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# Are fee-and-dividend schemes the savior of environmental taxation? Analyses of how different revenue use alternatives affect public support for Sweden's air passenger tax<sup>☆</sup>

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## ABSTRACT

This article studies if, how, and why different revenue uses affect public attitudes to environmental taxation. More specifically, using a large-scale ( $N = 4292$ ) randomized survey experiment with a  $2 \times 3$  factorial design, the article analyses how attitudes towards a proposed increase in the current air passenger tax in Sweden are altered when combining a tax increase with three different suggestions for revenue use. The increasingly popular fee-and-dividend solution, where revenues are distributed back to the public, thus decreasing negative distributive tax effects, is compared with two additional revenue uses: unspecified government spending on welfare services, and re-investment of revenues into aviation biofuels. Our results show that, although some of the commonly used independent variables such as climate concern, personal norms and political-ideological orientation are significant in determining policy attitudes, varying both tax level and revenue use also tangibly affects how a policy proposal is received. Interestingly, however, the fee-and-dividend approach does not yield the most positive policy attitudes. Rather, directing the revenues to fund an increased use of biofuels for aviation is the alternative that most clearly drives positive attitudes to this policy, and is also the alternative that is perceived as the most effective and fair in both the high tax and the low tax alternatives.

## 1. Introduction

Price-based measures such as Pigouvian (Pigou, 1920/2013) taxes, aiming to internalize the negative externalities of a behavior and thereby making it less frequent, are commonly viewed as effective and cost-efficient ways of advancing environmental protection globally (Tietenberg, 1990; Kallbekken and Aasen, 2010; Milne and Andersen, 2012; Sterner and Coria, 2013). Nonetheless, levying climate taxes to steer individual behavior is commonly met with public protest as they are perceived as unfair government tax grabs with negative distributional consequences (Bergquist et al., 2020; Maestre-Andrés et al., 2019). In order to counteract negative public attitudes both scholars (e. g., Hansen, 2015) and politicians (Baker III et al., 2017) have proposed a fee-and-dividend approach, where tax revenues are distributed back to the public rather than adding to the government's treasury. By compensating the public for the increased costs associated with a tax,

the fee-and-dividend approach is believed to be a viable way towards reducing perceptions of a new tax as being unfair (Hsu et al., 2008; Sumner et al., 2011).

However, several studies of the introduction of climate taxes conclude that their distributional effects, and therefore also the amount of public support they enjoy, is clearly dependent on how the revenues from the tax are used (Bento et al., 2009; Dresner et al., 2006; Kallbekken and Sælen, 2011; Beiser-Mcgrath and Bernauer, 2019). The fee-and-dividend approach has been advocated in connection with a greater interest in implementing carbon taxation on car fuels. While difficult to adopt in almost any context, a “carbon tax-and-dividend” approach has gained political traction in such places as Canada and Switzerland. It should be noted however, that the specific design of a fee-and-dividend system can vary considerably between political contexts. In essence, it is about redistributing revenues back to the public, thus making the tax revenue-neutral for the government and reducing

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the monetary effects for the individual citizen. Nonetheless, this can be accomplished in different ways, for example through cash transfers, income tax reductions or other forms of monetary compensation, with different periods of redistribution (for example once a year or more frequently), and with varying shares of the revenues redistributed. Recycling revenues in the form of dividends thus highlights the fact that there is rarely one solution that is the most appropriate across different political contexts. For example, Switzerland has introduced a CO<sub>2</sub> levy on fossil fuels for heating where about 40% of the revenues are redistributed uniformly, that is, each person receives the same amount through checks mailed to all individuals (Swiss Government, 2021; Carl and Fedor, 2016). It has also been decided to expand the system to include air travel; for the longest flights the levy will be about EUR 100 (Swissinfo, 2021). As of April 2019, the federal government of Canada has implemented a fee-and-dividend approach for provinces that have not yet implemented their own carbon pricing scheme. According to the federal system, about 90% of the revenues are repaid equally to all individuals (with a 10% increase for those living in rural communities) through a refundable tax credit (Canadian Government, 2021).

However, direct monetary compensation is not the only way of recycling revenues from a climate tax, and several jurisdictions in for example Switzerland, Norway and the Canadian provinces of British Columbia and Alberta, have implemented other forms of revenue use such as tax cuts for firms and green spending (Carl and Fedor, 2016). Although formal earmarking of tax revenues is prohibited in many countries, tax revenues can still be used to fund packages with parallel programs and projects. An example is environmental tax shifts, where the introduction of an environmental tax is combined with a simultaneous cut in, for example, taxes on employment, have been used in several countries. These designs produce a double-dividend effect since environmental benefits are combined with a reduction in taxes that have a distorting effect on the economy as a whole, thus increasing overall welfare (Goulder, 1995; Jorgenson et al., 2013). Other forms of revenue use are, of course, also possible. As a tax targeting, and aiming to limit, specific behaviors (such as the consumption of certain products), its effectiveness is rather sensitive to the price elasticity of the products whose externalities it is aiming to internalize. Combining the tax with investments to reduce the negative environmental impacts of a continued behavior would thus increase the possibility of overall positive environmental effects. However, the extent to which alternative tax and revenue use combinations have the potential to alleviate negative policy attitudes is less researched.

