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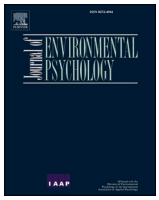

The chicken or the egg? Spillover between private climate action and climate policy support

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ABSTRACT

People engage in many different activities with climate consequences, including mundane everyday activities, such as eating meals and either saving or throwing away leftovers, and collective actions, such as voting, participating in political events and in other ways expressing support for or resistance against climate-relevant policy. Does engaging in everyday climate-relevant activities have implications for support of climate policy, and vice versa, as suggested by research on pro-environmental behavioural spillover? A repeated survey was collected yearly between 2018 and 2022 from representative samples of Norwegians, most of whom participated in more than one survey. The surveys included self-reports about two everyday climate-relevant behaviours (eating red meat and discarding food waste) and the support for two types of policy to mitigate climate change (expansion of wind power and "carbon taxes" – the use of taxes or fees to regulate climate-relevant behaviour). Cross-lagged structural equation modelling of relationships between everyday climate-relevant behaviour and support for mitigation policy reveal that, as expected, all auto-regressive effects (of a latent variable on itself, measured one year apart) are highly significant. There are also significant, positive cross-lagged (i.e., spillover) effects, which are generally bigger between the two types of everyday behaviours and support for the two types of policies than between everyday behaviour and policy support. However, support for carbon taxes has a strong positive effect on reducing meat consumption. Hence, it appears that when it comes to climate actions, consumer and citizen roles are intertwined. Spillover effects are partly mediated through climate concern.

1. Introduction

People engage in many different activities with climate consequences (Nielsen et al., 2021), including mundane everyday activities, such as preparing meals and handling leftovers (Reisch et al., 2021). They also engage in climate-relevant collective action, such as voting, participating in political events, and in other ways expressing support for or resistance against climate policy (Jagers et al., 2020). It is widely recognized that in order to reach the climate goals expressed, for example in reports from the Intergovernmental Panel on Climate Change (e.g., IPCC, 2022), both types of actions need to be aligned with these goals (Carrico, 2021; Sparkman et al., 2021). This has led to plenty of campaigns promoting both voluntary changes of everyday behaviour[1] and raising support for climate and other types of environmental policy aimed at regulating collective action[2] (Lytton, 2013). However, there is a widespread suspicion, especially among environmental organizations (e.g. Crompton, 2013), that the public often views voluntary, private action and political regulation as alternative means to reach environmental goals, such as the mitigation of climate change (e.g., Noblet & McCoy, 2018; Werfel, 2017). Some even suggest that when people do small, everyday things for the environment, they become less inclined to do bigger things (Chater & Loewenstein, 2022; Hagmann et al., 2019; Raimi, 2021) and may use the small (and clearly insufficient) acts as a justification for continuing an unsustainable lifestyle, including unrestricted vacation flight trips or driving a gas-guzzling SUV (Capstick et al., 2019; Hope et al., 2018). Countering this view, others argue that small, everyday behaviour changes can function as a wedge or catalyst for bigger changes (Austin et al., 2011; U.K. Department for

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[1] E.g., The Lazy Person's Guide to Saving the World, https://www.un.org/sustainabledevelopment/takeaction/.

[2] E.g., https://caneurope.org/active_campaigns/together-for-100-renewable-europe/, https://beyondfossilfuels.org.

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EnvironmentF.and Rural Affairs, 2008).

Overall, research on pro-environmental "behavioural spillover" – when performing one pro-environmental behaviour influences the likelihood that the person will perform another (Thøgersen, 1999) – suggests a weak tendency for pro-environmental behaviour to increase the likelihood of more pro-environmental behaviour (Carrico, 2021). However, there is also evidence that compensatory thinking (Capstick et al., 2019; Nayum & Thøgersen, 2022) and moral licensing (Mazar & Zhong, 2010) can decrease the likelihood of other pro-environmental behaviours, at least for some people and in some situations.

As indicated already, an important question is whether doing small, everyday things for the environment makes people more (or less) inclined to support environmental policy and, in this way, facilitate (or impede) collective action to mitigate environmental harms, such as climate change (Raimi, 2021)? However, empirical research on this question is rare (Carrico, 2021). Two studies based on cross-sectional research suggest that engaging in everyday environment- or climate-friendly activities might lead to higher support for environmental or climate policy, like the expansion of wind power (Thøgersen & Noblet, 2012) or serving organic food in public canteens (Mørk et al., 2017). Two randomly controlled trial (RCT) studies found that reflecting on own past pro-environmental behaviour (Lacroix et al., 2022, Study 3) and how it expresses one's values or identity (Sparkman et al., 2021) increased support for a carbon tax. However, two other RCT studies found that people who had been asked to think about their private energy saving behaviour expressed lower support for a tax on fossil fuels (Werfel, 2017) and for public investments in energy efficiency and renewable energy (Noblet & McCoy, 2018). Similarly, a third study found that participants who had been randomly allocated to shop in an online store with predominantly "green" (vs. "non-green") products subsequently expressed significantly lower general support for environmental policy (Castro Santa et al., 2024). There are also a couple of studies reporting no spillover effects on environmental policy support from interventions that increased recycling (Xu et al., 2018a) or the purchase of "green" products (Lanzini & Thøgersen, 2014).

Most behavioural spillover research to date is based on cross-sectional survey data only and is, hence, mute about causality (Carrico, 2021). The number of RCT studies on behavioural spillover is increasing (Carrico, 2021; Geiger et al., 2021), but most of them suffer from serious methodological shortcomings, such as investigating impacts of *reporting* one's past behaviour rather than of the actual behaviour (e.g., Noblet & McCoy, 2018; Sparkman et al., 2021; Werfel, 2017), investigating impacts on *intentions* rather than behaviour (e.g., Lacroix et al., 2022; Lauren et al., 2019; Truelove et al., 2021), or investigating immediate impacts only (e.g., Castro Santa et al., 2024; Spaccatini et al., 2023) and thereby *ignoring how long time it takes* for spillover effects to manifest themselves (Galizzi & Whitmarsh, 2019). On top of this, the triggering event is often weak, making the typical study underpowered to detect the size of behavioural spillover effects that can reasonably be expected (Geiger et al., 2021). Note that, to be reasonable, expectations need to take into account the many other factors that co-determine behaviour and often make behaviour resistant to change, such as institutions, habit, and the physical context, like transport infrastructure, shopping possibilities, the assortment in supermarkets, etc. (Thøgersen, 2014).

For research to properly reflect the time it takes for behavioural spillover effects to unfold, a longitudinal design is needed, with or without field experiments. Longitudinal studies mostly report positive spillover (Elf et al., 2019; Höchli et al., 2019; Lanzini & Thøgersen, 2014; Lauren et al., 2016; Sintov et al., 2017; Stangherlin et al., 2023; Thøgersen & Ölander, 2003). However, they are mainly limited to low-cost everyday behaviours (except Lauren et al., 2016) and most of them only measured behaviour at two timepoints (Elf et al., 2019; Lanzini & Thøgersen, 2014; Lauren et al., 2016; Stangherlin et al., 2023), which means that they are mute about the stability of identified spillover patterns over time.

This paper contributes to the limited research on pro-environmental behavioural spillover using longitudinal panel data, and specifically to the rare research on spillover between pro-environmental everyday behaviour and environmental policy support. To the best of our knowledge, we are the first to investigate possible spillovers not only from pro-environmental everyday behaviours to environmental policy support, but also from environmental policy support to pro-environmental everyday behaviours. We employ a design, where representative samples of the Norwegian population were interviewed once a year, five years in a row, using a structured questionnaire. Hence, our design allows for testing many more touchpoints than previous longitudinal spillover research, substantially advancing insights into the stability of behavioural spillover. The study focuses on two climate-relevant everyday behaviours: eating red meat and discarding food waste, as well as the support for two types of policy, which are considered essential components of climate change mitigation policy in many countries: the expansion of wind power and "carbon taxes" – defined here as the use of economic instruments like taxes or fees to regulate climate-relevant behaviour. Besides (1) investigating spillover between climate-relevant everyday behaviours and climate policy support, we also measure climate concern to investigate (2) how strongly the studied behaviours and policies are associated with climate change among the Norwegian public and (3) whether possible behavioural spillover effects are mediated through changes in climate concern (Höchli et al., 2019; Stangherlin et al., 2023).

