealing with *opinions*, and what ultimately matters in a democracy is the opinions of its citizens, irrespective of their underlying explanatory characteristics. In a second step, we strive to understand better what factors drive opinion, and this is where we use regression analysis (Section 4.2). We regress a set of dependent variables (attitudes toward climate change, current policy, and carbon taxation,<sup>13</sup> as well as attitudes about fairness and carbon tax revenue use) on demographic, socioeconomic, and political regressors. We run these regressions on a pooled dataset containing both the national and the protest sample. We include an indicator variable that indicates if the respondent is from the protest sample to capture the overall differences between the samples. We then, as an additional exercise, interact this variable with the main determinants of opinion to compare their respective importance within the two groups.

More specifically, the dependent variables that represent attitudes to climate change, current policy, and carbon taxation contain the five-point Likert scale answers to how important a societal problem the respondent considers climate change to be (we refer to this variable as *climate change*) and what the respondent thinks of current climate policy in Sweden (*current policy*), as well as how effective the respondent considers carbon taxation (*effectiveness*), how the respondent ranks carbon taxes (*policy ranking*), and how amenable the respondent is toward using carbon taxes to raise government funds for a sustainable transition (*collecting revenue*). The dependent variables that represent attitudes about fairness and carbon tax revenue use are binary indicator variables that indicate whether the respondent, when asked what is negative about a carbon tax, has chosen “unfair since it punishes low-income earners the most” (*unfair low-income*) and/or “unfair since it punishes those who live outside cities and in the countryside the most” (*unfair rural*), and whether the respondent, when asked how to use the carbon tax revenues, has chosen “pay back equal amounts to everyone who has paid tax” (*uniform refunding*), “pay back the most to those with the lowest incomes” (*progressive refunding*), and/or “use the money for investments that directly reduce carbon dioxide emissions” (*green investments*).

<sup>10</sup> We the movement's spokesperson, Peder Bokenhielm, who generously shared information with us. We are grateful for his time and help in our research.

<sup>11</sup> See Supplementary Table S1 for a full set of descriptive statistics of all data.

<sup>12</sup> Other discrepancies are likely due to differences between self-reported information and official definitions of, for example, “city.”

<sup>13</sup> Note here that for the regression analysis, we turn to a special focus on carbon taxation, analyzing specifically the answers to the carbon tax questions in the set of climate change policy questions, for which results are presented in Section 4.1.

**Table 1**  
Representation and comparison of samples.

	National sample (%)	Protest sample (%)	Sweden (%)	Protesters' own survey (%)
<b>Gender</b> (MWW <i>p</i> -value*: 0.000)				
Male	48.7	74.0	50.2	85
Female	51.0	25.1	49.5	15
Other	0.3	0.9	0.3	0
<b>Age</b> (MWW <i>p</i> -value*: 0.024)				
18–19	0.8	1.4	1.8	2
20–39	30.5	26.9	33.2	37
40–59	33.0	46.4	32.2	44
60–79	35.5	24.5	26.1	17
> 79	0.1	0.8	6.7	0
<b>Occupation</b> (MWW <i>p</i> -value*: 0.000)				
Other	10.9	10.1	8.3	12
Employed	55.8	67.5	58.8	74
Student	6.8	5.7	5.1	3
Pensioner	26.5	16.7	27.8	11
<b>Child in household</b> (MWW <i>p</i> -value*: 0.000)				
No	68.9	56.8	68.1	–
Yes	31.1	43.2	31.9	–
<b>Member of environmental organization</b> (MWW <i>p</i> -value*: 0.000)				
No	90.1	74.0	91.7	–
Yes	9.9	26.0	8.3	–
<b>Educational level</b> (MWW <i>p</i> -value*: 0.000)				
Comprehensive schooling	6.5	3.1	11.0	6
Upper secondary schooling or equivalent	30.9	22.7	43.5	42
Postsecondary nontertiary education	21.2	23.3	16.0	25
Bachelor's degree or equivalent	25.9	21.6	29.6	14
Master's degree or equivalent	15.5	29.0	**	13
<b>Disposable monthly income</b> (MWW <i>p</i> -value*: 0.000)				
< 14,000	21.6	18.9	20.0	–
14,000–18,999	15.2	13.5	20.0	–
19,000–22,999	16.8	12.3	20.0	–
23,000–29,999	22.1	25.0	20.0	–
> 29,999	24.3	30.3	20.0	–
<b>Residence</b> (MWW <i>p</i> -value*: 0.000)				
City	26.2	22.5	27.7	–
Town or smaller city	31.9	23.6	33.1	–
Village	23.5	20.9	22.9	–
Countryside	18.5	33.0	16.3	–
<b>Trust in government</b> (MWW <i>p</i> -value*: 0.000)				
Trust	43.9	28.9	50.2	–
No trust	41.9	63.0	36.1	–
Do not know	14.1	8.2	14.7	–
<b>Political orientation</b> (MWW <i>p</i> -value*: 0.723)				
Clearly left	11.6	12.2	10.1	–
Left	22.2	19.5	22.3	–
Neither left nor right	20.6	25.4	28.0	–
Right	24.2	21.9	27.1	–
Clearly right	15.2	15.8	13.5	–
Prefer not to answer	6.2	5.3	–	–

Source: Own surveys, Statistics Sweden, the SOM Institute at the University of Gothenburg (SOM Survey 2020), and a survey conducted in 2020 by the protest group themselves.

Notes: *Education level*. Data for Swedish education levels apply to persons above 16 years of age. *Residential area*. There is no official classification into these categories; accordingly, the numbers for Sweden are the authors' own estimates. *Income groups*. Sweden's income deciles are for disposable income, capital gains excluded.

\* The *p*-value reported is from a Mann–Whitney–Wilcoxon (MWW) two-sample test that tests the null hypothesis that the distributions of the answers from the two samples are equal.

\*\* There are no official Swedish statistics for the share of citizens with a master's degree.

The independent variables of interest are education, income, area of residence, trust in government, political orientation, and “belief in the Pigouvian mechanism”. The latter is defined in relation to a statement that a positive effect of a tax is “To influence my own and other people's behavior so that everyone uses less fossil fuel”.<sup>14</sup> The survey answer choices for all underlying questions for these independent variables are categories, and hence they are categorical variables. Thus, we include

<sup>14</sup> Respondents who select this alternative as one of the two most important aspects of a carbon tax are classified as believing in the incentive effect of the Pigouvian tax.

them as sets of dummy variables in the regressions. In the same manner, we include a set of demographic control variables. These include information on gender, age, occupational status, children in the household, and membership in an environmental organization.<sup>15</sup>

Since the dependent variables representing attitudes toward climate change, current policy, and carbon taxation are polytomous ordinal, we employ the standard estimator choice in such settings—namely, ordered logistic regression models. To provide easy readability of the size of the estimated effects, we chose to transform these dependent variables that originally were scaled over five levels to three levels by merging the two lowest as well as the two highest-ranked answer categories. This enables us to present single values that are easily interpretable of the estimated effects in terms of average marginal effects, which can be read as probabilities of answering positively (answer category four or five). A further advantage of presenting average marginal effects is that it allows for comparison of the regression results between samples and models (we compare the covariance between models in accordance with Weesie, 2000). We provide the ordered logistic regression results using the full five-point variation as [Supplementary Material](#). The dependent variables that represent attitudes about fairness and carbon tax revenue use are binary, thus we perform standard logistic regression models when analyzing these. We present also for these regressions the average marginal effects. Heteroscedasticity-consistent standard errors are used in all regressions.

## 4. Survey results

In [Section 4.1](#) we describe and compare the answers of the respondents in our two samples. In [Section 4.2](#) we analyze the determinants of the policy (carbon tax) questions in our survey.

### 4.1. Opinions on climate change policy among the population and protesters

#### 4.1.1. Attitudes toward climate change and climate change policy

Swedes generally think climate change is important (49% of the population say very important and an additional 36% somewhat important; see [Table 2](#)). This level of support is typical for Sweden ([Söderpalm and Wennö, 2019](#)). The shares in the protest sample are lower but still a majority believes the issue is at least somewhat important (43% very important and 15% somewhat important). Opinions about Sweden's current climate policy differ more between the two samples. The national sample is evenly split, with approximately a third of the respondents describing it as positive, a third negative, and a third undecided or holding a neutral view. Half of the responding protesters, however, think Swedish climate policy is very bad, and another quarter considers it rather bad.