In this article, we experimentally examine how and why a number of different climate tax revenue uses, including a fee-and-dividend design, affect public policy attitudes. We focus on the case of air travel, which is an area where environmental taxes have been historically uncommon, and where the existing tax levels are very low in comparison with, for example, road transport. Previous research on policy support for aviation policies is scarce, with Kantenbacher et al. (2018) and Larsson et al. (2020) as noteworthy exceptions. The method applied in this paper is a large-scale ( $N = 4292$ ) randomized survey experiment with a  $2 \times 3$  factorial design. The article asks whether and through which mechanisms attitudes towards an increase in the passenger tax on air travel in Sweden vary with both tax level and suggested uses of the revenues generated. Furthermore, to gain a deeper insight into the reasoning of our respondents, we also analyzed and summarized the comments from the survey. From a theoretical perspective, understanding why certain policy designs help alleviate negative policy attitudes is certainly of interest as it addresses theories on the public policy-public opinion nexus (Campbell, 2012; Hoff-Elmari et al., 2014). Furthermore, the results of the study will provide relevant empirical insights for decision-makers in their endeavors to design new policy tools that have the potential to be successfully implemented.

## 2. Why are policy attitudes important?

For several reasons, relying on voluntary behavioral changes among societal actors will not suffice to successfully combat climate change and reach the targets of the Paris Agreement (Jagers et al., 2020). Therefore, the demand for government interventions addressing behavioral change through the introduction of stringent policy measures is increasing. However, it is also a necessity to carefully consider the political feasibility of potential policy measures in order to steer clear of the negative political consequences of implementation in the short-term (for example, public protest, lack of compliance) and the long-term (eroding political legitimacy), respectively (Matti, 2010; Wallner, 2008).

Evaluating the merits of different policy designs is a multidimensional issue where the direct and indirect effects on the climate (i.e. effectiveness) must be considered in combination with the cost of implementing and enforcing the policy, and the possible side-effects of implementation (i.e. cost-efficiency) (IPCC, 2014). With regard to both effectiveness and cost-efficiency, pricing externalities through a tax have apparent advantages over other types of price-based or regulatory measures (Stern and Coria, 2013). However, the extent to which a policy measure successfully addresses climate change is not solely dependent on technical or political/administrative factors. Especially when implementing a policy measure with the aspiration of altering social choice mechanisms and steering behavioral change at the individual level, as is the case with an air passenger tax, the tax's effectiveness and cost-efficiency are also clearly intertwined with another component: the extent to which the policy measure is, or has the potential to be, accepted by the general public. A large body of research studying the relationship between opinion and policy demonstrates how public policy attitudes both constrain (Foyle, 2004; Sobel, 2001) and direct the actions of decision-makers (Soroka and Wlezien, 2010) as political leaders attempt to steer clear of decisions that risk upsetting large sections of the public.

Most research on the political feasibility of climate taxation to date has focused on carbon taxes on fossil fuels, demonstrating how the spread of negative attitudes among the general public has made implementation either difficult or even impossible. Recent examples are Washington State, where a ballot initiative for a carbon tax failed in both 2016 and 2018, and France, where the *gilets jaunes* (yellow vests) protests during the winter of 2018–19 led to the Macron government's suspension of its proposed CO<sub>2</sub> tax (Maestre-Andrés et al., 2019). Several other examples of the consequences of the low public acceptability of fuel taxes also exist, showcasing examples from, among others, Canada (Harrison, 2010; Harrison, 2012), Australia (Crowley, 2017) and the US (Shwom et al., 2010; Feldman and Hart, 2018). Although the focus of this article is on the feasibility of a climate-related air passenger tax, it is reasonable to assume that the core mechanisms driving policy attitudes are basically the same as for other forms of climate policy measures. For example, a recent study by (Larsson et al., 2020) concludes that across a number of aviation-policy measures, attitudes are primarily driven by the same individual, inter-relational and contextual factors that underpin attitudes to climate policy measures targeting other activities (e.g., Drews and Van den Bergh, 2016). Thus, it seems that attitudinal drivers are relatively stable across policy areas.

### 2.1. The drivers of climate policy attitudes

Research on policy attitudes in general, and climate policy attitudes in particular, have increased significantly in recent decades, and there exists today a rather comprehensive list of factors determining their formation (Drews and Van den Bergh, 2016). *Firstly*, a broad range of studies suggest that attitude formation is based on individual motivation. This category of motivational factors encompasses studies suggesting that self-interest is a key motivator for individual behavior and, more importantly, values-based models which demonstrate how policy attitudes are the result of a distinctive set of core values (Perlaviciute

and Steg, 2014), beliefs about and concern for the environmental situation and its causes (e.g., Lubell et al., 2007; Kim and Wolinsky-Nahmias, 2014), and personal norms or moral obligations (Bamberg and Rölle, 2003). Furthermore, motivation to support or accept political steering in general, and policy instruments in particular, has been associated with an individual's political-ideological orientation (Feldman and Hart, 2018; McCright and Dunlap, 2013; Jagers et al., 2019).