2. Behavioural spillover

2.1. Definition, theory, and correlational evidence

We define pro-environmental behavioural spillover as the phenomenon that the adoption or performance of an initial pro-environmental behaviour influences whether (i.e., increases or decreases the likelihood that) a person adopts or performs a different pro-environmental behaviour (Thøgersen, 1999). Note that behavioural spillover, according to this definition, includes but is not limited to indirect effect of behavioural interventions on non-targeted behaviours, mediated via a change in the targeted behaviour (a limitation adopted by, e.g., Carrico, 2021; Geiger et al., 2021; Maki et al., 2019). Although the need to foresee positive and negative indirect effects of policy interventions is one of the main reasons for the current interest in behavioural spillover (Maki et al., 2019), it is important to take into account that both initial and subsequent behaviours are co-determined by a host of different personal and context factors (e.g., Klöckner, 2013; Ölander & Thøgersen, 1995). On the one hand, this means that behavioural spillover may happen "spontaneously" as part of the "natural" evolution of people's lifestyles and changing context factors (e.g., Juhl et al., 2017). On the other hand, it means that any behaviour change has to overcome the inertia and obstacles created by the physical, institutional, and social context and by the individual's habits and lifestyle (Thøgersen, 2005).

The expectation of pro-environmental behavioural spillover has a solid theoretical foundation (Dolan & Galizzi, 2015) and is supported by mounting empirical evidence as noted above. The basic reason for expecting spillover between pro-environmental behaviours is their relevance for the same goal: environmental protection (Dolan & Galizzi, 2015; Nielsen, 2017; Scheuthle et al., 2005; Sharpe et al., 2021; Thøgersen & Ölander, 2002, 2006). When performing a goal-directed behaviour without any external encouragement or pressure, supporting attitudes become more accessible from memory and therefore more predictive of subsequent behaviour (Glasman & Albarracín, 2006; Knussen et al., 2004). In addition, deliberate action to reach a goal increases the salience of the goal in the mind of the actor (Dhar & Simonson, 1999). The more salient a goal, the more likely it is that individuals will notice the relevance of different everyday behaviours for the same goal, thus increasing the likelihood that they will act in a goal-consistent way in different areas (Ratneshwar et al., 2001). In

addition, goal theory suggests that, when doing things for the environment is perceived as a commitment to an environmental protection goal, starting to do some actions of this kind strengthens the person's commitment to the goal, which makes them more likely to move on to do more, perhaps even bigger and more difficult things towards this goal (e.g., Dhar & Simonson, 1999; Fishbach & Dhar, 2005).

Other possible mechanisms have been suggested, such as self-perception or -identity (Eby et al., 2019; Lauren et al., 2019), striving for cognitive consistency (Thøgersen, 2004), and self-efficacy (Lauren et al., 2016). Without ignoring any of these alternative mechanisms, we focus primarily on goal theory in the present research (cf., Margetts & Kashima, 2017; Stangherlin et al., 2023; Steinhorst et al., 2015; Steinhorst & Matthies, 2016) because it suggests both a driver of spillover and a benchmark relative to which the consistency of the different behaviours and policy support can be (and usually is) assessed.

Despite the general nature of the proposed spillover mechanisms, differences across pro-environmental behaviours are to be expected, and are indeed found, not least when they vary in behavioural difficulty (Green-Demers et al., 1997; Kaiser & Wilson, 2004), perceived similarity (Thøgersen, 2004), or the salience of environmental consequences (Alacevich et al., 2021; Barr et al., 2011; Spence et al., 2014; Struben & Sterman, 2008). For example, it is rational to choose the easiest or least costly option first when there are alternative means to reach one's (environmental as well as other) goals (Diekmann & Preisendörfer, 1998). Still, due to learning, increased attention, and other effects, an environmentally concerned person should be expected to perform more and more pro-environmental behaviours, and increasingly difficult ones, over time (Henn et al., 2020).

Mechanisms that can lead to *negative* behavioural spillover have also been suggested. For example, a person who has done something for the environment may then feel morally "off the hook" (Dolan & Galizzi, 2015; Sorrell et al., 2020). This is supported by empirical research in various fields finding that people often give themselves some "slack" after a good deed (Zhong et al., 2009). In addition, wishful thinking may make people believe that what they did already solved the problem; a phenomenon Weber (1997, pp. 314–341) calls "single-action bias." Or they may perceive what they have done already as a fair contribution to solving the problem, applying contribution ethics (Thøgersen, 1999). Both single-action bias and contribution ethics may make individuals less inclined to do more to address environmental problems after having done something.

Few correlation studies investigated spillover between everyday behaviours and support for environmental policy. Mørk et al. (2017) found a positive effect of private consumption of organic food on the support for government policy to increase the share of organic food served in public canteens, after controlling for personal norms regarding buying organic food and own use of public canteens. Also, Thøgersen and Noblet (2012) found a positive effect of everyday pro-environmental behaviour on the support for the expansion of wind power, after controlling for environmental concern.

Obviously, a correlation does not prove that doing one of the correlated behaviours influences the likelihood of doing the other (Carrico, 2021). Instead, a correlation could, for example, be the result of both activities depending on a third factor, such as holding certain values, skills, or resources (Sharpe et al., 2021; Thøgersen & Ölander, 2006). Then it is not one activity that influences the other, but the third factor that explains both. Note, however, that research on behavioural spillover also assumes that the interrelated behaviours are rooted in the same goals and values. However, spillover research further assumes that there might be additional indirect or "domino" effects between behaviours that are instrumental for the same goal. Such behaviours are not usually adopted at the same time, or in random order. If they are adopted in a sequence, for example ordered by behavioural costs (e.g., Henn et al., 2020) or perceived similarity (Thøgersen, 2004), the adoption of one goal-directed behaviour may influence the likelihood of adopting other behaviours that are instrumental for the same goal (e.g., Juhl et al., 2017).

The present research focuses especially on spillover between everyday pro-environmental behaviour and support for environmental policy. From the reviewed behavioural spillover theory and correlational research, we derive the following basic hypotheses.

H1a. Assuming that climate-friendly everyday behaviour and support for climate policy are perceived as relevant for the same superordinate goal (i.e., climate protection), we expect them to be positively correlated in the general population, and the same for different climate friendly everyday behaviours and support for different types of climate policy. The hypothesis is illustrated in Fig. 1.

Correlations between pairs of pro-environmental behaviour generally increase with their similarity in terms of domain categories, resource demands, etc. (Bratt, 1999; Margetts & Kashima, 2017; Truelove et al., 2014) or with their perceived similarity (Thøgersen, 2004). Based on this research and with policy support being considered a quasi-behavioural response (Stern, 2000), we hypothesize.

H1b. The various climate-friendly everyday behaviours are more strongly correlated with each other than with support for a specific climate policy. Likewise, the various climate policy support measures are more strongly correlated with each other than with specific everyday behaviors.

2.2. Evidence from experiments and longitudinal data

Better evidence for causal effects between pairs of behaviour comes from studies using randomly controlled experiments (RCTs) or longitudinal data. This study uses longitudinal data, but for completeness we added a brief review of the evidence from RCTs in Appendix A. RCTs are usually considered the strongest method for identifying causal effects (Carrico, 2021). However, most RCTs on behavioural spillover suffer from important limitations, partly due to time constraints and the need to maintain a controlled context, partly due to other methodological shortcomings (elaborated in Appendix A). These limitations and shortcomings are likely an important reason why a recent systematic review of intervention studies on behavioural spillover found no significant spillover effects in 140 studies out of 175 (Geiger et al., 2021).

A few studies based on longitudinal field data involving an intervention investigated spillover between everyday behaviours and support for environmental policy. Lacasse (2019) found a positive spillover effect from three weeks of performing a new everyday pro-environmental behaviour of the person's own choice (e.g., unplugging appliances, reusing shopping bags) to mailing a postcard to their senator about climate change. Similarly, Steinhorst and Matthies (2016) found a positive spillover of electricity saving on the support for carbon policy, but only for participants with strong personal ecological norms and when energy saving was framed in environmental (vs. monetary) terms. In a series of studies, research at Cardiff University, UK, found an increased support for other charges to reduce plastic waste after the introduction of a bag charge (Poortinga et al., 2013; Thomas et al., 2016, 2019). Two other studies found no spillover effects on environmental policy support from interventions that increased recycling (Xu et al., 2018a) or the purchase of "green" products (Lanzini & Thøgersen, 2014).