Opinions concerning the effectiveness of various policies to reduce carbon emissions do however vary strongly between our samples. In the national sample, we observe a bell-shaped distribution of answers, with many respondents in the middle and relatively few respondents holding extreme views. For the protesters, however, the distribution of answers is the exact opposite. Opinions within the group are widely divergent, even polarized. [Fig. 1](#) shows U-shaped preferences for several instruments. The most dramatically polarized response—an almost completely bimodal distribution—involves a carbon tax: the share of protesters who believe it is effective and protesters who think it has absolutely no effect are both large, though the negative group dominates.<sup>16</sup>

For both groups, we find the highest acceptance (and the least opposition) for subsidies to renewables. This is in stark contrast to low support for subsidized environmental and electric cars, for which preferences are much more negative, particularly for the protesters. According to both materials from the organization's website and our interview with its spokesperson, many protesters are highly skeptical of "ecofriendly" vehicles. One of the keywords we searched their Facebook page for was electric cars and the posts were overwhelmingly negative but there was a minority (less than 10%) that defended them. The most common critique was that electric vehicles are "too expensive and just for rich people in urban areas". Other points of critique were that there are not enough charging stations outside the cities, that the batteries are not reliable for longer trips, the batteries are produced in ways that are not environmentally sustainable.<sup>17</sup> The official website of the protest organization has many positive comments on internal combustion engines and also on biofuels, plus one or two comments in support of hybrid gas-electric cars in the long-run future. Members say they do want climate policy, and their organization includes among its demands the development of Swedish biofuels. The official position calls for a petrol price of around 12 SEK/litre (€1.2) or \$5.5/gallon. Clearly, this position would not count as a "petrol protest" in all countries, and it just shows the importance of national reference points.

Policies to reduce air travel evoke a similar pattern: bell-shaped distributions of answers from the national sample, and polarized responses from the protesters, with a big group strongly against and nearly as many strongly in favor. The same pattern is also found for sectoral or regional targets as well as for climate aid to developing countries: generally "normal" curves

<sup>15</sup> We further control for answering "Do not know" when asked about trust in the government or "Prefer not to answer" when asked about political orientation.

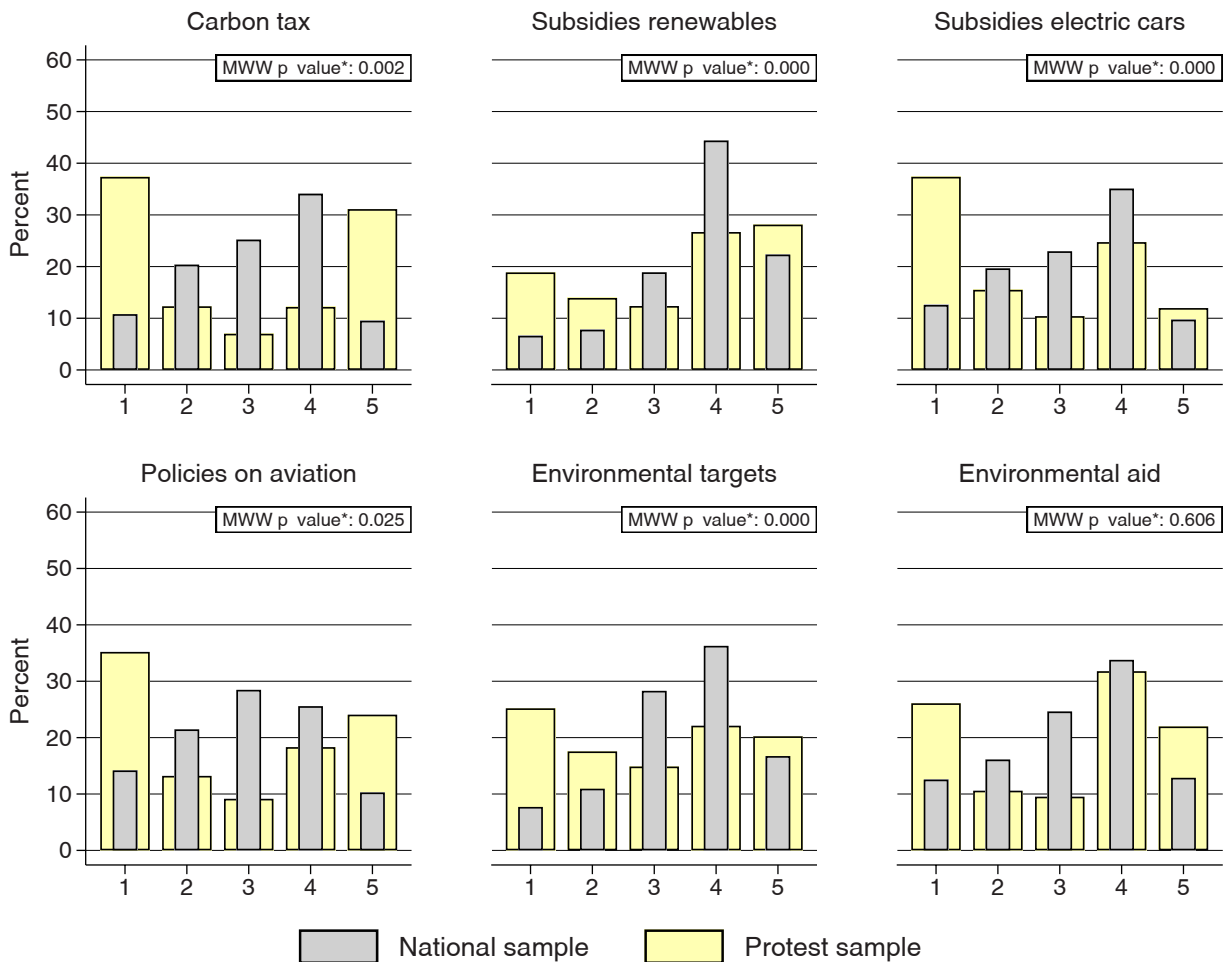
<sup>16</sup> According to the organization's spokesperson, this position might perhaps have been even more dominant if we had reached more respondents in the low educational attainment and low-income groups. Indeed, the rank of carbon taxation and educational level is positively correlated in the protest sample (0.17).

<sup>17</sup> More unusual posts criticized electric vehicles as a threat to the hobby that is veteran cars or promoted conspiracy theories saying that if everyone switches to electric vehicles then the state will just switch to tax electricity so we would all be fooled and driving would still be prohibitively expensive.

**Table 2**  
Respondents' opinion on climate change and Sweden's climate policy.

	National sample (%)	Protest sample (%)
<b>How important is the climate change problem?</b> (MWW <i>p</i> -value*: 0.000)		
Very unimportant	2.1	13.1
Somewhat unimportant	3.1	15.0
Neither important nor unimportant	9.5	14.1
Somewhat important	36.0	15.2
Very important	49.3	42.5
<b>Opinion of Sweden's climate policy</b> (MWW <i>p</i> -value*: 0.000)		
Very bad	10.2	49.7
Somewhat bad	21.5	24.7
Neither good nor bad	33.0	10.8
Somewhat good	32.5	12.7
Very good	2.7	2.1

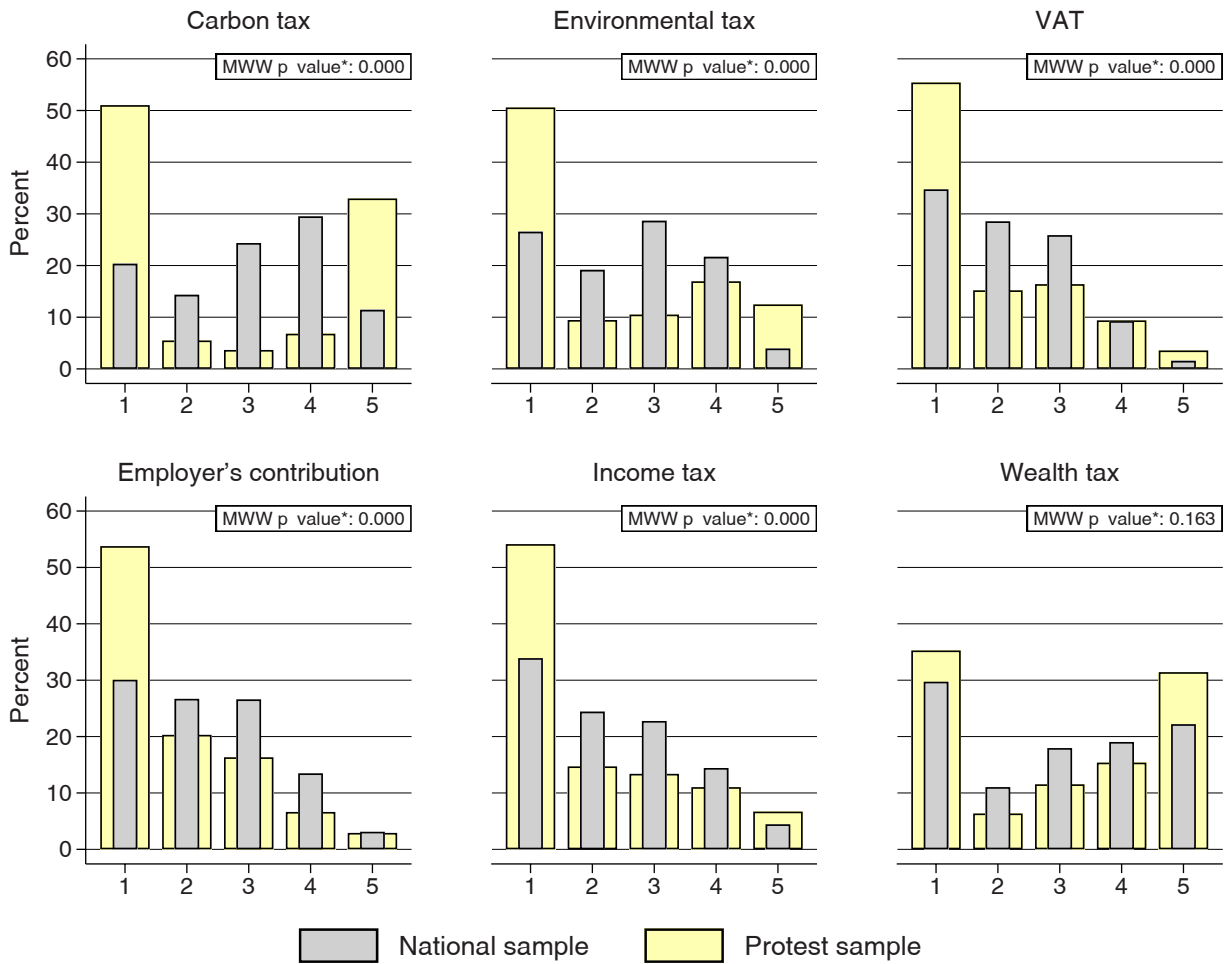
\* The *p*-value reported is from a Mann-Whitney-Wilcoxon (MWW) two-sample test that tests the null hypothesis that the distributions of the answers from the two samples are equal.