Secondly, a number of studies highlight the significance of inter-relational factors in the formation of policy attitudes. High levels of trust, both in other people's voluntarily compliance with policy initiatives (Biel and Thøgersen, 2007; Harring, 2014; Johansson Sevä and Kulin, 2018) and in the political-administrative system responsible for implementing and enforcing policy (Kallbekken and Sælen, 2011; Kallbekken et al., 2013) have been put forth as explanations for people's propensity to accept policy decisions. In addition, both descriptive and prescriptive social norms, that is, how we perceive others to be acting as well as their expectations of us, affect how policy attitudes are formed (Cialdini et al., 1990; Farrow et al., 2017; Nyborg, 2018).

Thirdly, attempts to explain cross-national differences in policy attitudes have led scholars to also focus on the importance of variation in contextual factors. In this literature, overall policy attitudes have been attributed to, for example, the system of government and policy-making (Harrison, 2010), national economic dependencies (Kenny, 2018; Ščasný et al., 2017), political culture (Cherry et al., 2014; Inglehart and Baker, 2000), wealth and affluence (Franzen and Vogl, 2013), the quality of government (Harring, 2014), and the political context in which policy decisions are taken and implemented (Linde, 2018; Stoll-Kleemann et al., 2001). More importantly, although context has a direct effect on attitudes, it is also reasonable to assume that contextual factors interact with individual-level and interrelational factors (Davidovic et al., 2020).

Fourthly, policy attitudes are also determined by people's beliefs about the consequences of the specific policy (Schuitema et al., 2011), so-called policy-specific beliefs. At least four facets of policy consequences have been outlined in previous research: the perceived personal costs of the policy implementation, both in terms of money (Kenny, 2018; Kallbekken et al., 2013; Eriksson et al., 2006) and the curtailment of personal freedom (Rienstra et al., 1999); the perceived effectiveness of the policy instrument (Jaensirisak et al., 2005; Kallbekken and Sælen, 2011); and the policy instrument's perceived distributive effects. Multiple studies have found that perceptions of fairness are highly significant for how policy attitudes are formed (Fujii et al., 2004; Johansson-Stenman and Konow, 2010).

In this article, we are interested both in the extent to which different suggestions for revenue use affect public attitudes towards a proposed tax increase, but also if and in what way different uses of the generated tax revenues trigger different factors that determine attitudes. For example, we could expect responses to a fee-and-dividend design to be determined by concerns about the distributive effects of a tax increase (concerns about fairness). Similarly, a suggestion to invest tax revenue in environmentally friendly technology could on the other hand be anticipated to be attractive to respondents with a high level of concern for the environment and who thus value policy effectiveness highly. Lastly, we analyze to what degree the responses to both tax levels and revenue use are moderated by factors such as ideology, environmental concern and trust, as previous studies have demonstrated that, for example, where a person sits on the left-right political spectrum or trust in government spectrum is clearly significant for how their attitudes to both political steering in general, and taxes in particular, are formed.

### 3. Case, data and methods

Limiting global warming to between 1.5 and 2 degrees, as stipulated in the Paris agreement, will require substantial transformations in all sectors of society. Aviation accounts for a relatively small but - prior to

the Covid-19 pandemic - growing share of global greenhouse gas (GHG) emissions. The relative importance of emissions from air travel also tends to be larger in affluent countries; it has for example been estimated to account for 14% of the total consumption-based GHG emissions in Sweden (Larsson et al., 2018). Current climate policy in this sector, however, remains weak in comparison to for example the road sector and there is a growing pressure for implementing new policy instruments such as taxes (Larsson et al., 2019). In this article, we have chosen Sweden as a case for exploring the drivers of attitudes to a proposed increase of the Swedish air passenger tax and how these are affected by the use of tax revenues. Sweden has a high profile as a global environmental leader, going back to the Stockholm summit of 1972, with high scores on various environmental performance indices and a large range of successfully implemented environmental policies and policy measures (Lundqvist, 2004). In 1991, as one of the first countries in the world, Sweden introduced a CO<sub>2</sub> tax directed towards the private consumption of petrol as part of a major tax reform. Since then, the use of the CO<sub>2</sub> tax as the primary instrument for climate change mitigation in Sweden has been supported by all major political parties, largely due to broad acceptance of the tax among the general public (Jagers and Hammar, 2009).

For Sweden, over 90% of air travel is international and, from a cost-efficiency perspective, the preferred policy alternative would be an international carbon tax on jet fuel (Larsson et al., 2019). However, there is an international resolution which prohibits fuel taxes on aviation (ICAO, 1993). Instead, a less effective distance-based passenger tax could be implemented. The political interest in implementing environmental taxes for air travel has been low in Sweden for a long time. The Green party managed to get the Swedish parliament to decide on a passenger tax in 2006, but the new political leadership that followed the election that same year decided not to implement the tax. During the last few years, Sweden has experienced an intense public debate about the climate impact of aviation which led to the introduction of the air passenger tax on 1 April 2018. The tax currently has three different levels, depending on flight distance: ≈ €6 for flights within the EU (including domestic flights), ≈ €25 for longer flights up to 6000 km, and ≈ €40 for flights longer than 6000 km. As of today, no specific revenue offset is included in the Swedish air passenger tax design. In this study, we analyze the attitudes to a suggested increase in this tax (see Data and measurements).