Longitudinal studies investigating the "natural" development in consumption patterns over time have not been reviewed as systematically as intervention studies. In an early study, Thøgersen and Ölander (2003) used a three-wave panel survey with a large random sample of Danish consumers and a time-lag of one year. They found positive spillover from recycling to buying organic food and non-car travel behaviour and negative spillover from buying organic food to recycling. The positive spillover effects increased with universalism value priorities and personal norms for environment-friendly behaviour. Similarly, using a two-wave panel with residents in Copenhagen and Lisbon and a

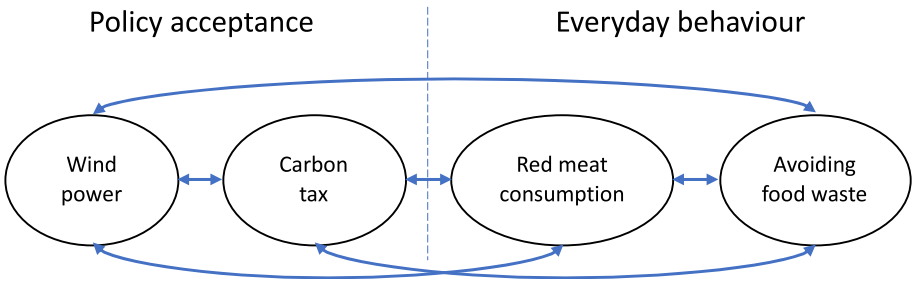

Fig. 1. Correlations between climate-relevant everyday behaviours and climate policy acceptances.

time-lag of four months, Stangherlin et al. (2023) found a positive spillover between recycling and buying "circular products." Finally, based on a study in Switzerland using a time lag of three years, Puntiroli et al. (2022) found limited positive spillover between different behaviours, but only within one of three behavioural categories (different kinds of mobility-related behaviour) and among consumers with strong environmental values.

The strongest evidence of positive behavioural spillover comes from a study using panel scanner data from a major Danish retailer, including all registered transactions over 20 months from 8704 randomly selected customers with a loyalty card (Juhl et al., 2017). Using a hidden Markov model, Juhl et al. (2017) identified latent states representing dynamic customer segments and captured the movements between states or segments. Consistent with behavioural spillover, they found a tendency to buy organic food products in an increasing number of categories over time and the order of adoption being inversely related to the behavioural costs of adopting.

It is an important caveat that most of the studies reporting instances of behavioural spillover also identified environmentally relevant behaviours that were not influenced by the first behaviour, suggesting that the likelihood of behavioural spillover depends on the behaviour. Still, the published longitudinal studies generally support the assumption that positive behavioural spillover is happening in practice.

It is generally assumed in this research that behavioural spillover is at least partly due to a striving for consistency, in general and regarding goal striving, which should logically lead to pro-environmental behaviours that are perceived as similar in some relevant way becoming more aligned over time, as illustrated in Fig. 2. Hence, based on the assumption that different pro-environmental behaviours, resp. support for different climate policies, are perceived as more similar than a behaviour and a policy support, we hypothesize.

H2a. In the absence of targeted interventions, positive spillover is more pronounced between different climate-friendly everyday behaviours, and between support for different types of climate policy, than between climate-friendly everyday behaviour and support for climate policy.

H2b. Due to positive spillover, different climate-friendly everyday behaviours, and support for different types of climate policy, become more strongly correlated over time, and so does climate-friendly everyday behaviour and support for climate policy.

2.3. *Goal importance as mediators of behavioural spillover*

Several studies have found a positive effect of goal-priming on pro-environmental choices and behaviour (Biel et al., 2005; Evans et al., 2013; Thøgersen & Alfinito, 2020; Verplanken & Holland, 2002). For example, a study found that participants were significantly more likely to go out of their way to recycle a sheet of paper if a prior task had made them think about environmental (versus financial or control) aspects of car-sharing (Evans et al., 2013). Even stronger evidence is provided by a six weeks field experiment with 150 households in Singapore, randomly assigned to a control group or one of three treatment groups, one of which set themselves an electricity-saving goal (Liu et al., 2021). All treatment groups reduced their electricity consumption compared to the control group and in addition those setting an electricity-saving goal significantly reduced their (meter-read) water-consumption, that is, a positive spillover effect. This stream of research suggests that *if* a pro-environmental goal is successfully activated, this increases the likelihood that persons notice other ways to act towards that goal and

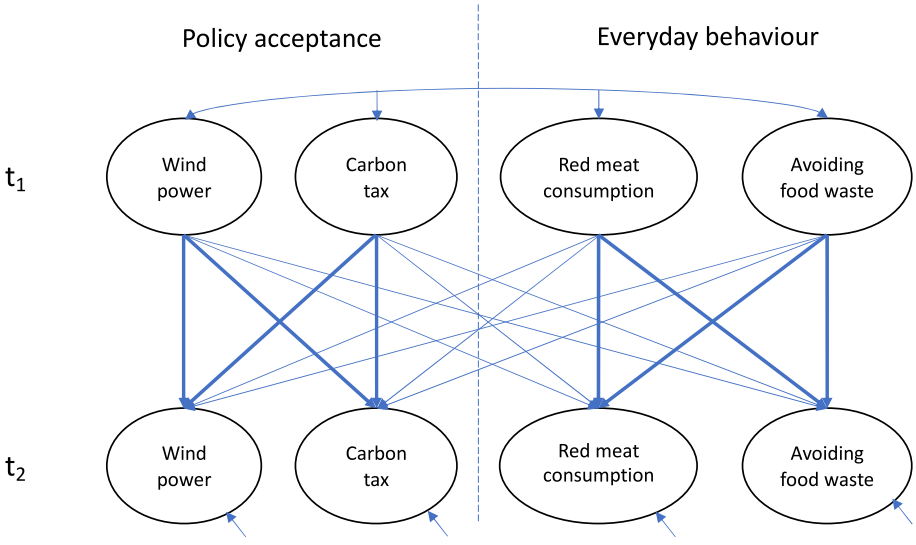

Fig. 2. Cross-lagged panel model of relationships between climate-relevant behaviours and policy acceptance over time. Thicker arrows between behaviour categories illustrate stronger expected cross-lagged effects.

thereby the likelihood that they perform other pro-environmental behaviours. This inference is supported by research finding that reflecting on own past pro-environmental behaviours in connection to one's values or identity increased support for climate policy, like a carbon tax (Sparkman et al., 2021).

An important question is, then, whether pro-environmental behaviour activates or strengthens a more general pro-environmental goal, which then mediates positive spillover to other, goal-relevant behaviours? This question was answered affirmatively by a two-waves panel survey with a four months time-lag in Denmark and Portugal, studying spillover effects between recycling and buying "circular" products (Stangherlin et al., 2023). The study found significant and positive spillover effects between the two behaviours, mediated through the personal importance of the goal of waste reduction. On this background we formulate the following hypotheses, which are illustrated in Fig. 3.

H3. In the general population, different climate-friendly everyday behaviours, and support for different types of climate policy, are positively correlated with indicators of the personal importance of climate change mitigation goals.

H4. Positive spillover between different climate-friendly everyday behaviours and support for different types of climate policy is mediated through indicators of the personal importance of climate change mitigation goals.

3. Method

3.1. Sample

The data for this study come from a five-waves representative web-based survey managed by Kantar, sampling participants from their ISO certified standing panel in Norway, which were contacted during the spring of 2018, 2019, 2020, 2021, and 2022. Kantar used an interactive procedure for the sampling of 18 years old or older residents of Norway, stratifying invitations to participate to secure a representative sample in terms of gender, age, geographical distribution, and education level. Those who completed the questionnaire in full were contacted again one year later and were invited to participate in the next survey. Each year, more than 4000 completed the questionnaire and more than 2000 of these completed the full questionnaire again the next year. To reduce the time to complete the questionnaire, some questions were only asked to a random half of participants. Hence, the present paper is based on the random half that responded to questions about policy acceptance (N = 2073, 2036, 2029, 2485, and 2009). We analyse correlations between latent variables based on the full sample whereas the (cross-lagged) analyses of developments over time are based on subsamples of respondents participating (at least) in two consecutive waves.

3.2. Constructs

The survey asked about support for or rejection of two types of climate-relevant policies that have been implemented and/or are hotly discussed in many countries: increasing wind power and using "carbon taxes" to regulate climate-harmful behaviour. Support for increasing wind power in Norway was measured with two items: (a) "Norway should increase onshore wind power production." (b) "Norway should increase offshore wind power production." Support for "carbon taxes" was measured with three items: (a) "We should increase the price of fossil energy sources such as oil, diesel, and gasoline." (b) "Meat prices should be increased – especially for the products that give the highest greenhouse gas emissions." (c) "How positive or negative are you about road tolls?" (asked from 2019 to 2021). We measured responses to all these items on a 5-point scale, the last one from "Very negative" = 1 to "Very positive" = 5, all others from "Does not match at all" = 1 to "Matches very well" = 5, with the additional options "Don't know" and "Not relevant" coded as missing values.