**Fig. 1.** Respondents' view of effectiveness of various policy instruments. Notes: 1 = very ineffective; 2 = somewhat ineffective; 3 = neither effective nor ineffective; 4 = somewhat effective; 5 = very effective. \*The *p*-value reported is from a Mann-Whitney-Wilcoxon two-sample test that tests the null hypothesis that the distributions of the answers from the two samples are equal.

for the national sample and more polarization among the protesters. However, in regard to aid to developing countries, the difference in distribution between the two samples is not statistically significant.<sup>18</sup>

Next we attempt to motivate the tax by a framing that emphasizes the need for public investments, such as charging posts for electric vehicles and other climate investments. In that context, we ask what tax the respondent would prefer to raise to



**Fig. 2.** Respondents' assessment of options to raise funds for green investments. *Notes:* 1 = very negative; 2 = somewhat negative; 3 = neither positive nor negative; 4 = somewhat positive; 5 = very positive. \*The p-value reported is from a Mann-Whitney-Wilcoxon two-sample test that tests the null hypothesis that the distributions of the answers from the two samples are equal.

fund such investments? A large group remains negative to raising any tax—VAT, employment, income taxes, and even (to a smaller extent) energy taxes. Interestingly, resistance is lower and support higher for a reintroduction of a wealth tax (which Sweden abolished 1990). With this question formulation, the carbon tax now gets a more positive response than any of the other taxes except for a wealth tax. This is also true for the protesters, although their response to this question is extremely polarized, see Fig. 2.

#### 4.1.2. Attitudes concerning fairness and carbon tax revenue use

To further understand the difference between the protesters and the general population, Table 3 shows differences in opinion in response to questions about the positive and negative aspects of a carbon tax respectively.

Close to forty percent of the general population indicates a belief in what economists think of as the Pigouvian mechanism of the tax—its effect on behavior. The share for the protesters, 34%, is only slightly lower.<sup>19</sup> The official position of the protest group is to cut the petrol tax in half and lower the price of petrol. On their Frequently Asked Questions website page, the organization

<sup>18</sup> We also varied our questions by asking what advice respondents would give to another (unspecified) country about its environmental policy. The responses were fairly similar (Supplementary Table S2 displays mean responses for the two samples). This set of questions also included the option of introducing a meat tax which turned out to be the lowest ranked alternative in both samples (maybe many respondents fail to see any link to the climate). As in Table 1, we find that protest opinions are generally more negative in regard to all policy options compared to the general population. This applies in particular to subsidies for electric cars and to emissions trading. Protest opinion about permit trading in the EU ETS is also very negative.

<sup>19</sup> This difference is perhaps surprisingly low. One explanation might be the overrepresentation in the protest sample of people with a university degree compared to the organization's own numbers. Indeed, education is positively correlated with choosing this option and from a simple regression of this variable on all demographic variables, education stands out together with gender.

**Table 3**  
Respondents' opinions about carbon tax.

	National sample (%)	Protest sample (%)	Difference (pp.)
<b>Positive aspects of a carbon tax</b>			
It applies the polluter-pays principle	39.9	35.2	4.7**
It affects my own and other people's behavior	39.4	33.5	5.9***
It gives incentives for research	25.1	23.2	1.9
It collects government funds to fight climate change	18.7	13.1	5.6***
There is nothing positive about a carbon tax	14.4	44.2	-29.8***
<b>Negative aspects of a carbon tax</b>			
It is unfair because it hurts rural areas	55.1	56.7	-1.6
It is unfair because it hurts low-income earners	25.3	34.3	-9.0***
It has an insufficient effect on the climate	24.4	31.0	-6.6***
It hurts Swedish industry and competitiveness	14.6	27.6	-13.0***
It is too expensive	14.6	15.9	-1.3
There is nothing negative about a carbon tax	6.4	14.4	-8.0***
Tax money could go to corrupt purposes	5.3	10.3	-5.0***

Note: Numbers do not add to 100% because respondents could choose two alternatives. The star levels are based on p-values from Mann-Whitney-Wilcoxon (MWW) two-sample tests that tests if the difference equals zero, where \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

**Table 4**  
Respondents' preferences for using carbon tax revenue.

Investment type	National sample (%)	Protest sample (%)	Difference (pp.)
Invest in clean energy, technology, and infrastructure that reduces emissions	60.2	50.6	9.6***
Provide support to research on climate change	34.3	28.1	6.2***
Use the revenues to improve health, social care, and education	23.7	29.6	-5.9***
Use the revenues where they are the most needed in the government budget	10.6	10.2	0.4
Larger transfers or refunds to those with low income	8.2	14.6	-6.4***
Uniform transfers or monetary refunds to all citizens	6.5	17.7	-11.2***

Note: Numbers do not add to 100% because respondents could choose two alternatives. The star levels are based on p-values from Mann-Whitney-Wilcoxon (MWW) two-sample tests that test if the difference equals zero, where \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

answers the question, “would this not lead to more emissions?” by saying that it probably would not, “since most people do not drive around for fun”. A more technical way of putting this would be that the organization believes the price elasticity is very low. This issue has been extensively researched and empirical estimates show that the price elasticity is indeed low in the very short run (which is probably the effect that is easiest to see) – but the elasticity is sizeable in the long run (Dahl and Sterner, 1991; Lin and Prince, 2013). The problem for politicians is of course that protest movements and opinion in general focus on the short run.

Close to 19% of the population (13% of protesters) state that a main positive effect is to collect revenue for the government to use to address climate change. These respondents will be particularly interested in whether the government actually uses the money this way; we turn to that question shortly. The other main positives are that a carbon tax reflects the polluter-pays principle (an expression of fairness thinking?) and that it gives incentives for new technology.

The picture that emerges on negatives is also quite clear. The carbon tax is thought to be unfair, partly to low-income earners (25%) but mainly to people in rural areas (55%). This time the figures for the protesters are not dramatically different. The third-largest concern is that the tax is not sufficiently effective (this view is also held by the protesters, and it reminds us that they do want some form of climate policy). Others mention costs or concerns about competitiveness (which is often thought to be a bigger problem for small open economies than for larger ones). Also noteworthy from the results is that only a small share of protesters (10%), and even fewer in the general population (5%), believe that the tax revenues will be used corruptly.

Preferences concerning the use of tax revenue are shown in Table 4. The option that receives the most support (60% of the national sample, 51% of the protest sample) is to spend the money on investments that reduce carbon emissions. The second-place alternative (34% and 28% respectively) is to use the revenues for research related to climate change. Taken together, these two results show strong support for using the proceeds of a carbon tax for climate-related purposes. A large share of respondents (24% and 30%) also want earmarking for classic public welfare goods, such as health and other social programs. Refunding cash to citizens does not receive much support but is somewhat more popular among the protest sample. In the national sample, 7% would support refunding to all citizens and 8% refunding to those with low income, versus 18% and 15%, respectively, among the protesters. The lowest share of responses among the protesters (10%), with a similar share of answers among the national sample (11%), is the alternative economists typically pick: putting the tax proceeds back into the general budget.<sup>20</sup> The protesters are slightly more in favor of refunding and using revenue for classic welfare purposes, and slightly less

<sup>20</sup> Worth mentioning here is that this answer is highly correlated (-0.90) with not trusting the government in the national sample (-0.58 in the protest sample).

**Table 5**

Spearman's rank correlation coefficients between carbon rank, fairness concerns, and revenue use in both samples separately.