#### 3.1. Data and measurements

The data in this study come from an online survey included in wave 31 of the Swedish Citizen Panel administered by the Laboratory of Opinion Research at the SOM Institute, University of Gothenburg ([www.gu.se/en/som-institute](http://www.gu.se/en/som-institute)). The fieldwork lasted 26 days, from 12 September to 7 October 2018. In total, the Panel has some 60,000 voluntary respondents, recruited using both probability and non-probability methods, who regularly get invited to take unpaid surveys on varying topics. The recruitment of respondents for the non-probability part of the panel is mainly conducted through advertisements, without any offer of payment for partaking. For this study, a gross sample of 7500 respondents from the non-probability sample was used, stratified according to age, sex and education based on benchmark data from Statistics Sweden. After two reminders, the response rate was 60%, resulting in 4292 respondents. The participant sample is fairly representative of the Swedish adult population, with a slight overrepresentation of men (52%). The age range of the sample is from 18 to 70 years, with a mean age of 47. The sample is also fairly representative in terms of education, with 27% having completed three years or more of higher education. In terms of political ideology, the sample is slightly left-leaning, with a mean of 4.62 on a 0–10 scale going from left to right. Nonetheless, using a non-probability sample means that generalizations to the Swedish population on level estimates should be done with caution. In this experimental study, however, we are mainly concerned



with mechanisms elucidated through the experimental design, and thus we believe that the representativeness of our sample according to above will suffice.

When agreeing to participate in the survey, each respondent was given an introductory question asking them to indicate their attitude (from very negative to very positive) towards the current Swedish air passenger tax. The subsequent experimental design included six different treatment groups and constitutes a  $3 \times 2$  factorial design. On entering the online survey, respondents were randomly assigned to one of the six experimental conditions, which resulted in the following number of respondents per condition: 650–689. Considering the characteristics accounted for above (sex, age, education, and ideology), there were no statistically significant differences between the participants in the different experimental conditions. The level of tax increase in the different experimental conditions could either be  $\approx$  €20 or  $\approx$  €50 for flights within the EU and either be  $\approx$  €130 or  $\approx$  €330 for the longest flights. Both levels of tax increase thus signal a relatively tangible increase in the cost of flying. In addition to the proposed tax increase, the randomly assigned experimental condition also included a suggestion for how to use the revenues raised by the tax. Apart from the fee-and-dividend proposal, taking the form of an equal cut in income tax for all Swedes funded by the revenues from the increased air passenger tax, two other revenue uses were also included in the experiment: either to use the revenues to fund welfare services such as schools and healthcare, or to increase the share of biofuels used for aviation. Fig. 1 shows how the experimental treatments were presented to the respondents and Table 1 illustrates the six different treatments including the short names used in the Results section.

The main dependent variable, policy attitudes, was measured by one item asking the respondents to state their attitude to the policy proposal ('If you consider the proposal as a whole, what is your attitude towards this proposal?') on a scale from 1 (very negative) to 7 (very positive), with 4 being the scale midpoint. Furthermore, the respondents were asked to indicate how they perceived the possible consequences of the proposed policy in accordance with the policy-specific beliefs regarding fairness and effectiveness. All responses were given on a 7-point scale (very unfair/very fair, very ineffective/very effective, measured on a scale running from  $-3$  to  $+3$  and recoded as 1–7 in order to facilitate the analysis).

The survey also included a further number of independent variables which are commonly thought to impact policy attitudes (see above). Climate concern ('I am worried about changes in the global climate', ranging from 1 = do not agree at all, to 4 = completely agree), and personal norm ('I feel a moral duty to do something about the climate problem', ranging from 1 = do not agree at all, to 4 = completely agree) tap the respondent's values-based motivation. Ideology was measured by asking about the respondent's placement on the left-right political spectrum ('It is sometimes said that political opinions can be placed on a left-right continuum. Where would you place yourself on such a left-right continuum?') ranging from far to the left (0) to far to the right (10). Institutional trust was measured by an index of questions tapping the respondent's level of trust in the Swedish parliament, the Swedish government, and Swedish authorities and political parties (answers ranging from 1 = very little trust to 5 = very great trust). Lastly, a

**Table 1**

Experimental treatments and short names.

	<i>Dividend</i>	<i>Welfare</i>	<i>Biofuels</i>
<i>Low tax</i>	Tax 200/1300 ... used to lower tax overall by an equal amount for all taxpayers ...	Tax 200/1300 ... used to increase funding of welfare services such as health care and education.	Tax 200/1300 ... used to fund an increased use of biofuels for aviation.
<i>High tax</i>	Tax 500/3300 ... used to lower tax overall by an equal amount for all taxpayers ...	Tax 500/3300 ... used to increase funding of welfare services such as health care and education.	Tax 500/3300 ... used to fund an increased use of biofuels for aviation.

question on the respondent's perception of social norms ('People around me see it as important to do something about the climate problem', ranging from 1 = do not agree at all, to 4 = completely agree) was included in the survey.

As controls, we used sex, age, education, income, place of residence (dummy variables for urban/rural/abroad with medium-sized town as the reference category), and number of flights per year. Finally, in relation to the policy proposal and after answering the questions on overall attitude and policy-specific beliefs, the respondents were presented with the opportunity to leave written comments regarding their attitudes to the proposal. These comments are here used to further nuance the results from the experiment.