In addition, we asked questions about two everyday behaviours that are often in focus in the public debate and campaigns on climate change mitigation: the consumption of red meat and discarding food waste. The consumption of red meat, generally considered the most climate unfriendly part of the diet, was measured with the question: "How often do you have dinner with beef or mutton/lamb?" on a scale from 0 to 6, where 0 = never; 1 = less than 1 time per week; 2 = 1 time per week; to 6 = 5 or more times per week. Discarding food waste was measured with four items, introduced with the question: "How often do you discard (more than 100 gr) of these food types (e.g., due to leftovers, expiry date, reduced quality)?": (1) beverages (milk, juice, etc.), (2) bread, (3) dinner/hot meals, (4) fruit and vegetables. Responses were given on a 6-point scale where 1 = Daily; 2 = Every other day; 3 = 1–2 times a week; 4 = A few times a month; 5 = Less often; 6 = Never. Hence, this can be considered a measure of *avoiding* food waste.

We controlled whether the behaviours and policy acceptances are indeed viewed as climate-relevant in the studied population by analysing their relation to concern about climate change (climate concern), using both affective and cognitive items (cf. Bouman et al., 2020). Affective climate concern was captured with the item: (a) "To what extent do you worry about climate change?" This item was measured on a 4-point scale from "Not worried at all" = 1 to "Very worried" = 4. Cognitive climate concern was captured with the items: (b) "Climate change is happening." (c) "Climate change has no negative consequences" (reversed). (d) "Human activity does not affect the climate" (reversed). We measured responses to these items on the 5-point scale

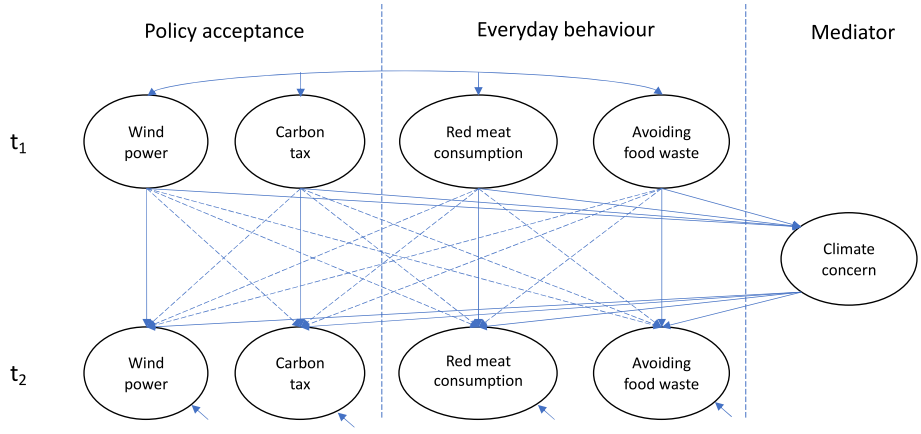

Fig. 3. Cross-lagged panel model of relationships between climate-relevant behaviours and policy acceptance over time with cross-lagged (spillover) effects mediated through climate concern.

from "Does not match at all" = 1 to "Matches very well" = 5. Since these four items load strongly on the same factor, we use them all to represent climate concern. To improve model fit, error terms of the two reversed items are allowed to correlate in all models reported in the following.

3.3. Analysis method

AMOS 28 (Arbuckle, 2017) with Maximum Likelihood (ML) estimation is used for all statistical analyses. Missing values are handled by means of Full Information ML. Confirmatory factor analysis (CFA) and structural equation modelling (SEM) are based on the usual assumptions of uncorrelated error terms (except for the two mentioned items), a simple structure factor pattern, and exogeneous constructs being allowed to correlate. However, in the cross-lagged panel analyses, errors of equations predicting an everyday behaviour or policy acceptance are allowed to correlate and so are error terms of the same manifest variable measured one year apart. We estimate all autoregressive effects and all cross-lagged relationships between included variables in the cross-lagged panel analyses. In analyses involving comparisons over time, models are assuming at least partial metric invariance, which was confirmed by the CFAs used to analyse correlation patterns (Table 2).

3.4. Reliability and validity

The reliability and validity test of multi-item constructs is done by means of CFA. Construct reliability (CR) and average variance extracted (AVE) are reported in Table 1 and Heterotrait-Monotrait (HTMT) ratios in Table 2.

With a few exceptions, the CR is above the generally accepted threshold (.70), and exceptions are only in the first years. In all cases, the CR is above the .60 threshold that is usually accepted in exploratory studies (Hair et al., 2010; Malhotra & Dash, 2011). The AVE is below the .50 threshold in only a few cases and then it is close and improving over time. The AVE is a more conservative measure than the CR and Malhotra and Dash (2011, p. 702) note that the convergent validity of a construct may be deemed adequate based on CR alone, even when more than 50% of the variance is due to error. On this background we judge that our constructs possess satisfactory construct reliability and convergent validity.

Discriminant validity is assessed by means of the heterotrait-monotrait (HTMT) ratio of correlations method (Henseler et al., 2015). As reported in Table 2, the highest HTMT ratio is .72, which is well below the commonly recommended threshold of .85 (Kline, 2023). Hence, our multi-item constructs also appear to possess sufficient discriminant validity.

4. Results

4.1. Correlations

First, we investigate the correlations between latent variables to test the consistency between everyday behaviours, policy acceptances, and climate concern, predicted by Hypotheses H1a and b. Correlations are calculated by means of CFA. The results, reported in Table 3, generally support H1a and the basic assumption that there are forces driving consistency between these behaviours and policy acceptances, although they are not completely consistent.

Consistent with H3 and the assumptions that the included everyday behaviours and policy acceptances are viewed as climate-relevant by participants and that relevance for a shared goal is a driving force behind increased consistency between climate-relevant behaviours and policy acceptances (Sharpe et al., 2021; Thøgersen & Ölander, 2006), in general they are significantly correlated with climate concern, with the expected sign. The only exception is discarding food waste, which was not significantly related to climate concern in 2018 and 2019. Hence, it appears that the climate relevance of food waste became increasingly salient in Norway during these years. Further, it appears that the acceptance of climate-relevant policy, and especially support for carbon taxes, is generally more strongly correlated with climate concern than the two climate-relevant behaviours are. However, the acceptance of wind power is less strongly correlated with climate concern than the acceptance of carbon taxes. Among the everyday behaviours, climate concern is more strongly correlated with the consumption of red meat than with discarding food waste.

It is an important observation that the strength of these correlations generally increased until 2020 but decreased in 2021 and either remained at the same level or increased slightly again in 2022. Hence, hypothesis H2b was confirmed until 2020, but not in the most recent years. It seems a reasonable speculation that this change in the trend towards greater consistency is due to the societal disruptions created first by the Covid-19 pandemic and later by Russia's attack on Ukraine, which made other important societal problems more salient and may therefore to some extent have reduced the public's attention to climate change (Thøgersen, 2010).

The expectation that the correlations between the two behaviours and between the two policy acceptances are stronger than between behaviours and policy acceptances (H1b) is only partly confirmed, though. The correlation between the two climate-relevant policy acceptances is positive, medium to strong, and increasing over time. Also, the correlation between the two climate-relevant everyday behaviours is

Table 2
Discriminant validity, HTMT ratios. N = 2073/2036/2029/2485/2009.

	2018	2019	2020	2021	2022
Carbon tax[a]-Wind power[b]	.26	.33	.39	.38	.42
Carbon tax-ClimateC[c]	.64	.72	.61	.58	.66
Carbon tax-Food waste[d]	.00	.02	.03	.02	
Wind power-ClimateC	.28	.34	.40	.37	.44
Wind power-Food waste	.02	.03	−.02	−.05	
ClimateC-Food waste	.04	.03	.05	.07	

[a] Support for carbon taxes (only two items in 2018 and 2022).
[b] Norway should increase wind power.
[c] Concern about climate change.
[d] (In)frequency of discarding food waste.

Table 1
Model validity measures, multi-item constructs. N = 2073/2036/2029/2485/2009.