	(1) National sample	(2) Protest sample	(3) National sample	(4) Protest sample	(5) National sample	(6) Protest sample	(7) National sample	(8) Protest sample	(9) National sample	(10) Protest sample
	Carbon tax rank		Unfair income		Unfair rural		Uniform refunding		Progressive refunding	
<b>Unfair income</b>	-0.03	-0.17*	1	1						
<b>Unfair rural</b>	0.01	-0.19*	0.09*	0.24*	1	1				
<b>Uniform redistribution</b>	-0.07*	-0.13*	-0.01	0.01	-0.08*	-0.01	1	1		
<b>Progressive redistribution</b>	-0.02	0.09*	0.14*	0.06	-0.05*	0.02	-0.02	-0.12*	1	1
<b>Green investment</b>	0.23*	0.49*	0.03	-0.05	0.17*	-0.06	-0.23*	-0.34*	-0.22*	-0.04

\*  $p < 0.05$ 

for climate purposes, but the differences are truly small. These overall findings are similar to those of Carattini et al. (2017) for the Swiss population that shows large support for green earmarking, but with the difference that refunding of revenues appear as more popular in Schweiz where the levels of support for such revenue use are more similar to those of the Swedish protesters.

To probe the data for possible differences within individuals and between our two samples, we study the unconditional rank correlations between “fairness of carbon tax”, “support for carbon tax” and support for refunding or green investments, see Table 5. Among the general population, fairness concerns are not significantly correlated with support for carbon taxation, and supporting a uniform redistribution scheme is even negatively correlated with support for carbon taxation (see column 1). Support for green investments and carbon taxation are both positively correlated to carbon tax support. Among the protesters, however, the relationship between fairness concerns and support for carbon taxation is far stronger. Those with strong fairness concerns are significantly less likely to support carbon taxation (column 2). Simultaneously, those protesters that are in favor of uniform redistribution of revenues are less likely to support carbon taxation while those who support a more progressive redistribution scheme are more likely to support carbon taxation. In the protest sample, the positive correlation between support for green investments and carbon taxation is high; the correlation coefficient is more than twice as high as in the national sample.

The fairness concerns on behalf of low-income households and rural residents are positively correlated but more so among protesters (0.24 versus 0.09; columns 3 and 4). Interestingly, having fairness concerns is not correlated with any redistribution scheme (or revenue use for green investments) among the protesters (columns 4 and 6). Believing carbon taxation is unfair to the poor is correlated (0.14) with support to progressive redistribution but only in the general population (column 3). Believing carbon taxation is unfair to the rural population, in turn, is negatively correlated to redistribution efforts (-0.08 and -0.05) while it is positively correlated to supporting green investments (0.17). Support for green investments is negatively correlated with both redistribution schemes (-0.23 and -0.22) in the general population but only with uniform distribution among the protesters.

In our analysis of the protesters' Facebook page, one search was explicitly for the keyword “fairness” and it turned up a large number of posts with a large number of comments and reactions associated with them (commonly with over 1000 reactions and hundreds of comments on posts). These dealt overwhelmingly with the price of fuel and the construction of fuel taxes as well as vehicle taxes and Bonus Malus (an instrument that gives a subsidy to clean cars and taxes more heavily emitting cars). Around ten percent each dealt with the urban-rural divide and with class or low-income aspects. We note that, perhaps not surprisingly, a recurring overall theme of the posts and the tone used is that of not being heard by the decision-makers. The most common reactions (signaled using emoticons) to the posts are those of agreement, anger, and laughter.

## 4.2. Exploring variations of opinion

### 4.2.1. Attitudes toward climate change and carbon taxation

One of our key interests is ascertaining how much the protesters stand out. Table 6 presents the regression results (marginal effects) for the attitudes toward climate change and climate change policy.<sup>21</sup> After controlling for the various characteristics of the respondents, we see that being a member of the protest movement is associated with a 19% decrease in the probability of regarding climate change as an important problem (column 1). Similarly, protesters are more negative towards Sweden's current climate policy (associated with a decrease of 18% in the probability of supporting the current policy; column 2). In contrast, the estimated marginal effects from being a protester on viewing carbon taxation as effective, rank it in the context of suggesting it for another country, or support it for collecting government funds for a sustainable transition are surprisingly low – varying between decreases in probabilities of five to eight percent (column 3–5). This indicates that the underlying belief

<sup>21</sup> For ordered logistic regression results using the five-point scaled dependent variables, see Supplementary Table S2.

**Table 6**  
Opinions on climate change, current policy, and carbon taxation: Average marginal effects from ordered logistic regressions.

	(1) Climate change	(2) Current policy	(3) Effectiveness	(4) Policy ranking	(5) Collecting revenue
<b>Protester</b> (ref. National sample)					
Yes	-0.19***	-0.22***	-0.05***	-0.08***	-0.07***
<b>Education</b> (ref. Comprehensive schooling)					
Upper secondary schooling or equivalent	0.02	-0.01	0.05**	0.04*	0.04
Postsecondary nontertiary education	0.02	-0.00	0.02	0.06**	0.08***
Bachelor's degree or equivalent	0.00	-0.03	0.03	0.02	0.06**
Master's degree or equivalent	0.03	-0.01	0.14***	0.13***	0.14***
<b>Income</b> (ref. < 14,000 SEK)					
14,000–18,999	0.01	-0.03	0.03	0.02	0.00
19,000–22,999	0.01	-0.01	0.02	-0.03	-0.02
23,000–29,999	0.02	-0.01	0.04*	0.00	0.00
> 29,999	0.00	-0.01	0.03	0.01	0.01
<b>Residence</b> (ref. City)					
Town or smaller city	-0.02	-0.02	-0.05**	-0.03*	-0.04**
Village	-0.05***	-0.03*	-0.10***	-0.08***	-0.12***
Countryside	-0.03	-0.08***	-0.13***	-0.10***	-0.15***
<b>Trust in government</b> (ref. Trust)					
No trust	-0.15***	-0.31***	-0.23***	-0.17***	-0.24***
<b>Political orientation</b> (ref. Neither left nor right)					
Clearly left	0.14***	-0.05**	0.12***	0.11***	0.14***
Left	0.10***	-0.01	0.04	0.06***	0.06***
Right	0.02	-0.04**	-0.02	-0.03	-0.04**
Clearly right	-0.05**	-0.08***	-0.08***	-0.07***	-0.13***
<b>Pigouvian principle</b> (ref. No)					
Yes	0.18***	0.09***	0.22***	0.21***	0.21***
<b>Joint chi-square p-value for ...</b>					
Education	0.502	0.352	0.000	0.000	0.000
Income	0.749	0.731	0.471	0.293	0.745
Residence	0.055	0.000	0.000	0.000	0.000
Political orientation	0.000	0.001	0.000	0.000	0.000
<b>Demographic controls</b>	Yes	Yes	Yes	Yes	Yes
<b>Pseudo R-squared</b>	0.259	0.176	0.155	0.131	0.204
<b>Observations</b>	2843	2843	2843	2838	2843

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01 (Star levels are based on robust standard errors).

about the effectiveness of carbon taxes (to mitigate carbon emissions or to collect revenue for the climate transition) may not be the factor that is driving the opposition against carbon taxation: There must be other determinants that play important roles.

To examine these determinants closer, we turn to the estimates corresponding to the additional regressors in Table 6. Let us start with the attitudes behind acceptance of climate change as a problem (column 1). People who believe in the Pigouvian mechanism are more likely to view climate change as a problem; people who do not trust the government and are to the right on the political spectrum are less likely to do so. Perhaps surprisingly, we find no clear effects from education, residence, or income categories.

Turning to the current Swedish climate policy (column 2), we observe a similar pattern, but the trust variable stands out as an even more important determinant, and dissatisfaction is strongest in the rural areas. Simultaneously, we find that those in the middle of the political spectrum and those who understand the Pigouvian mechanism are the most satisfied with current climate policy. Both political extremes (left and right) are similarly dissatisfied. Again, we find no significant correlations from either education or income level.

Next, we turn to the attitudes toward carbon taxation; how the respondents perceive carbon taxes in terms of effectiveness (column 3), how they rank carbon taxation as a policy option in general (column 4), and how the respondents view carbon taxation in the context of raising government funds for a sustainable transition (column 5). The results for these three dependent variables are rather similar. Support for carbon taxation is positively correlated with education, belief in the Pigouvian mechanism, and urban residence, while lack of trust in government and right-wing political identity is associated with low levels of support. Again, we find no significant relationship with income. This is noteworthy considering the considerable debate on perceived regressivity.