#### 4. Results

The results are divided into two sub-sections where the first reports on the statistical analyses of the public support for the different treatments and the second provides additional nuances from the analysis of comments.

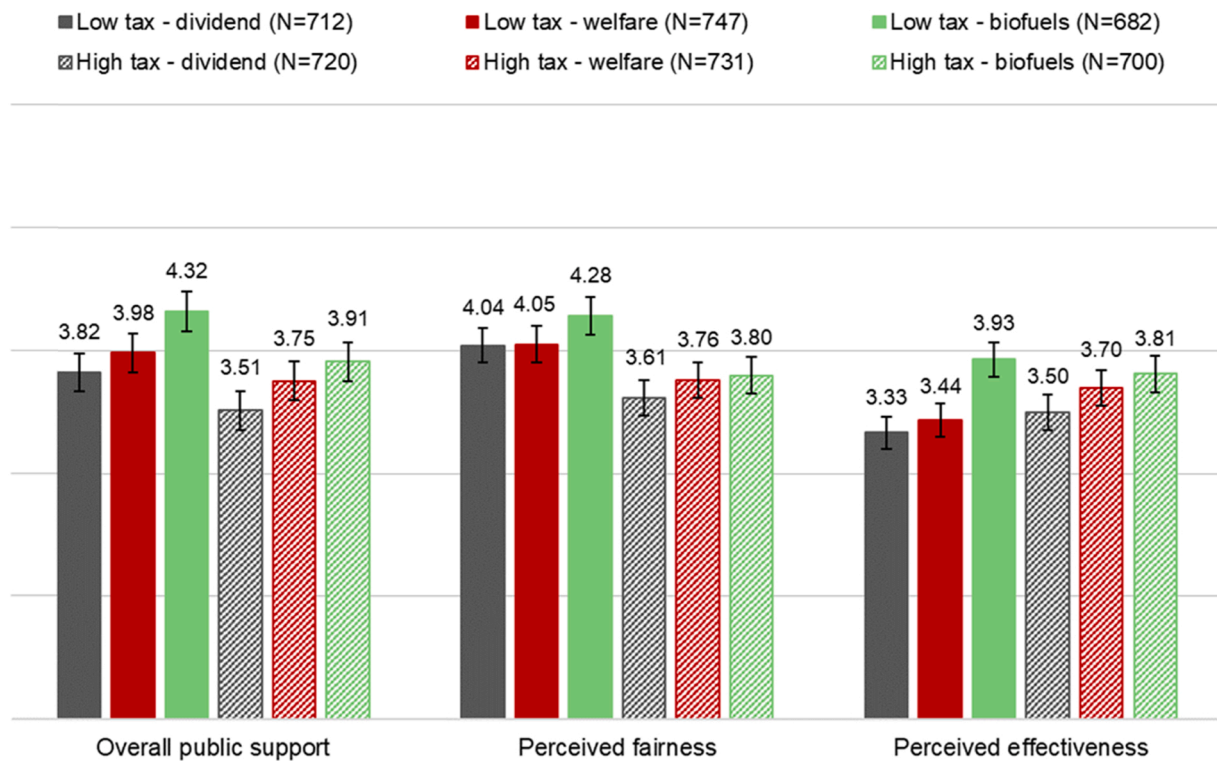
##### 4.1. Statistical analysis

Fig. 2 shows the overall levels of public support, the perceived fairness and perceived effectiveness of the air passenger tax in the six different treatments in the experiment (additional descriptive statistics of the sample is provided in Table 2). Using the revenue to fund an increased use of biofuels for aviation clearly results in stronger support and is also considered to be fairer and more effective than the other two uses. This is the case for both the low-tax proposal (SEK 200 and 1300) and the high-tax proposal (SEK 500 and 3300). As could be expected, the support is also higher for the low-tax proposal than the high-tax proposal.

It is, however, also interesting to note that overall levels of support, perceived fairness, and perceived effectiveness are rather low as mean values only on a few occasions register above the neutral (4) mark on the scale. Although level estimates should be made with caution, these results follow in line with previous studies demonstrating the generally low levels of support for environmental taxes across a range of countries (e.g., Fitzpatrick et al., 2018, Carattini et al., 2018). In particular, it is notable that, people on average seem to perceive taxes as being rather ineffective. This perception is contrary to most research on the policy

In public debate, the negative effects of aviation on the climate and the environment have been discussed. One proposal that has been put forth is to increase the tax on air travel to [SEK 200] [SEK 500] for travel within the EU and to [SEK 1300] [SEK 3300] for longer journeys, in order to reduce this negative climate impact. The income from the increased aviation tax would be used to [lower tax overall by an equal amount for all taxpayers, regardless of how much the individual is flying] [increase funding of welfare services such as health care and education] [fund an increased use of biofuels for aviation].

**Fig. 1.** Experimental treatments (translated from Swedish).



**Fig. 2.** Overall public support, perceived fairness, and perceived effectiveness of the increased air passenger tax in the six different experiment groups. All values are on the scale from 1 to 7.

**Table 2**

Sample descriptives for variables used in the regression analysis.