	2018		2019		2020		2021		2022	
	CR	AVE	CR	AVE	CR	AVE	CR	AVE	CR	AVE
ClimateC[a]	.78	.47	.79	.49	.79	.49	.82	.53	.78	.47
Food waste[b]	.84	.58	.84	.56	.85	.58	.85	.59		
Wind power[c]	.78	.64	.64	.48	.71	.56	.74	.59	.77	.63
Carbon tax[d]	.62	.45	.82	.60	.82	.61	.83	.62	.83	.72

[a] Concern about climate change.
[b] (In)frequency of discarding food waste.
[c] Norway should increase wind power.
[d] Support for carbon taxes (only two items in 2018 and 2022).

Table 3
Correlations between climate-relevant everyday behaviours, climate policy acceptances, and concern about climate change. N = 2073/2036/2029/2485/2009.

			2018	2019	2020	2021	2022
ClimateC[a]	<→	Carbon tax[b]	.66	.74	.75	.69	.68
ClimateC	<→	Wind power[c]	.29	.35	.45	.41	.45
ClimateC	<→	Food waste[d]	*.04*	*.03*	.06	.09	
ClimateC	<→	Red meat[e]	−.12	−.19	−.26	−.23	−.24
Red meat	<→	Food waste	−.17	−.18	−.20	−.16	
Red meat	<→	Carbon tax	−.14	−.25	−.32	−.28	−.31
Red meat	<→	Wind power	*.00*	−.08	−.14	−.09	−.16
Food waste	<→	Carbon tax	*.00*	*.02*	*.03*	*.03*	
Food waste	<→	Wind power	*.02*	*.03*	*−.02*	−.06	
Wind power	<→	Carbon tax	.25	.33	.41	.41	.42
Measurement model							
FW_4	<—	Food Waste	.77	.76	.76	.77	
FW_3	<—	Food Waste	.82	.81	.82	.84	
FW_2	<—	Food Waste	.77	.76	.79	.76	
FW_1	<—	Food Waste	.67	.67	.68	.70	
CC_4	<—	ClimateC	.70	.67	.70	.75	.69
CC_3	<—	ClimateC	.70	.69	.72	.78	.71
CC_2	<—	ClimateC	.68	.74	.69	.63	.63
CC_1	<—	ClimateC	.68	.69	.70	.74	.70
WP_2	<—	Wind power	.71	.56	.64	.70	.72
WP_1	<—	Wind power	.89	.80	.84	.83	.86
EC_1	<—	Carbon tax	.69	.86	.88	.87	.86
EC_2	<—	Carbon tax	.64	.77	.78	.80	.84
EC_3	<—	Carbon tax		.68	.68	.69	

Note: We used slightly different datasets to calculate the numbers in this table. The numbers for 2018 come from a calculation based on the 2018–2021 data. The numbers for each of the years 2019–2021 come from a calculation based on the 2019–2021 data. The numbers for 2022 come from a calculation based on the 2018–2022 data.
Model fit: 2019–2021: Chi-square = 1453.682, 215 df., p < .05. TLI = .95, CFI = .96, RMSEA = .030 (.028-.031). 2018–2021: Chi-square = 1749.769, 238 df., p < .05. TLI = .94, CFI = .96, RMSEA = .027 (.026-.028). 2018–2022: Chi-square = 1588.805, 121 df., p < .05. TLI = .90, CFI = .95, RMSEA = .034 (.032-.035).
Italic = not significant, p > .05.
[a] Concern about climate change.
[b] Support for carbon taxes.
[c] Norway should increase wind power.
[d] (In)frequency of discarding food waste.
[e] Red meat consumption.

significant with the expected sign and increasing until 2020, but it is only small to medium (Cohen, 1988). Correlations between policy acceptances and discarding food waste are generally non-significant and the only significant one (in 2021) is weak and in the opposite direction of what was expected. If anything, the negative correlation between acceptance of wind power and avoiding food waste in 2021 is consistent with a negative spillover between the two, but finding such exceptions from a general pattern when doing a large number of statistical tests can also be due to chance. Correlations between policy acceptances and meat consumption are generally significant and in the expected direction, and with a tendency to strengthen until 2020. Opposite to our expectation (H1b), the correlation between support for the use of carbon taxes and meat consumption is stronger than the correlation between meat consumption and avoiding food waste in all years.

4.2. Cross-lagged panel analysis

Structural equation cross-lagged panel modelling (CL-SEM) is used to study the development over time in the climate-relevant everyday behaviours and the climate policy acceptances and the pattern of behavioural spillovers between them. Four identical analyses were carried out, each of them on subsamples that participated in the study in two consecutive years: 2018–19, 2019–20, 2020–21, and 2021–22. The structural part of the cross-lagged panel model is shown in Table 4 and for better overview the significant paths are drawn in Fig. 4.

The cross-lagged (i.e., spillover) effects should be interpreted on the backcloth of the "stabilities" (as autoregression paths are usually called in panel models). These are all highly significant and mostly strong, the smallest standardized coefficient of such a path (red meat consumption in 2021–22) being .45. It appears that all constructs became more stable during the early years and less stable at the end of the covered period. The most stable is the acceptance of carbon taxes with stabilities from .90 to .98. The stabilities of the acceptance of wind power and the two climate-relevant everyday behaviours are at a more moderate level. A possible reason why the acceptance of the expansion of wind power was considerably less stable than the acceptance of carbon taxes might be controversies in Norway about the rapid expansion of wind power production capacity at the time of the study, among other things about violation of indigenous peoples' rights at the largest wind power production sites established in the same period (Korsnes et al., 2023).

Since autoregressive effects are controlled, significant cross-lagged effects mean that other independent variables account for *change* in the dependent variable. The expectation that there are more significant and stronger cross-lagged effects between the two everyday behaviours and the two policy acceptances than between everyday behaviour and policy acceptance (H2a) was only partly confirmed by the data. There

Table 4
Four 2-waves cross-lagged panel models of relationships between climate-relevant behaviours and policy acceptance, standardized coefficients. N = 1163/1427/1295/1128.

			2018-19	t	p	2019-20	t	p	2020-21	t	p	2021-22	t	p
FW2	<-	FW1	.65	22.320	<.001	.72	29.076	<.001	.60	22.160	<.001			
RM2	<-	RM1	.57	23.532	<.001	.59	27.285	<.001	.59	24.498	<.001	.45	15.969	<.001
WP2	<-	WP1	.59	15.038	<.001	.62	15.076	<.001	.76	22.391	<.001	.78	20.927	<.001
CT2	<-	CT1	.95	30.969	<.001	.96	49.015	<.001	.98	48.294	<.001	.90	33.253	<.001
RM2	<-	FW1	-.09	-3.496	<.001	-.09	-3.814	<.001	*-.03*	*-1.059*	*.290*	*-.04*	*-1.379*	*.168*
WP2	<-	FW1	*-.03*	*-0.931*	*.352*	*.05*	*1.676*	*.094*	-.07	-2.645	.008	*-.01*	*-0.296*	*.767*
CT2	<-	FW1	*-.02*	*-0.828*	*.408*	*-.01*	*-0.604*	*.546*	*.00*	*-0.248*	*.804*	*-.01*	*-0.371*	*.710*
FW2	<-	RM1	*-.04*	*-1.364*	*.173*	-.05	-2.238	.025	-.11	-4.168	<.001			
WP2	<-	RM1	*.01*	*0.198*	*.843*	*-.01*	*-0.415*	*.678*	*.02*	*0.609*	*.543*	*-.03*	*-0.911*	*.362*
CT2	<-	RM1	*.02*	*0.682*	*.495*	*.00*	*-0.276*	*.783*	*.01*	*0.782*	*.434*	*-.01*	*-0.531*	*.595*
RM2	<-	WP1	*-.04*	*-1.324*	*.185*	*-.05*	*-1.824*	*.068*	.07	2.240	.025	*.02*	*0.635*	*.525*
FW2	<-	WP1	*.05*	*1.690*	*.091*	*-.05*	*-1.577*	*.115*	*-.04*	*-1.105*	*.269*			
CT2	<-	WP1	*.00*	*0.120*	*.905*	*.02*	*0.967*	*.333*	*-.02*	*-0.847*	*.397*	*.04*	*1.672*	*.094*
RM2	<-	CT1	-.17	-6.233	<.001	-.14	-5.562	<.001	-.10	-3.551	<.001	-.12	-3.348	<.001
FW2	<-	CT1	*-.02*	*-0.526*	*.599*	*.04*	*1.451*	*.147*	*-.03*	*-0.790*	*.429*			
WP2	<-	CT1	.17	4.280	<.001	.14	3.905	<.001	.10	3.288	.001	.01	0.292	*.771*

Note: Non-significant coefficients (p > .05) are in italics and red colour. WP = Norway should increase wind power, CT = Support for carbon taxes, FW = (In)frequency of discarding food waste, RM = Red meat consumption. Model fit 2018-19/2019-20/2020-21/2021-22: Chi-square = 349.977/430.028/457.356, 156/198/198 df., p < .05. TLI = .98/.99/.98, CFI = .99/.99/.99, RMSEA = .023/.020/.023. The measurement model and other remaining output from the modelling can be acquired from the first author.