#### 4.2.2. Attitudes about fairness and carbon tax revenue use

Our focus is the determinants of policy acceptance: what people think is fair, and how the use of carbon tax proceeds for certain purposes may influence policy acceptance. The logistic regression results (average marginal effects) are presented in Table 7. Being a protester is associated with an increase of six percent in the probability of believing that carbon taxes are unfair to the poor (column 1), while we find no such correlation with believing carbon taxes are unfair to those who live in the countryside (column 2). When instead looking at the support for refunding carbon tax revenues back to the population, being a protester is associated with increases in the probability of supporting uniform and progressive refunding with nine and seven

**Table 7**  
Opinions on fairness and use of carbon tax revenue: Average marginal effects from logistic regressions.

	(1) Unfair low-income	(2) Unfair rural	(3) Uniform refunding	(4) Progressive refunding	(5) Green investment
<b>Protester</b> (ref. National sample)					
Yes	0.06***	0.03	0.09***	0.07***	-0.09***
<b>Education</b> (ref. Comprehensive schooling)					
Upper secondary schooling or equivalent	-0.08**	0.01	0.01	0.05**	-0.03
Postsecondary nontertiary education	-0.06 *	0.06*	0.00	0.02	0.03
Bachelor's degree or equivalent	-0.05	0.11***	-0.04**	-0.02	0.09***
Master's degree or equivalent	-0.12***	0.01	0.01	-0.01	0.09***
<b>Income</b> (ref. < 14,000 SEK)					
14,000–18,999	0.01	-0.00	-0.02	-0.05**	0.04
19,000–22,999	-0.04	-0.02	-0.01	-0.05**	0.04
23,000–29,999	-0.02	-0.06*	0.01	-0.08***	0.04
> 29,999	-0.03	-0.01	0.01	-0.08***	0.04
<b>Residence</b> (ref. City)					
Town or smaller city	0.01	0.03	-0.03*	-0.01	-0.02
Village	0.04	0.06**	-0.01	-0.03**	-0.02
Countryside	0.04 *	0.16***	-0.04**	0.00	-0.03
<b>Trust in government</b> (ref. Trust)					
No trust	0.08***	0.05**	0.03**	-0.01	-0.12***
<b>Political orientation</b> (ref. Neither left nor right)					
Clearly left	0.06 *	0.01	-0.07***	0.05**	0.08**
Left	0.02	0.07***	-0.03**	0.01	0.07**
Right	-0.07***	0.06**	-0.00	-0.03*	0.04
Clearly right	-0.07***	0.00	0.00	-0.01	-0.06**
<b>Pigouvian principle</b> (ref. No)					
Yes	0.05***	0.02	-0.02*	-0.01	0.20***
<b>Joint chi-square p-value for ...</b>					
Education	0.176	0.005	0.573	0.007	0.000
Income	0.844	0.066	0.118	0.011	0.474
Residence	0.672	0.000	0.649	0.232	0.643
Political orientation	0.000	0.020	0.050	0.077	0.000
<b>Demographic controls</b>	Yes	Yes	Yes	Yes	Yes
<b>Pseudo R-squared</b>	0.034	0.034	0.094	0.080	0.116
<b>Observations</b>	2843	2843	2834	2822	2843

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01 (Star levels are based on robust standard errors).

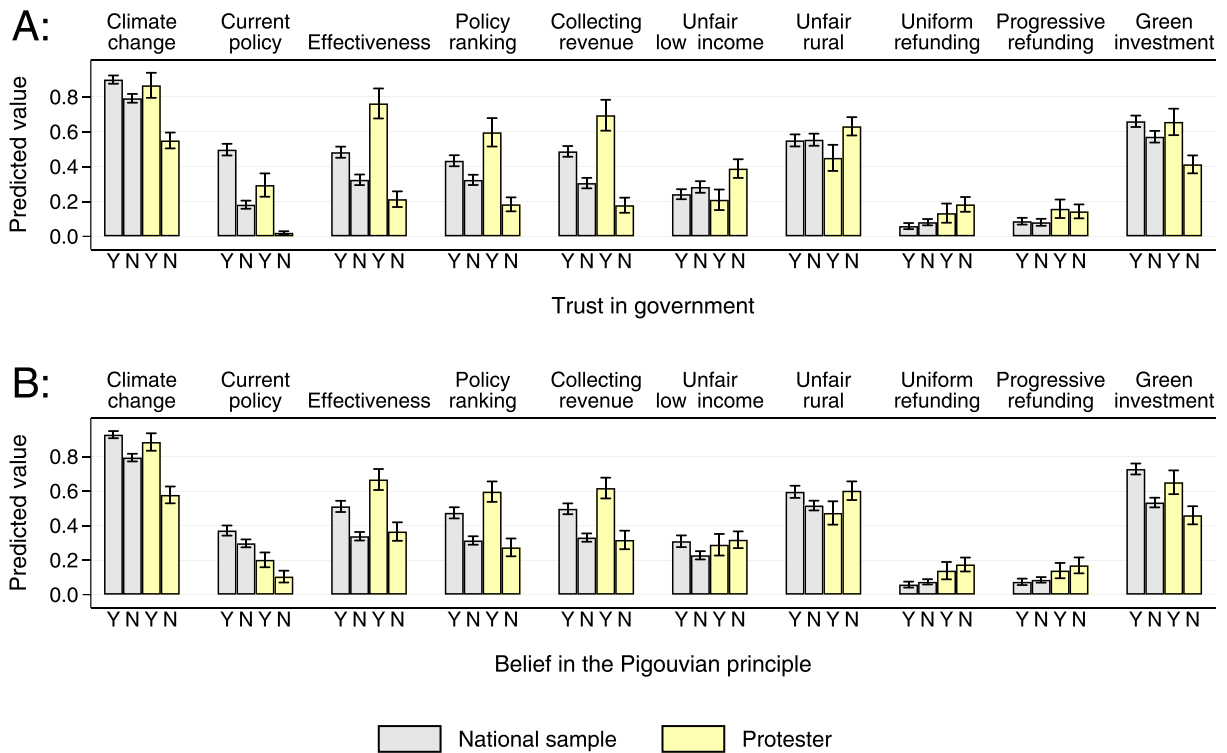
percent respectively (columns 3–4). Support for using the revenue for green spending is instead negatively correlated with belonging to the protest group. While these results indicate that protesters tend to be relatively more concerned with vertical regressivity than the general population and are more prone to support direct compensation back to low-income households and less prone to be in favor of green spending, it should be noted that the estimated probabilities are not very large. Instead, some of the other variables of interest, again, appear to play equally or more important roles.

To better understand these drivers we return to column 1 in Table 7 and the concern that a carbon tax may be regressive—one of the main issues stated by our respondents (in both samples; see Table 3). Interestingly, we do not find any statistically significant evidence that concern varies over the income distribution. Variables that yield statistically significant effects are instead trust in government and political orientation, where respondents who do not trust government or self-identify as left-wing display positive correlations with believing that a carbon tax would be regressive. Belief in the Pigouvian mechanism is also associated positively with support of this idea.

Second, we examine the concern that a carbon tax may hurt rural households (column 2). Here we find strong and significant evidence that rural citizens share this concern to a larger degree. Belief in the Pigouvian mechanism is also positively related to having this concern. Education and political orientation also matter here, but the relationship to these variables appears highly nonlinear.

Third, we turn to the issue of how to use the revenue from a carbon tax. As we saw in Table 4, uniform refunding and progressive refunding were not the most preferred alternatives (chosen by fewer than 10% of the representative sample but somewhat more among protesters). The regression shows no clear determinants of support for a uniform refunding strategy among our variables of interest (see column 3), but for progressive refunding (column 4), we find significantly less support among high-income groups.

For the most popular use of carbon tax revenue—using the revenues for green investments (column 5)— educational level matters: a higher level of education is positively related to funding green investments. Income and area of residence are not important determinants. We further find that lack of trust in government and/or identifying as clearly right on the political spectrum are associated with a decrease in the probability of being in favor of using carbon tax revenue for green investments.



**Fig. 3.** Predicted probabilities for the dependent variables conditional on having/ not having trust in the government (Panel A) and believing/not believing in the Pigouvian principle (Panel B). Notes: Predicted probabilities are estimated as in Table 6 and Table 7, with the additional interaction terms *No trust in government* × *Protester* and *Belief in the Pigouvian principle* × *Protester* included as regressors. The whiskers represent the 95% confidence intervals.

Belief in the Pigouvian mechanism, on the other hand, is associated with a large increase in the probability. This last point is interesting since one interpretation of the Pigouvian mechanism is that the tax itself is the instrument and that the use of the proceeds is secondary. Here, however, it seems that those who support the tax and believe in its incentive properties also support using the revenue for further climate change mitigation.

#### 4.2.3. Drivers of protesters' opinion

From the above analysis, we find that the most important determinants of opinion on climate policy are not only whether respondents are protesters or not, but trust in government and belief in the Pigouvian principle. For this reason, these variables merit special attention. We replicate our regression analysis above with the addition of interacting the protest sample indicator with the variables for trust and belief in the Pigouvian mechanism. Fig. 3 shows the predicted probabilities for those with or without trust (Panel A) and with or without belief in the Pigouvian mechanism (Panel B). All the values are given for the representative and protest samples. Note that the predicted probabilities for the various dependent variables are strikingly similar between Panel A and B: Trust in the government and belief in the Pigouvian mechanism are correlated with the responses in similar ways regardless of being protesters or not. However, there are differences.

In Panel A, we find that the trust variable is associated with a bigger difference (for close to all dependent variables) for the protest sample compared to the national sample. While attitudes to climate change as an important problem are similar between those with or without trust in the national sample and for protesters who trust the government, the probability for those in the protest group who do not trust the government is estimated to be significantly lower. It is the combination of lacking trust and belonging to the protest movement that gives the largest relative effect: The probability of a non-truster in the protest movement supporting the current climate policy is virtually zero.