	Scale	Mean	Std Dev.
Personal norm	1–4	3.21	.79
Social norm	1–4	2.51	.76
Climate concern	1–4	3.09	1.00
Political orientation (right)	0–10	4.59	2.48
Number of flights	flights/year	1.54	1.79
Institutional trust	1–5	2.76	.92
Age	years	47.5	14.1
Personal income	1–13	7.64	3.08
Education level	1–9	5.85	1.95
Share of sample			
Female	47%		
Male	53%		
Urban (SKL 1)	24%		
Semi-urban (ref. category, SKL 2–4)	49%		
Rural (SKL 5–9)	26%		
Live abroad (SKL 10)	1%		

effectiveness of taxes (e.g., Sterner and Coria, 2013, Heres et al., 2017) and demonstrates a sharp contrast between expert and public opinion on this matter.

We employed ordinary least squares (OLS) regressions to explore the effects of both the level of a proposed tax increase and the proposed use of revenues on policy attitudes, as well as to analyze the significance of our independent variables in determining attitude formation. In the regression models, a set of dummy variables indicates the different treatments the respondents were exposed to. The reference category for these variables is the Dividend alternative for revenue use. For the level of the tax increase, a dummy variable indicates whether the respondents received the high-tax proposal rather than the low-tax proposal (reference). The results of this regression using the full sample are presented in Table 3. The effect size of changing the revenue use from Dividend to Biofuels is found to be equally large as the difference between the high-tax and the low-tax proposals or a full step in the four-step scale of

**Table 3**

OLS regressions for the full sample with policy support for increasing the air passenger tax as the dependent variable. Dummy variables for revenue use have Dividend as the reference category. Dummy variables for area of residence (Urban, Rural, Live abroad) have Semi-urban (e.g. smaller town) as the reference category.

	B	Std. error	Beta	Sig.	VIF
Personal norm	.38 ***	.04	.14	.000	1.63
Social norm	-.02	.04	-.01	.556	1.13
Climate concern	.39 ***	.04	.18	.000	1.79
Political orientation (right)	-.27 ***	.01	-.31	.000	1.31
Number of flights	-.18 ***	.02	-.15	.000	1.11
Institutional trust	.20 ***	.03	.08	.000	1.22
Gender (0 man, 1 woman)	.28 ***	.06	.06	.000	1.14
Age	.00	.00	-.02	.113	1.13
Personal income	.00	.01	.00	.812	1.31
Education level	.06 ***	.02	.06	.000	1.18
Urban	.07	.07	.01	.279	1.18
Rural	.03	.07	.01	.700	1.16
Live abroad	-.51 *	.26	-.03	.045	1.03
Tax level (high 1; low 0)	-.36 ***	.05	-.08	.000	1.00
Revenue welfare (1; else 0)	.10	.07	.02	.132	1.34
Revenue bioenergy (1; else 0)	.37 ***	.07	.08	.000	1.33
N	3970				
Adj. R <sup>2</sup>	.38				

Significance levels: \*\*\* =  $p < .001$ , \*\* =  $p < .01$ , \* =  $p < .05$  (2-tailed test).

climate concern. The dummy variable for using the revenues for Welfare was not statistically significant at .05. The relative importance of the other independent variables is largely as expected: climate concern, a personal norm to act in a more climate-friendly way, a political/ideological orientation to the left, and high levels of institutional trust are all associated with a higher level of support for the policy. People who fly more are also less supportive of the tax and women are more supportive

of the tax than men.

While the regression in Table 3 was performed on the full sample, we also ran the same regression for each of the six experiment groups, hence omitting the dummy variables for tax level and revenue use. This is to explore if there are any differences in who supports the different alternatives. These results are presented in Table 4. The results follow largely the same patterns for all groups, but some differences can be identified. A political orientation to the right is negatively correlated with policy support in all groups but more strongly so when the revenue is used for Welfare. The Biofuels alternative promotes neither a decreased nor increased left/right polarization as compared to the Dividend alternative. The support for a tax with the Biofuels alternative is also more strongly associated with climate concern and institutional trust than with the other uses of revenue. Finally, women are significantly more positive than men to the two earmarking revenue uses, whereas no difference was found for the Dividend alternative.

#### 4.2. Comments analysis

Following the questions about policy support, the respondents were given the opportunity to share additional thoughts. This was framed as something additional, non-mandatory and with no guidance on what types of comments were expected. Out of the 4292 participants in the survey, 1317 chose to provide a comment. 299 of these comments were coded as commenting on the use of revenues, that is, the central topic of this paper. Other comments stated, for example, more general views on taxation, the climate issue or the survey itself.

As shown in Table 5, 94% of comments among the participants who responded to the air passenger tax version of the survey with Dividend framing and 98% of the comments among those who responded to the version with Welfare framing, were coded as being negative to these revenue uses. Instead, 78 (81%) and 124 (91%) of these comments, respectively, proposed using the revenues for some type of climate or environmental measure. We also looked more closely at these 202 comments with proposals for other measures: 102 (50%) contain no specific usage other than general earmarking for the climate or environment; 50 (25%) proposed supporting alternative travel modes, primarily train travel; and 57 (28%) proposed that the revenues could be used to make aviation more eco-friendly through research, innovation and support for new fuels (only 3 comments specifically mentioned biofuels).