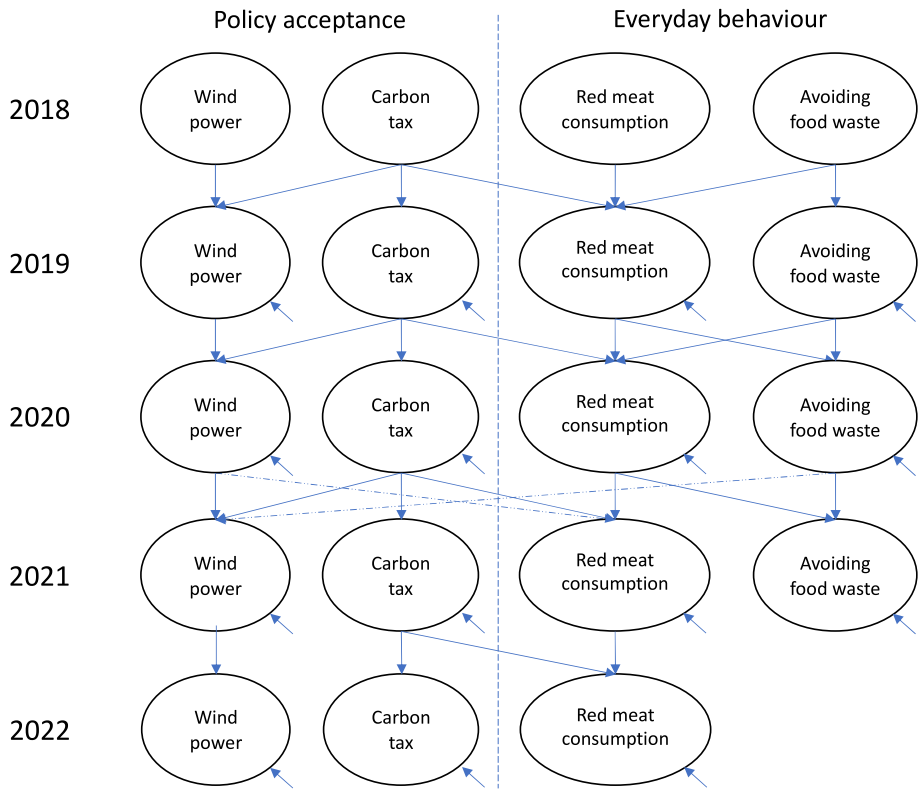

Fig. 4. Significant structural paths in the cross-lagged panel model of relationships between climate-relevant behaviours and policy acceptance in Table 4. Dotted line means opposite effect than expected.

were significant and positive cross-lagged effects between the two everyday behaviours during all years for which we have data for both behaviours. In the first two periods, there was a positive spillover from avoiding food waste to reducing red meat consumption and from the second period onwards there was a positive spillover from reducing red meat consumption to avoiding food waste. Also, in all periods except the last one, there was a positive cross-lagged effect from acceptance of carbon taxes to acceptance of wind power.

Unexpectedly, the cross-lagged effects from an everyday behaviour to acceptance of a climate-relevant policy were generally not significant. However, there was a significant cross-lagged effect with the expected sign from acceptance of carbon taxes to reduction of red meat consumption in all periods. Hence, it appears that in the present context climate policy acceptance accounted for changes in climate-relevant everyday behaviour, but not the other way around. Discarding food waste had a significant cross-lagged effect on the acceptance of wind power in one period, but the effect was weak and indicates a negative spillover, if any. The same is true for the cross-lagged effect from acceptance of wind power to red meat consumption in the same period.

In sum, it appears that when Norwegians make up their minds about climate-relevant regulation, their own climate-relevant everyday (food-related) behaviour does not play much of a role. However, their acceptance of carbon taxes appears to have a significant cross-lagged effect on red meat consumption and in the expected direction.

The cross-lagged effects are generally indicative of a positive behavioural spillover, that is, people tend to adjust climate-relevant behaviour and policy acceptance to be more consistent over time. Especially, consumers who avoid food waste are more likely to cut down on red meat consumption and consumers who have a low red meat consumption are more likely to reduce their food waste. Also, people who support carbon taxes are likely to increase their support for wind power over time. The two exceptions to this general pattern appear between acceptance of wind power and the two everyday behaviours in the 2020-21 period. In this period, people who wasted more food were more likely to increase their support for wind power and people who supported wind power were less likely to reduce their consumption of red meat. Besides this, people who support carbon taxes are more likely to reduce their red meat consumption.

4.3. *Are the spillover effects mediated through increased climate concern?*

Next, we investigate the extent to which the apparent spillover effects are mediated through the personal importance of mitigating climate change. Specifically, we investigate whether the cross-lagged effects identified in Table 4 and Fig. 4 are mediated through concern about climate change. The results of the four cross-lagged panel analyses with climate concern (measured at Time 2) as mediator are reported in Table 5.

As implied by the mediation hypothesis (H4), the inclusion of climate concern as an additional predictor of climate friendly behaviour and policy acceptance in the second wave in each CL-SEM analysis leads to several cross-lagged effects being attenuated and, in some cases, no longer significant. Further supporting H4, climate concern is consistently influenced by policy acceptances one year earlier, and in the last two periods also by either past red meat consumption or discarding food waste, and climate concern generally impacts policy acceptances and in one period also red meat consumption. However, climate concern has no impact on discarding food waste, and in one period also no impact on acceptance of wind power. Still, we find a range of indirect effects of a substantial magnitude, especially from the acceptance of carbon taxes (see Table 6).

5. Discussion

This article presents an analysis of the development in two climate-relevant everyday behaviours and the support for two types of climate policies in Norway from 2018 to 2022, focusing especially on "behavioural spillover," that is, whether a person's climate-friendly everyday

Table 5
Four 2-waves cross-lagged panel models of relationships between climate-relevant everyday behaviours and policy acceptance, with climate concern at the second wave as mediator. $N = 1163/1427/1295/1128$.

			2018-19	t	p	2019-20	t	p	2020-21	t	p	2021-22	t	p
FW2	<-	FW1	.65	22.267	<.001	.72	29.080	<.001	.60	22.163	<.001			
RM2	<-	RM1	.57	23.592	<.001	.58	27.189	<.001	.58	24.181	<.001	.45	16.034	<.001
WP2	<-	WP1	.57	14.102	<.001	.60	14.854	<.001	.76	21.961	<.001	.76	2.567	<.001
CT2	<-	CT1	.90	19.324	<.001	.91	33.446	<.001	.95	35.415	<.001	.87	26.376	<.001
RM2	<-	FW1	-.08	-3.325	<.001	-.09	-3.816	<.001	*-.03*	*-1.036*	*.300*	*-.04*	*-1.399*	*.162*
WP2	<-	FW1	*-.04*	*-1.192*	*.233*	*.05*	*1.670*	*.095*	-.07	-2.608	.009	*-.03*	*-0.949*	*.343*
CT2	<-	FW1	*-.02*	*-0.832*	*.405*	*-.01*	*-0.752*	*.452*	*.00*	*-0.267*	*.789*	*-.02*	*-0.703*	*.482*
FW2	<-	RM1	*-.04*	*-1.418*	*.156*	-.05	-2.270	.023	-.11	-3.989	<.001			
WP2	<-	RM1	*-.01*	*-0.238*	*.812*	*.00*	*0.009*	*.993*	*.02*	*0.594*	*.552*	*-.02*	*-0.756*	*.450*
CT2	<-	RM1	*.01*	*0.529*	*.597*	*.00*	*-0.144*	*.885*	*.02*	*0.973*	*.331*	*-.01*	*-0.336*	*.737*
RM2	<-	WP1	*-.03*	*-1.015*	*.310*	*-.05*	*-1.805*	*.071*	.09	2.994	.003	*.02*	*0.528*	*.598*
FW2	<-	WP1	.08	2.435	.015	*-.04*	*-1.448*	*.148*	*-.05*	*-1.401*	*.161*			
CT2	<-	WP1	*-.01*	*-0.402*	*.688*	*.02*	*0.779*	*.436*	*-.03*	*-1.267*	*.205*	*.03*	*1.344*	*.179*
RM2	<-	CT1	-.20	-4.645	<.001	-.14	-3.993	<.001	*-.02*	*-0.538*	*.591*	-.12	-2.796	.005
FW2	<-	CT1	*-.02*	*-0.435*	*.664*	*.04*	*1.156*	*.248*	*-.07*	*-1.584*	*.113*			
WP2	<-	CT1	*.08*	*1.382*	*.167*	*.01*	*0.161*	*.872*	.10	2.512	.012	-.09	-2.192	.028
CC2	<-	FW1	*-.01*	*-0.193*	*.847*	*.03*	*0.945*	*.345*	*.01*	*0.223*	*.823*	.09	2.950	.003
CC2	<-	RM1	*.03*	*0.967*	*.334*	*-.04*	*-1.571*	*.116*	-.06	-2.238	.025	*-.05*	*-1.516*	*.130*
CC2	<-	WP1	.14	3.904	<.001	.09	2.688	.007	.17	5.080	<.001	.11	2.906	.004
CC2	<-	CT1	.65	15.041	<.001	.64	17.023	<.001	.59	15.782	<.001	.52	12.559	<.001
FW2	<-	CC2	*.00*	*-0.079*	*.937*	*-.01*	*-0.310*	*.756*	*.07*	*1.658*	*.097*			
RM2	<-	CC2	*.07*	*1.623*	*.105*	*.00*	*-0.126*	*.900*	-.14	-3.694	<.001	*.01*	*0.153*	*.878*
WP2	<-	CC2	.14	2.460	.014	.20	4.376	<.001	*.00*	*.026*	*.980*	.18	4.503	<.001
CT2	<-	CC2	.09	2.186	.029	.08	3.022	.003	.06	2.257	.024	.07	2.402	.016