The support for carbon taxation, as measured by opinions of effectiveness, policy ranking, or selecting carbon tax to collect government revenue, is also clearly correlated with the trust variable in both samples. However, while the difference in estimated support for a carbon tax differs by 10–17% points between trusting and not trusting in the general population, this difference is 40–55% points in the protest group. In the protest sample, trust in the government is so highly correlated with positive attitudes to carbon taxation that this (minority) group of respondents is curiously predicted to be *more* likely to support carbon taxes than the general population.

Regarding the dependent variables that concern fairness and revenue use, the trust variable appears to play a very limited role for opinion in the general population. The differences in estimated probabilities between with/without trust of government

in the protest group are larger – at least when it comes to perceiving carbon taxation as unfair to the rural population and supporting the use of revenue for green investments.

Turning to “belief in the Pigouvian principle” Panel B shows big effects for opinions on climate change and current climate policy in both samples – especially among the protesters. As in the case above of “trust”, we find that support for carbon taxation is strongly correlated with belief in the Pigouvian principle and again, the differences between predicted probabilities are much larger in the protest sample: The difference in support is around 18% points in the general population but 28–35% points in the protest sample. In regard to fairness and refunding, belief in the Pigouvian principle plays a minor role in both samples, while it appears to matter more for support of green investments.

In sum, we find that these two factors (trust in the government and belief in the Pigouvian mechanism) are not only important for popular opinion but they apply in particular to the protesters.

## 5. Concluding discussion

Carbon pricing is an efficient instrument to deal with a pressing problem. It has however been used much less than expected. This may be due in part to lobbying but it is also due to public resistance, making it important to understand this resistance and its determinants. It would be useful to find implementation strategies that enhance acceptability. Lately, this has become a growing field of research and there are a number of stylized facts that appear important in most countries. These include the following: Resistance increases the higher the tax and the faster the introduction. Trust in the government is an important factor in explaining acceptance. The perceived effectiveness of a tax (which we refer to as a belief in the Pigouvian mechanism) increases public support for a tax. Explaining how a tax works can increase support – and trials or earlier experience of the tax mechanism should have the same effect.

Most decisive for support is however the perceived fairness of the taxation. This in turn depends on perceptions of cost to oneself, people's varying opportunities to adapt to a tax by non-fossil forms of transportation or heating, etc. Attitudes to fairness also hinge on the respondents' political views, the degree of inequality, and other factors in a country. The most prominent discussions concern equity with respect to income and to areas of residence (urban vs rural). Public support typically increases if tax revenues are refunded. There are however many ways of refunding a tax. An economist may argue that taxes are refunded if other taxes are cut, or general spending is increased – i.e. if the proceeds of a carbon tax are added simply to the general budget. This however typically garners less support among the general public – particularly those with little trust in government institutions. Using the revenues for climate-related purposes including renewable energy tends to be popular and increase support for a policy – particularly among those who are most concerned with the climate issue.

More factors are likely to affect support: the characteristics of a country or economy concerning population density, climate, equality, and so forth. To study Sweden in this regard is an interesting special case since Sweden has a lot of prior knowledge on carbon taxes, low emissions (little dependency on fossil fuels for heating), high levels of trust, and relatively low levels of inequality. The main contribution of our paper is however the comparison between two groups of respondents. In addition to surveying the public, we have surveyed a group of protesters. As the experience of the yellow vests in France showed, social movements can set the agenda by picking up and reinforcing sentiments of dissatisfaction and providing an effective platform to formulate and propagate these opinions and thereby heavily influence the implementation of policies.

Some of our main results concern the similarity between the protest group and the population at large. We find that many of the protestors are (contrary to some reports) truly concerned about climate change and want climate policy, even if they tend to prefer other policies like domestic ethanol production. When it comes to carbon taxes, we find opinion on carbon taxes is much more polarized: most respondents are strongly opposed, but a surprisingly a large group is accepting of carbon taxes, at least if applied to all sectors and all users. It is not resistance to climate politics but a fierce passion for fairness that appears to motivate the protesters. They oppose the current fuel tax because it hits “ordinary motorists” harder than, for instance, big industry or air travelers.<sup>22</sup> Another strong evidence of fairness concern was that the only reasonably strong support we found for raising any tax was for the wealth tax – and again the support was particularly strong among the protesters.

Despite similarities, there are of course differences between our samples. The most crucial of these is that membership in the protest movement seems to reinforce several of the other most important correlations we find. Thus, lack of trust in the government and lack of belief in the Pigouvian mechanism is, as always, correlated with negative attitudes to carbon taxes – so far this repeats the stylized facts – we show that this relationship is significantly magnified or strengthened amongst the members of the protest movement. This should provide some keys for thinking about how to design carbon taxes in ways that increase acceptability in both groups.

A striking illustration of the protesters' zeal for fairness is given by the contrast between their support for renewables and their strong opposition to electric cars. The subsidies to electric vehicles are of course a way to lower their price but despite this, they are considered far too expensive for ordinary income earners. This is a complex issue since in fact most vehicles in Sweden (also with internal combustion engines) are first bought by companies or high-income individuals. People with average incomes

<sup>22</sup> Puzzled over the existence of any acceptance of carbon taxes and the role of fairness, we did in fact ask the protest movement's spokesperson what members would think if a carbon tax were uniformly applied to all people, all sectors and all countries. The spokesperson said that under those circumstances, the protest organization would not exist and stressed that fairness is their overriding concern. With reference to the perception of unfairness in rural areas, we further asked about using carbon tax revenues to support low-income municipalities and he said that would make members “very happy.”

typically buy a car that is used. The motivation for the electric vehicle subsidy is to change the composition of the vehicle stock so that second-hand electric vehicles become available eventually. Still the resistance expressed by the protest movement is compact: Subsidies for electric vehicles are thought to benefit rich people in cities.

Considering the prevalence of fairness issues, we were particularly interested in the effects of income on various attitudes. Considering the prominence of distributional and fairness issues in the debate over a carbon tax, we expected the income variable to play a pivotal role. We found, however, that the role of income is generally insignificant. An exception is attitudes to progressive refunding where high-income earners are (unsurprisingly) less enthusiastic. We did however find that area of residence matters. People in rural areas are less content with the state of current policy, believe carbon taxes are unfair to the rural population, and thus report low levels of support for carbon taxation.

Concerning policies to increase acceptance of carbon taxation, we find results that are in line with the general finding from earlier studies: specifying the use of tax revenues is positive. Returning revenues to the general budget, however, is generally not very popular – but we actually found that it beats refunding! We instead found strong preferences for environmental earmarking, echoing results of earlier research (Baranzini and Carattini, 2016; Carattini et al., 2017; Kotchen, 2017). The second-highest ranked alternative was climate research, the third was for general welfare, then came the general budget, and revenue refunding (uniform or progressive) was the least favored alternative. The order for the protesters was essentially similar but refunding came one notch higher with the “general budget” last.

Sweden has had some success when it comes to carbon taxes. They were introduced gradually, (with exceptions in some areas that were gradually abolished) people have adapted, and been compensated through various mechanisms including reduction of other taxes, increased expenditures on climate goods and other public goods. This was not generally done through overt earmarking or refunding but through an integrated environmental fiscal reform process – using the annual budgetary process. One could summarize by saying that the revenues have been put in the general budget – typically the least attractive of the alternatives in the context of a survey. The taxes are generally well accepted. Still, even Sweden has a protest movement, and a very active one, indicating that there are limits to how high the carbon tax can go without running into opposition. For a broader acceptance of higher carbon taxes in both Sweden and other countries, issues of fairness need to be addressed head-on. A prime way of doing this is pricing emissions from all users, sectors, countries, and sources to a reasonably equal degree. In the past, this would have been dismissed as utopian. When the first countries introduced carbon taxes they knew they were doing this alone and exemptions were used to avoid losing jobs in trade-exposed sectors.

The situation today is quite different from 1990, with a high degree of consensus concerning a complete phase-out of fossil fuels by mid-century. At the same time, the old exceptions just mentioned have become a source of opposition on grounds not only of efficiency but also of fairness. The idea of global carbon pricing in all sectors is still a giant and difficult challenge, but considering that the resistance to carbon pricing today to some extent hinges on how unfair it is to have different taxes, it might still be time to reconsider globally harmonized taxation. Universal and reasonably uniform taxation ought to alleviate concerns of both efficiency and fairness. The idea of pricing carbon is spreading and recent policy packages have taken some steps (such as border carbon adjustments) that are intended to extend carbon pricing also to sources located in jurisdictions without (sufficient) pricing. At the same time, we should acknowledge the other concerns. An increase in the carbon tax should not imply higher total levels of taxation or a bigger role for the state. Carbon tax revenue should always be used efficiently and transparently and different countries will probably choose different combinations of earmarking and refunding. Our study has led us to believe that this would alleviate many of the concerns of fuel-tax protesters and thus increase policy acceptance.