A considerable proportion (55%) of the comments from participants who responded to the air passenger tax survey with the Biofuels framing also include negative views. However, none of these suggested that a general tax shift would be a better use of the revenues and only 1 person would like to see the revenues used for funding welfare services. Instead,

**Table 5**

Comments from the survey.

Revenue use	N	Comments	Comments about revenues	Categorization of comments about revenue use
Dividend	1432	446 (31%)	96 (22% of comments)	Positive 2 (2%); Negative 90 (94%); Neutral 4 (4%) Use revenue for climate/env. measures: 78 (81%) Use revenue for Welfare: 2 (2%)
Welfare	1478	492 (33%)	136 (28% of comments)	Positive 1 (1%); Negative 133 (98%); Neutral 2 (1%) Use revenue for climate/env. measures: 124 (91%) Use revenue for Dividend: 1 (1%)
Biofuels	1382	379 (27%)	67 (18% of comments)	Positive 10 (15%); Negative 37 (55%); Neutral 20 (30%) Use revenue for Dividend: 0 (0%) Use revenue for Welfare: 1 (1%) Skeptical to biofuels/suggests another climate measure: 39 (58%)
All	4292	1317 (31%)	299 (23% of comments)	

the negative comments primarily expressed concern about bioenergy itself and/or suggested other measures to reduce emissions. The most common suggestion was to support train travel.

#### 5. Discussion and conclusion

Are fee-and-dividend schemes the savior of carbon taxation? In this article we analyzed the questions of if, how, and why, different alternatives for revenue use affect attitudes to a proposed increase in the Swedish air passenger tax. Both among the research community and in several jurisdictions, fee-and-dividend designs are currently being discussed as a potential remedy to increase the political feasibility of introducing Pigouvian climate taxation. This discussion mainly draws on the fact that many studies, along with a number of high-profile empirical examples, have highlighted that perceptions of negative distributive effects (i.e., concerns about fairness) are the most important factor driving negative attitudes to climate taxes and spurring public protests. Here, therefore, we compare the fee-and-dividend solution with two additional revenue uses: one that resembles the common fate of tax revenues in many countries, that is, unspecified government

**Table 4**

Separate OLS regressions for the six experiment groups (2 tax levels × 3 revenue uses).

	Low tax			Low tax			Low tax			High tax			High tax			High tax		
	Dividend			Welfare			Biofuels			Dividend			Welfare			Biofuels		
Personal norm	.43	***		.41	***		.31	**		.34	**		.17			.57	***	
Social norm	.13			.12			-0.15			-0.15			-0.06			-0.03		
Climate concern	.34	***		.33	***		.64	***		.31	***		.39	***		.41	***	
Political orientation (right)	-0.24	***		-0.32	***		-0.24	***		-0.24	***		-0.31	***		-0.25	***	
Number of flights	-0.16	***		-0.17	***		-0.16	***		-0.29	***		-0.17	***		-0.16	***	
Institutional trust	.16	*		.22	**		.30	***		.15			.12			.25	***	
Gender (0 man, 1 woman)	.29			.50	***		.40	**		-0.17			.32	*		.31	*	
Age	-0.01			-0.01			.00			-0.01			.00			.00		
Personal income	.01			.00			-0.02			.04			-0.02			-0.01		
Education level	.02			.04			.07			.08			.15	***		.05		
Urban	.25			.13			-0.14			-0.34	*		.29			.23		
Rural	.04			.06			.00			-0.18			.22			.05		
Live abroad	-0.74			-0.54			-1.73	**		.53			.56			-0.96		
N	656			689			628			674			673			650		
Adj. R <sup>2</sup>	.33			.41			.45			.28			.40			.42		
Max. VIF	1.94			1.70			1.93			1.78			1.79			1.80		

Significance levels: \*\*\* =  $p < .001$ , \*\* =  $p < .01$ , \* =  $p < .05$  (2-tailed test).

spending on welfare services of various kinds; and another that instead aims to increase the effectiveness of the tax instrument even further by re-investing the revenues in aviation biofuels. Our results show that, although some of the commonly used independent variables such as climate concern, personal norm and political-ideological orientation significantly determine policy attitudes, varying both the tax-level and revenue use also tangibly affect how a policy proposal is received. Contrary to our expectations, however, the fee-and-dividend approach did not yield the most positive policy attitudes. Rather, directing the revenues to fund an increased use of biofuels for aviation is the alternative that most clearly drives positive policy attitudes, and this is also the alternative that is perceived to be the most effective and fair in both the high-tax and the low-tax alternatives. This is in line with previous studies showing that the perceived effectiveness (or the collective benefits) of a climate tax - which in this case undoubtedly is increased by using its revenues to invest in biofuels, thus creating both a behavioral and a substitutional effect - is more readily connected to climate tax attitudes than to personal outcome expectancies or perceived individual costs that are remedied through the fee-and-dividend approach (e.g., Larsson et al., 2020). Our findings also correspond with those studies suggesting that transparency in the use of the generated revenues - which we argue would be increased by investments in the use of new technology being traceable but would decrease with a tax cut - affects policy attitudes in a positive way (Hammar and Jagers, 2006; Kallbekken and Sælen, 2011). This aspect might be anticipated to be even more important in countries with lower levels of trust in government than is the case in Sweden.