Note: Non-significant coefficients ($p > .05$) are in italics and red colour. CC = Concern about climate change, WP = Norway should increase wind power, CT = Support for carbon taxes, FW = (In) frequency of discarding food waste, RM = Red meat consumption. Model fit 2018-19/2019-20/2020-21/2021-22: Chi-square = 456.321/606.201/669.663/423.562, 171/214/214/107 df., $p < .05$. TLI = .96/.97/.96/.95, CFI = .97/.99/.97/.97, RMSEA = .038/.036/.041/.051. The measurement model and other remaining output from the modelling can be acquired from the first author.

Table 6
Indirect effects mediated through climate concern, based on the models in Table 5.

	Carbon tax	Wind power	Food waste	Red meat
2018-19				
Carbon tax 2	.085*	.015*	−.001	.003
Wind power 2	.115*	.020*	−.001	.004
Food waste 2	−.002	.000	.000	.000
Red meat 2	.043	.009	.000	.002
2019-20				
Carbon tax 2	.065*	.007	.002	−.003
Wind power 2	.193***	.021*	.005	−.008
Food waste 2	−.007	−.001	.000	.000
Red meat 2	−.003	.000	.000	.000
2020-21				
Carbon tax 2	.052*	.013*	.000	−.003
Wind power 2	.001	.000	.000	.000
Food waste 2	.040	.012	.000	−.004
Red meat 2	−.106***	−.026**	−.001	.008
2021-22				
Carbon tax 2	.045**	.008	.007	−.003
Wind power 2	.102***	.020*	.017*	−.008
Food waste 2				
Red meat 2	−.002	−.001	−.001	.000

* $p \leq .05$. ** $p < .01$. *** $p < .001$Significance of indirect effects estimated by JMP-Pro 17.

behaviours and policy support tend to spread to other areas over time (i.e., positive spillover). The two analysed everyday behaviours are red meat consumption and discarding food waste, and the two climate policies are the expansion of wind power in Norway and the use of carbon taxes to promote climate-friendly behaviours. Since both everyday behaviours and policy support are covered, it is also possible to analyse spillover between the two, an under-researched topic in this stream of research.

As expected based on prior research, we found that climate-friendly responses tend to be positively correlated and that climate-friendly responses are positively correlated with climate concern. This is consistent with the hypothesis that a climate-friendly response pattern tends to generalize over time, driven by the person's internalized beliefs about and evaluation of climate change. We also found that not all climate-relevant responses are equally correlated with climate concern, suggesting that participants associated some of them more than others with climate change. For example, in the studied population and context, most people apparently view carbon taxes directed at specific everyday behaviours (e.g., meat taxes, fossil fuel taxes, road tolls) as more climate-relevant than wind power and red meat consumption as more climate-relevant than discarding food waste.

Further, the cross-lagged panel analysis revealed that climate-friendly everyday behaviour and climate policy support in one area often leads to more consistent responses in different areas over time, that is, positive behavioural spillover. Few traces of negative spillover were found. Hence, it does not appear that climate-friendly everyday behaviour and climate policy are viewed as alternative (rather than complementary) means of mitigating climate change, or that either climate-friendly everyday behaviour or supporting climate policy can compensate for not doing the other. Still, as expected, correlations and cross-lagged effects tend to be stronger between different climate-relevant everyday behaviours and between support for different climate policies than across these two domains. The exception is the spillover from support for carbon taxes to reducing red meat consumption, which was at the same level as the spillover from avoiding food waste to reducing red meat consumption.

Consistent with meta-analytic evidence from RCT research (Maki et al., 2019), we found no positive spillover from the studied everyday behaviours to policy support. However, we found a quite strong spillover from support for one of the two policies (i.e., carbon taxes) to one of the two everyday behaviours (i.e., reducing red meat consumption). So, this research confirms that behavioural spillover can occur across these two domains but shows that it differs between both policies and everyday behaviours, and that it can go from policy support to everyday behaviour rather than the other way around.

The mediation analyses confirm the expected mediation of cross-lagged effects through climate concern but only identified a few

mediation (i.e., indirect) effects of substantial magnitude. When comparing the correlations in Table 3 to the indirect effects in Tables 6 and it appears that the size of the indirect effects depends on how strongly participants associate the different responses (i.e., everyday behaviours and support for policies) to climate change. For acting in a climate-friendly way or endorsing a climate change mitigation policy to make a climate protection goal more salient and important, people need to perceive them as climate-relevant, and the more climate-relevant the stronger the expected effect. According to Table 3, support for carbon taxes was more strongly correlated with climate concern than any of the other measured responses, which can explain why, according to Tables 5 and 6, it was also the strongest and most consistent source of indirect effects on other responses, mediated through climate concern.

Another important finding is that both relationships between constructs and their stabilities change over time. First, the measured responses became more strongly related to each other and to climate concern until 2020. Both everyday behaviours and policy support also became more stable until 2020, after which it varied. This pattern emphasizes the need to take societal or contextual factors into account that may facilitate or impede, and thereby moderate, pro-environmental behavioural spillover. Pro-environmental behavioural spillover is not happening in a vacuum, but in a context characterised by facilitators, impediments, and distractors (Thøgersen & Ölander, 2002). Behavioural spillover effects compete with institutions and habits as well as "lock--ins" created by the physical context, such as transport infrastructure, shopping possibilities, or the assortment in supermarkets (Thøgersen, 2023). To the extent that goal salience or importance mediate behavioural spillover, it is vulnerable to other important issues that can capture the public agenda and distract attention away from the goal or issue motivating the spillover. In the present case, it seems obvious that the disruption of the trend towards higher consistency in climate-relevant responses in 2020 was due to the COVID-19 pandemic, starting in the spring of 2020 and keeping its grip on public attention through most of 2021. Russia's attack on Ukraine in February 2022 was a further, major distractor. Both events effectively captured public attention and apparently reduced the attention to climate change among the Norwegian public. Thereby, they also seem to have reduced the strength of positive behavioural spillover between climate-relevant responses.

An important limitation that this study shares with other survey studies is that behaviour is self-reported rather than measured directly, which creates a risk of social desirability and other biases. We reduced the risk of biases primarily by asking very specific behaviour questions and prior research found little bias in similar self-reports (Vesely & Klöckner, 2020). Also, personal biases in responding should primarily lead to inflated stabilities in the cross-lagged panel analyses and therefore, if anything, lead to an attenuation of cross-lagged effects. Hence, it seems unlikely that the reported estimates of spillover effects are inflated due to such biases. Still, we encourage spillover research using direct measures of behaviour as far as possible.

Another limitation is that the study was carried out in only a single country. This makes the cross-country generality of the findings uncertain. Hence, we encourage replications of this research in other countries.