## Acknowledgements

The authors acknowledge financial support from the Mistra Carbon Exit research program (the Swedish Foundation for Strategic Environmental Research) and Climate Change Impacts and Policies in Heterogeneous Societies (CHIPS) as part of AXIS, an ERA-NET initiated by JPI Climate and funded by FORMAS (grant registration number 2018-0271). We have received valuable comments from participants of the Environment for Development annual Workshop 2020 and the Nordic Environmental Social Science Conference 2022 as well as seminar participants at the Centre for Collective Action Research in Gothenburg and the Florence School of Regulation. Research assistance from Petter Wikström and Villemo Karnström is also acknowledged. We also wish to thank Linus Mattauch, Stephan Sommer, Niklas Haring, Sverker Jagers, Felicia Robertson, Simon Gren, Egli Florian, Simone Borghesi, Stefano Carattini, Mattias Wahlström, Jan Steckel, Jeroen van den Bergh, and Aurélien Saussay for valuable comments.

## Conflict of interest

None.

## Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.reseneeco.2022.101331](https://doi.org/10.1016/j.reseneeco.2022.101331).

## References

- Akerlof, G., et al. (2019, January 16). Economists' Statement on Carbon Dividends. Wall Street Journal. (<https://www.wsj.com/articles/economists-statement-on-carbon-dividends-11547682910>).
- Andersson, J., Atkinson, G., 2020. The distributional effects of a carbon tax: The role of income inequality. Centre for Climate Change Economics and Policy Working Paper 378/Grantham Research Institute on Climate Change and the Environment Working Paper 349. London: London School of Economics and Political Science Available at: (<https://www.lse.ac.uk/granthaminstitute/publication/the-distributional-effects-of-a-carbon-tax-the-role-of-income-inequality/>).
- Andersson, J.J., 2019. Carbon taxes and CO<sub>2</sub> emissions: Sweden as a case study. *Am. Econ. J. Econ. Policy* 11 (4), 1–30. <https://doi.org/10.1257/pol.20170144>
- Andor, M.A., Frondel, M., Sommer, S., 2018. Equity and the willingness to pay for green electricity in Germany. *Nat. Energy* 3 (10), 876–881. <https://doi.org/10.1038/s41560-018-0233-x>
- Atansah, P., Khandan, M., Moss, T., Mukherjee, A., Richmond, J., 2017. When Do Subsidy Reforms Stick? Lessons from Iran, Nigeria, and India. CGD Policy Paper. Available at: (<https://www.cgdev.org/sites/default/files/when-do-subsidy-reforms-stick-lessons-iran-nigeria-and-india.pdf>).
- Axsen, J., Wolinetz, M., 2021. Taxes, tolls and ZEV zones for climate: synthesizing insights on effectiveness, efficiency, equity, acceptability and implementation. *Energy Policy* 156, 112457. <https://doi.org/10.1016/j.enpol.2021.112457>
- Baranzini, A., Carattini, S., 2016. Effectiveness, earmarking and labeling: testing the acceptability of carbon taxes with survey data. *Environ. Econ. Policy Stud.* 19 (1), 197–227. <https://doi.org/10.1007/s10018-016-0144-7>
- Baranzini, A., Goldemberg, J., Speck, S., 2000. A future for carbon taxes. *Ecol. Econ.* 32 (3), 395–412. [https://doi.org/10.1016/S0921-8009\(99\)00122-6](https://doi.org/10.1016/S0921-8009(99)00122-6)
- Baranzini, A., Carattini, S., Tesauro, L., 2021. Designing effective and acceptable road pricing schemes: evidence from the Geneva congestion charge. *Environ. Resour. Econ.* 79 (3), 417–482. <https://doi.org/10.1007/s10640-021-00564-y>
- Bergquist, M., Nilsson, A., Harring, N., Jagers, S.C., 2022. Meta-analyses of fifteen determinants of public opinion about climate change taxes and laws. *Nat. Clim. Change* 1–6. <https://doi.org/10.1038/s41558-022-01297-6>
- Beuermann, C., Santarius, T., 2006. Ecological tax reform in Germany: handling two hot potatoes at the same time. *Energy Policy* 34 (8), 917–929. <https://doi.org/10.1016/j.enpol.2004.08.045>
- Bovenberg, A.L., 1999. Green tax reforms and the double dividend: an updated reader's guide. *Int. Tax. Public Financ.* 6 (3), 421–443. <https://doi.org/10.1023/A:1008715920337>
- Brännlund, R., Persson, L., 2012. To tax, or not to tax: preferences for climate policy attributes. *Clim. Policy* 12 (6), 704–721. <https://doi.org/10.1080/14693062.2012.675732>
- Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. *Qual. Res. Psychol.* 3 (2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Caplan, B., 2007. *The Myth of the Rational Voter: Why Democracies Choose Bad Policies*. Princeton University Press.
- Carattini, S., Baranzini, A., Thalmann, P., Varone, F., Vöhringer, F., 2017. Green taxes in a post-paris world: are millions of nays inevitable? *Environ. Resour. Econ.* 68 (1), 97–128. <https://doi.org/10.1007/s10640-017-0133-8>
- Carattini, S., Baranzini, A., Lalive, R., 2018a. Is taxing waste a waste of time? Evidence from a Supreme Court Decision. *Ecol. Econ.* 148, 131–151. <https://doi.org/10.1016/j.ecolecon.2018.02.001>
- Carattini, S., Carvalho, M., Fankhauser, S., 2018b. Overcoming public resistance to carbon taxes. *Wiley Interdiscip. Rev. Clim. Change* 9 (5), e531 <https://doi.org.ezproxy.ub.gu.se/10.1002/wcc.531>.
- Carattini, S., Kallbekken, S., Orlov, A., 2019. How to win public support for a global carbon tax. *Nature* 565, 289–291. <https://doi.org/10.1038/d41586-019-00124-x>
- Cherry, T., Kallbekken, S., Kroll, S., 2012. The acceptability of efficiency-enhancing environmental taxes, subsidies and regulation: an experimental investigation. *Environ. Sci. Policy* 16, 90–96. <https://doi.org/10.1016/j.envsci.2011.11.007>
- Cherry, T., Kallbekken, S., Kroll, S., 2014. The impact of trial runs on the acceptability of environmental taxes: experimental evidence. *Resour. Energy Econ.* 38, 84–95. <https://doi.org/10.1016/j.reseneeco.2014.06.005>
- Climate Leadership Council, 2019. Economists' statement on Carbon Dividends. (<https://www.econstatement.org/>).
- Clinch, J.P., Dunne, L., 2006. Environmental tax reform: an assessment of social responses in Ireland. *Energy Policy* 34 (8), 950–959. <https://doi.org/10.1016/j.enpol.2004.08.055>
- Criqui, P., Jaccard, M., Sterner, T., 2019. Carbon taxation: a tale of three countries. *Sustainability* 11 (22), 6280. <https://doi.org/10.3390/su11226280>
- Cronin, J., Fullerton, D., Sexton, S., 2019. Vertical and horizontal redistributions from a carbon tax and rebate. *J. Assoc. Environ. Resour. Econ.* 6 (S1), S169–S208 <https://doi.org.ezproxy.ub.gu.se/10.1086/701191>.
- Cullenward, D., Victor, D.G., 2020. *Making Climate Policy Work*. John Wiley & Sons.
- Dahl, C., Sterner, T., 1991. Analysing gasoline demand elasticities: a survey. *Energy Econ.* 13 (3), 203–210. [https://doi.org/10.1016/0140-9883\(91\)90021-Q](https://doi.org/10.1016/0140-9883(91)90021-Q)
- Dal Bó, E., Dal Bó, P., Eyster, E., 2018. The demand for bad policy when voters underappreciate equilibrium effects. *Rev. Econ. Stud.* 85 (2), 964–998. <https://doi.org/10.1093/restud/rdx031>
- Douenne, T., Fabre, A., 2020. French attitudes on climate change, carbon taxation and other climate policies. *Ecol. Econ.* 169, 106496. <https://doi.org/10.1016/j.ecolecon.2019.106496>
- Douenne, T., Fabre, A., 2022. Yellow vests, pessimistic beliefs, and carbon tax aversion. *Am. Econ. J. Econ. Policy* 14 (1), 81–110. <https://doi.org/10.1257/pol.20200092>
- Dresner, S., Dunne, L., Clinch, P., Beuermann, C., 2006. Social and political responses to ecological tax reform in Europe: an introduction to the special issue. *Energy Policy* 34 (8), 895–904. <https://doi.org/10.1016/j.enpol.2004.08.043>
- Drews, S., Van den Bergh, J., 2016. What explains public support for climate policies? A review of empirical and experimental studies. *Clim. Policy* 16 (7), 855–876. <https://doi.org/10.1080/14693062.2015.1058240>
- European Social Survey, 2016. Data and Documentation Round 8 [WWW Document]. Available here: (<https://www.europeansocialsurvey.org/data/download.html?r=8>) (accessed 2021, June 29).
- Fairbrother, M., 2019. When will people pay to pollute? Environmental taxes, political trust and experimental evidence from Britain. *Br. J. Political Sci.* 49 (2), 661–682. <https://doi.org/10.1017/S0007123416000727>
- Fairbrother, M., Johansson Sevå, I., Kulin, J., 2019. Political trust and the relationship between climate change beliefs and support for fossil fuel taxes: Evidence from a survey of 23 European countries. *Glob. Environ. Change* 59, 102003. <https://doi.org/10.1016/j.gloenvcha.2019.102003>
- Fairbrother, M., Arrhenius, G., Bykvist, K., Campbell, T., 2021. Governing for future generations: how political trust shapes attitudes towards climate and debt policies. *Front. Political Sci.* 3, 656053. <https://doi.org/10.3389/fpos.2021.656053>
- Feindt, S., Kornek, U., Labeaga, J.M., Sterner, T., Ward, H., 2021. Understanding regressivity: challenges and opportunities of European carbon pricing. *Energy Econ.* 103, 105550. <https://doi.org/10.1016/j.eneco.2021.105550>
- Gevrek, Z., Uyduranoglu, A., 2015. Public preferences for carbon tax attributes. *Ecol. Econ.* 118, 186–197. <https://doi.org/10.1016/j.ecolecon.2015.07.020>
- Gibbons, M., 1999. Science's new social contract with society. *Nature* 402, C81–C84. <https://doi.org/10.1038/35011576>
- Grainger, C.A., Kolstad, C.D., 2010. Who pays a price on carbon? *Environ. Resour. Econ.* 46, 359–376. <https://doi.org/10.1007/s10640-010-9345-x>
- Hammar, H., Jagers, S., 2006. Can trust in politicians explain individuals' support for climate policy? The case of CO<sub>2</sub> tax. *Clim. Policy* 5 (6), 613–625. <https://doi.org/10.1080/14693062.2006.9685582>
- Hammar, H., Jagers, S., 2007. What is a fair CO<sub>2</sub> tax increase? On fair emission reductions in the transport sector. *Ecol. Econ.* 61 (2–3), 377–387. <https://doi.org/10.1016/j.ecolecon.2006.03.004>
- Hammerle, M., Best, R., Crosby, P., 2021. Public acceptance of carbon taxes in Australia. *Energy Econ.* 101, 105420. <https://doi.org/10.1016/j.eneco.2021.105420>
- Inchauste, G., Victor, D.G. (Eds.), 2017. *The political economy of energy subsidy reform*. World Bank Publications.