Furthermore, it is evident that regardless of revenue recycling design, an air passenger tax of the kind here suggested does not reach high levels of support. Neither is it perceived as particularly fair or effective. Thus, while we have found a more salable tax-design, it should be acknowledged that, overall, this is not a popular policy proposal. In particular, we note that the respondents score low on the perceived effectiveness of the tax, regardless of revenue recycling scheme. This is in line with several previous studies on the perceived effectiveness of price-based measures (e.g., Rienstra et al., 1999; Steg et al., 2005). One possible explanation to the gap between expert and public opinion that has been put forward is the lack of public understanding of how taxes (are intended to) work, and in particular a failure to distinguish between the goals of a Pigouvian tax (pricing externalities to steer behavior) and a Ramsay tax (collecting revenue) (Dresner et al., 2006; Kallbekken and Sælen, 2011). If people in general believe that the sole goal of an environmental tax is to raise revenues to pay for climate mitigation, this might also explain why our biofuel-option receives the highest levels of support.

Although these are thought-provoking results, some reservations are of course needed. As with all surveys, the results may be related to the specific fee-and-dividend design (i.e., “lower tax overall”) used here. Different formulations may produce different outcomes and may affect attitudes differently across political contexts. For example, a range of previous studies demonstrate how attitudes to policy instruments vary considerably with political culture and the overall quality of government for example (Jagers et al., 2020; Harring, 2014). Thus, although Swedes have an overall high trust in both government and tax authorities, another framing describing a model with monthly payments to each bank account, for example, might have yielded more positive attitudes in our context, and may work even better in less trusting contexts. The formulation in the biofuels question may also be perceived as slightly more specific than the welfare question that rather exemplifies spending on health care and education.

Moreover, analyzing the acceptability of novel policy designs is a complicated task as proposals that are familiar to the respondents may well produce higher support than novel policies that might be more difficult to comprehend. Channeling tax revenues towards spending on welfare services or for environmental purposes (biofuels in this case) are rather straightforward and also follow a familiar pattern in most

countries. The fee-and-dividend design, on the other hand, is novel and can raise questions about the administrative costs and the effectiveness of collecting money just to later repay it. In line with this, research demonstrates how attitudes towards implemented policies tend to grow more positive over time, as people gain more experience with them (Jagers et al., 2017).

Although the main focus for this article is the comparison among the experimental treatments, conducting a single-country case-study also calls for a certain amount of sensitivity concerning external validity. In particular, it requires considering the context in which the study was undertaken. Sweden is in some ways a special case given the long tradition of environmental policy tools in use, a favorable environmental opinion, as well as an already (although rather low) air passenger tax already in place. These circumstances might certainly affect policy attitudes also towards a hypothetical proposal. Furthermore, although there is a lack of up-to-date empirical studies, there are some indications that Swedes could be slightly more positive towards the use of bioenergy than the average among fellow EU member states (Alasti, 2011). This in turn might affect also attitudes towards the biofuel-treatment.

In future studies, apart from analyzing the extent to which our results can be generalized to contexts beyond Sweden, we suggest that the effects of framing or labeling ought to be considered further. In the present study, respondents were asked about their attitudes to an air passenger tax increase, as this is the concept commonly used in Sweden. However, previous research has shown that, in certain contexts, other wordings might be more positively received (Rabe and Borick, 2012; Löfgren and Nordblom, 2009). Similarly, other words with positive connotations could potentially increase acceptability; for example, including the word *climate* or *investment* is likely to yield higher support. A *climate investment fee* sends different signals to a *passenger tax*, which might be viewed as more of a penalty that targets the individual. Lastly, revenue uses other than the ones tested here should certainly also be considered. For example, while we note that revenue use to boost biofuels yields positive attitudes in Sweden in general, it is also contested by some based on dubious climate benefits and high costs. When we studied the comments, we found that a large share of the respondents who got the Dividend and Welfare treatments in the survey commented that some type of support for environmental purposes would be a better use of the revenues generated. However, looking further at these comments we found that support for alternative modes of transportation (mainly trains) is mentioned 17 times more frequently than biofuels. Our previous research has also shown that investments in improved train services, both high-speed rail and international night train connections, are highly popular among the Swedish public (Larsson et al., 2020).

Although this study has focused on attitudes towards a hypothetical increase in an air passenger tax in Sweden, it is nevertheless possible to draw a number of more general conclusions that should provide important food for thought for policymakers contemplating the implementation of climate taxes in general and air passenger taxes in particular. Firstly, how such revenues are used does matter for policy attitudes, even to the extent that finding the “right” revenue use can enable higher tax increases without weakening public support. Secondly, alleviating negative distributional effects and personal monetary costs through a fee-and-dividend design is not necessarily the Alexandrian cut through this Gordian knot that can solve the problem of public opposition towards Pigouvian taxes. Lastly, many people seem to connect the benefits of an environmental tax with the pro-environmental investments that the tax revenues enable, not to its effects on behavioral patterns. This further suggests that combining the taxation of undesirable behavior with expenditures in the environmental domain may be a feasible way forward.

#### CRedit authorship contribution statement

Simon Matti, Jörgen Larsson, Jonas Nässén: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft,



Writing – review and editing, Funding acquisition.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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