A third limitation is that our study only covers two everyday behaviours and two climate policies. Future research should analyse a wider range of everyday behaviours and policies and whether the match or mismatch between specific behaviours and policies matter for spillover. For example, in the present study the behavioural domains (red meat and food waste) do not match the policy domains (wind power and carbon tax), which may have reduced the likelihood of spillover compared to matching behaviours and policies.

6. Conclusion

This study further confirms the existence of positive behavioural spillover and it partly confirms that pro-environmental behavioural spillover depends on the similarity of the types of responses (everyday behaviours vs. support for different policies) (Margetts & Kashima, 2017; Thøgersen, 2004). It also further confirms that negative behavioural spillover is rarely a problem in practice. Hence, perhaps more than anything else, this study should reduce the worry that easy and simple pro-environmental behaviour makes people resist more radical and impactful changes (Raimi, 2021), which usually imply structural and/or economic policy interventions (cf. Sparkman et al., 2021). At least this does not seem to be the case in the studied context.

We also found that pro-environmental behavioural spillover depends on the context, including the societal focus on the issue (in this case, climate change) and other important issues competing for the limited attention of the public (Thøgersen, 2010). As illustrated by this study, no issue stays unchallenged at the public agenda forever and when society is hit by major disruptions, like a pandemic, an economic crisis, or war, the public's focus on even very important issues can be distracted, derailing further changes in behaviour motivated by the issue. When the issue is a major social problem that does not disappear on its own, and the disruption is temporary, it stands to reason that the issue can resurface on the public agenda, especially if it is high on the political and media agendas (Danner et al., 2022; Gilardi et al., 2022; Luo et al., 2019).

We expected, but did not find, significant spillover effects from climate-friendly everyday behaviour to the support for climate policy. However, we did not expect, but found evidence of spillover from policy support to everyday behaviour. A somewhat technical partial explanation for these findings is that support for carbon taxes was extremely stable in the studied context, which made little room for change in this variable to be explained by other variables. When it comes to support for wind power, the controversies about the siting of specific projects allegedly violating the rights of indigenous people might have influenced the spillover patterns. Hence, these findings cannot necessarily be generalized before they have been replicated with other climate policies and in other contexts. Be that as it may, according to this study, one should not expect that campaigning for voluntary, climate-friendly changes of everyday behaviour will necessarily lead to more support for climate policy. A targeted effort is needed to achieve that (Raimi, 2021). Still, it appears that policies can be so engaging that a higher policy support will also make people voluntarily change some everyday behaviours in a climate-friendly direction. This emphasizes the importance of engaging the public in the democratic process, participating in policy conversations, debates, and personal and joint reflections, also for promoting voluntary changes towards a more climate-friendly consumption pattern.

Declarations of interest

None.

Data availability

Data will be made available on request.

CRediT authorship contribution statement

John Thøgersen: Writing – original draft, Methodology, Formal analysis, Conceptualization. **Arild Vatn:** Writing – review & editing, Project administration, Methodology, Funding acquisition, Conceptualization. **Marianne Aasen:** Writing – review & editing, Project administration, Methodology, Funding acquisition, Conceptualization.

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Appendix A. Evidence from controlled experiments

The best evidence for causal effects between two constructs come from studies using controlled experiments (RCTs) or longitudinal data. This study uses longitudinal data, but for completeness we review evidence from RCTs in this appendix, since these are usually considered the strongest method for identifying causal effects (Carrico, 2021). However, it is often ignored that most RCTs on behavioural spillover suffer from important limitations, partly due to time constraints and the need to maintain a controlled context, partly due to other methodological shortcomings. These limitations and shortcomings are likely an important reason why a recent systematic review of intervention studies on behavioural spillover found no significant spillover effects in 140 studies out of 175 (Geiger et al., 2021).

First, studies using RCTs generally investigated the immediate effects of a manipulation on a response (e.g., Castro Santa et al., 2024), which makes them mute about spillover effects that take time to manifest themselves (Galizzi & Whitmarsh, 2019). Second, many used an intervention with a relatively weak effect on the first behaviour, which logically implies an even weaker indirect effect on other behaviours, and they were underpowered to detect the size of spillover effects that can reasonably be expected from the intervention (Geiger et al., 2021).

In addition, many of these studies lacked actual measures of both a triggering and a receiving behaviour, one or both being replaced by proxies. Especially, some studies used different frames for *reporting* one's past behaviour as the behaviour manipulation, assuming that the effect of a framing that leads the same past behaviour seem more or less frequent is similar to the effect of more or less frequent past behaviour itself (e.g., Lacroix et al., 2022; Noblet & McCoy, 2018; Sparkman et al., 2021; Werfel, 2017). On the receiving side, many studies used behavioural intentions as a proxy for behaviour (Maki et al., 2019). Using proxies can be reasonable and the research can lead to valuable insights, but it is uncertain to which extent results can be generalized to spillover from one behaviour to another.

In sum, more than anything else, the lack of significant indirect intervention effects reported by recent meta-analyses (Geiger et al., 2021; Maki et al., 2019) suggests that it is difficult to design behavioural interventions that, on top of their intended direct effects, generate positive spillover to other behaviours. Hence, more work is needed to refine experimental paradigms before RCTs are a useful means to estimate behavioural spillover effects in practice.

There is a lack of research using RCTs to study spillover between pro-environmental everyday behaviour and policy acceptance. The closest are four mentioned studies that manipulated the reporting of one's past behaviour as the behavioural intervention. Lacroix et al. (2022, Study 3) and Sparkman et al. (2021) found that increasing the salience of past pro-environmental behaviour increased support for a carbon tax, at least under some conditions. In contrast, Werfel (2017) found that Japanese participants who were randomly assigned to report their energy-saving actions following the shutdown of the Fukushima power plant (increasing the salience of these actions) were less likely to support a carbon tax than the control group who did not report their energy saving. Similarly, Noblet and McCoy (2018) found that residents of Maine, USA, who were randomly assigned to report their energy-saving and pro-environmental actions were less likely to support public investments in energy efficiency and renewable energy, but only if they scored low on intrinsic motivation to protect the environment. Other studies, using real behaviour in field experiments as "trigger," found no spillover effects on support for environmental policy from buying eco-labelled products (Lanzini & Thøgersen, 2014) or source separation of household waste (Xu et al., 2018a).

Field experiments

Some studies based on longitudinal field data involved an intervention (usually with matched samples since random allocation is rarely possible) while others just investigated the "natural" development in consumption patterns over time. For example, among the former, Lanzini and Thøgersen (2014) used a field experiment stretching over six weeks to test spillover effects from buying eco-labelled products to a range of other pro-environmental behaviours when participants received either financial compensation and incentives or verbal encouragement and praise for buying eco-labelled products. The study found a positive spillover from buying eco-labelled products on several low-cost pro-environmental behaviours. Using a similar paradigm, but with waste separation as the trigger and stretching over five months, Xu et al. (2018a) found positive spillover effects on five other, mostly low-cost pro-environmental behaviours. Further, Bergquist et al. (2019) found a positive spillover effect from saving energy to saving water among residents in student apartments in Umeå, Sweden, who participated in an energy conservation study, but only when energy saving was framed as an injunctive norm among their peers. Also, Carlsson et al. (2021) found that an information campaign over two years to reduce water consumption in Jerico, Colombia, had a positive indirect effect on electricity consumption, but only among those who were efficient water consumers at baseline. However, a 7-weeks field study in Lynnfield, Massachusetts, found no significant spillover effect on electricity consumption of a targeted intervention reducing water consumption (Tiefenbeck et al., 2013).

In "natural" field experiments, Sintov et al. (2017) found a significant increase in self-reported energy and water saving among residents in Costa Mesa, California, after they had begun to source separate compostable waste for kerbside collection, and Reams et al. (1996) found a significant decrease in recyclable litter after the implementation of kerbside recycling in Baton Rouge, Louisiana. Based on a three-year panel study, Xu et al. (2018b) found a positive spillover from source separation of household waste to electricity saving in Hangzhou, China, when residents received environmental education, but negative when they were encouraged by monetary incentives. However, Suffolk (2016) found no spillover effects on other energy-related behaviours from home energy efficiency improvements supported under the Welsh Government's Arbed scheme for low-income and fuel-poor households in Wales. Similarly, in a series of studies, research at Cardiff University, UK, found no spillover effects on other behaviours of the reduction in the use of plastic carrier bags after the introduction of a bag charge (Poortinga et al., 2013; Thomas et al., 2016, 2019).

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