- Jagers, S., Lachapelle, E., Martinsson, J., Matti, S., 2021. Bridging the ideological gap? How fairness perceptions mediate the effect of revenue recycling on public support for carbon taxes in the United States, Canada and Germany. *Rev. Policy Res.* 38 (5), 529–554. <https://doi.org/10.1111/ropr.12439>
- Janusch, N., Kroll, S., Goemans, C., Cherry, T., Kallbekken, S., 2020. Learning to accept welfare-enhancing policies: an experimental investigation of congestion pricing. *Exp. Econ. A J. Econ. Sci. Assoc.* 24 (1), 59–86. <https://doi.org/10.1007/s10683-020-09650-2>
- Kallbekken, S., Aasen, M., 2010. The demand for earmarking: Results from a focus group study. *Ecol. Econ.* 69 (11), 2183–2190. <https://doi.org/10.1016/j.ecolecon.2010.06.003>
- Kallbekken, S., Sælén, H., 2011. Public acceptance for environmental taxes: Self-interest, environmental and distributional concerns. *Energy Policy* 39 (5), 2966–2973. <https://doi.org/10.1016/j.enpol.2011.03.006>
- Kallbekken, S., Kroll, S., Cherry, T., 2011. Do you not like Pigou, or do you not understand him? Tax aversion and revenue recycling in the lab. *J. Environ. Econ. Manag.* 62 (1), 53–64. <https://doi.org/10.1016/j.jeeem.2010.10.006>
- Klenert, D., Mattauch, L., Combet, E., Edenhofer, O., Hepburn, C., Rafaty, R., Stern, N., 2018. Making carbon pricing work for citizens. *Nat. Clim. Change* 8 (8), 669–677. <https://doi.org/10.1038/s41558-018-0201-2>
- Klok, J., Larsen, A., Dahl, A., Hansen, K., 2006. Ecological tax reform in Denmark: history and social acceptability. *Energy Policy* 34 (8), 905–916. <https://doi.org/10.1016/j.enpol.2004.08.044>
- Kotchen, M., 2017. Longer-run evidence on whether building energy codes reduce residential energy consumption. *J. Assoc. Environ. Resour. Econ.* 4 (1), 135–153. <https://doi.org/10.1086/689703>
- Laffont, J., Tirole, J., 1996. Pollution permits and compliance strategies. *J. Public Econ.* 62 (1), 85–125. [https://doi.org/10.1016/0047-2727\(96\)01575-7](https://doi.org/10.1016/0047-2727(96)01575-7)
- Lin, C., Prince, L., 2013. Gasoline price volatility and the elasticity of demand for gasoline. *Energy Econ.* 38, 111–117. <https://doi.org/10.1016/j.eneco.2013.03.001>
- Maestre-Andrés, S., Drews, S., Van den Bergh, J., 2019. Perceived fairness and public acceptability of carbon pricing: a review of the literature. *Clim. Policy* 19 (9), 1186–1204. <https://doi.org/10.1080/14693062.2019.1639490>
- Maestre-Andrés, S., Drews, S., Savin, I., Van den Bergh, J., 2021. Carbon tax acceptability with information provision and mixed revenue uses. *Nat. Commun.* 12 (1), 7017. <https://doi.org/10.1038/s41467-021-27380-8>
- Mankiw, N., 2009. Smart taxes: an open invitation to join the Pigou Club. *East. Econ. J.* 35 (1), 14–23. <https://www.jstor.org/stable/20642460>.
- Mehleb, R., Kallis, G., Zografos, C., 2021. A discourse analysis of yellow-vest resistance against carbon taxes. *Environ. Innov. Soc. Transit.* 40, 382–394. <https://doi.org/10.1016/j.eist.2021.08.005>
- Metcalfe, G.E., 2020. Designing a carbon tax to reduce US greenhouse gas emissions. *Rev. Environ. Econ. Policy.* <https://doi.org/10.1093/reep/ren015>
- Murray, B., Rivers, N., 2015. British Columbia's revenue-neutral carbon tax: A review of the latest "grand experiment" in environmental policy. *Energy Policy* 86, 674–683. <https://doi.org/10.1016/j.enpol.2015.08.011>
- Nordhaus, W.D., 2011. *Energy: Friend or Enemy?* New York Review Books, pp. 29–31.
- Oates, W.E., Portney, P.R., 2003. The political economy of environmental policy. *Handbook of environmental economics.* Elsevier, pp. 325–354.
- Olson, M., 1965. The logic of collective action: Public goods and the theory of groups. *Harv. Econ. Stud.* 124.
- Pigou, A.C., 1920. *The economics of welfare.* Macmillan and Co.
- Sælén, H., Kallbekken, S., 2011. A choice experiment on fuel taxation and earmarking in Norway. *Ecol. Econ.* 70 (11), 2181–2190. <https://doi.org/10.1016/j.ecolecon.2011.06.024>
- Savin, I., Drews, S., Maestre-Andrés, S., van den Bergh, J., 2020. Public views on carbon taxation and its fairness: a computational-linguistics analysis. *Clim. Change* 162 (4), 2107–2138. <https://doi.org/10.1007/s10584-020-02842-y>
- Söderpalm, P., Wennö, J., 2019. Mediebild, opinion och faktakoll i klimatfrågan. Kantar Sifo.
- Sommer, S., Mattauch, L., Pahle, M., 2020. Supporting carbon taxes: the role of fairness. *SSRN Electron. J.* <https://doi.org/10.2139/ssrn.3707644>
- Stavins, R., 2020. The future of US carbon-pricing policy. *Environ. Energy Policy Econ.* 1 (1), 8–64. <https://doi.org/10.1086/706792>
- Sterner, T. (Ed.), 2012. *Fuel Taxes and the Poor: the Distributional Effects of Gasoline Taxation and Their Implications for Climate Policy.* RFF Press, Routledge.
- Thalmann, P., 2004. The public acceptance of green taxes: 2 million voters express their opinion. *Public Choice* 119 (1/2), 179–217. <https://www.jstor.org/stable/30025819>.
- Tirole, J., 1988. *The Theory of Industrial Organization.* MIT Press.
- Tirole, J., 2010. From pigou to extended liability: on the optimal taxation of externalities under imperfect financial markets. *Rev. Econ. Stud.* 77 (2), 697–729. <https://doi.org/10.1111/j.1467-937X.2009.00585.x>
- Weesie, J., 2000. Seemingly unrelated estimation and the cluster-adjusted sandwich estimator. *Stata Tech. Bull.* 9 (52).
- Weitzman, M., 2014. Can negotiating a uniform carbon price help to internalize the global warming externality? *J. Assoc. Environ. Resour. Econ.* 1 (1), 29–49. <https://doi.org/10.1086/676039>
- Whitmarsh, L., Capstick, S., 2018. *Perceptions of climate change. Psychology and Climate Change.* Academic Press, pp. 13–33.
- World Bank, 2020. *State and Trends of Carbon Pricing 2020.* World Bank.