THE ROLE OF MISPERCEPTIONS IN FIGHTING

CLIMATE CHANGE

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ABSTRACT

Fighting climate change is one of the most important tasks of our age. While producers should bear responsibility, it is also important to focus on consumer behaviour, since desired behaviours are not prevalent yet. One explanation for this is incorrect beliefs driving consumer behaviour. The existing literature has identified two misperceptions among the general public that contribute to a lack of social action. First, people seem to underestimate the severity of the issue and the difference that behavioural changes can make. Second, people seem to underestimate others' willingness to change their behaviour. As a consequence, they might have wrong perceptions of social norms, preventing them from contributing – more – to public goods. Correcting these misperceptions often helps with changing behaviour. And, with efforts to inform consumers on the rise, it is important to evaluate the effectiveness of different information campaigns.

This thesis provides – to the best of my knowledge – the first systematic review of the literature examining these two misperceptions. The second misperception seems more important to correct as it more effectively brings about behavioural change. Still, I find that information interventions are not enough, and stricter policies are needed to sufficiently combat climate change. I also argue, however, that having well-informed citizens has other advantages such as increased support of climate policies. This, in turn, may also increase the acceptance of harsher measures like taxes. I conclude that information interventions to correct consumer misperceptions can be an effective tool to complement stricter policies and to help increase support for climate policies.

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INTRODUCTION

Climate change is a pressing issue, with greenhouse gas emissions, such as carbon, being the major contributor to anthropogenic climate change (Intergovernmental Panel On Climate Change 2014). Addressing behaviours that result in substantial emissions has become increasingly important. The goal is to limit the increase in average temperature before 2100 to 1.5°C (compared to pre-industrialisation levels) in order to prevent further irreversible damages (IPCC 2022). Even though almost all countries have signed the Paris Agreement, to commit to this degree target, there is currently insufficient action to obtain this goal (UNEP 2019). While producers bear a big responsibility, so do consumers. Existing research suggests that most people are aware of man-made climate change and are also willing to act against it (e.g., Camilleri et al. 2019; Diamond, Bernauer, and Mayer 2020; European Commission, Directorate General for Climate Action 2021; Van Valkengoed, Steg, and Perlaviciute 2023). Thus, the question arises: why is there a lack of social action?

One explanation is incorrect beliefs driving consumers' behaviour. The existing literature has identified two misperceptions among the general public that contribute to the lack of social action. First, people seem to underestimate the severity of the issue and the difference that behavioural changes can make. Second, people seem to underestimate others' willingness to change their behaviour. As a consequence, they might have wrong perceptions of social norms, preventing them from contributing (more) to public goods. At the same time, it is an open question which misperception is more important to correct.

The assumption is that correcting these misperceptions will help with changing behaviour. It is, therefore, important to evaluate the effectiveness of different information campaigns. While efforts and initiatives are on the rise to inform consumers of externalities and emissions related to their consumption behaviours, desired behaviours are often not prevalent. These efforts include examples such as the EU Ecolabels, and other forms of labels indicating the carbon impact of consumer products and services (Taufique et al. 2022). Thus, it is important to understand why existing campaigns were not successful in inducing behavioural change and what could be alternative ways of informing consumers.

In this thesis, I explore whether one of the identified misperceptions is more important to be corrected – and why – and whether solving one could help with correcting the other. By bringing together the literature on misperceptions, I aim to discover implications for more effective policies, targeting these. I argue that it is more important to correct beliefs about the willingness of others to change consumer behaviour. This argument derives from work in cognitive science and economics on collective action problems as well as the importance of social image concerns. First, an individual alone will not make a difference in fighting climate change. Hence, if someone believes that others are not willing to contribute their part, there is little to no point in changing one's own behaviour. Moreover, what other people think of us, and our actions, can have strong motivational effects. Hence, correcting the misperception about others' willingness to do more might create social pressure on the individual to also do more.

To make my point, I bring together empirical and experimental evidence on the different misperceptions and conduct a careful in-depth systematic analysis of existing studies. Existing studies have focused on studying one misperception at a time. Since these are conducted in different contexts, this comparison helps to gain an overview of underlying patterns in consumer behaviour in different contexts and the effectiveness of information provision. Economic studies (e.g., Andreoni et al. 2002, Falk et al. 2018) have shown that humans are generally altruistic, although preferences vary across the globe. As such, people are often willing to consume in more responsible ways, taking into account the externalities that their consumption choices impose on others. This work provides the base for the comparison of the studies that I use.

If consumers do not respond to the efforts used for correcting a misperception (e.g., the carbon emissions of specific products), these efforts should be used elsewhere to combat the issue more effectively. Similarly, informing people about the willingness of their community to contribute should depend on whether there is a behavioural impact from the information provision.

Arguably, because fighting climate change requires collective action, correcting the misperception of how severe the problem is, without changing the perception of social norms, will not be enough. Policy implications might include targeting information about environmentally positive actions, and making mandatory information disclosure about CO2 emission or energy use on packaging. This should depend on which misperception is more important, and whether correcting it has an effect on the other. Research like this is important for knowing what area to target policy on. Furthermore, harsher measures such as taxes, bans and subsidies take time, are costly and hard to implement due to political opposition. Hence, if another way of limiting greenhouse gas emissions – such as information campaigns – is effective, this should be explored (Imai et al. 2022). While most existing labels inform the consumers regarding their misperception of how harmful certain products are, some studies also look at the second misperception, namely the underestimation of social norms.

This thesis proceeds as follows. The next section will be devoted to two separate analyses of the existing literature and their evaluations. Then, I will move on to discussing the limitations of these studies and their limitations. Lastly, I will point out the policy implications of the presented results and bring in other insights.

SYSTEMATIC REVIEW OF LITERATURE AND CLASSIFICATION: THE ROLE OF MISPERCEPTIONS

One explanation for the lack of action is incorrect beliefs driving consumers' behaviours. Correcting the misperceptions causing environmentally harmful behaviours – if effective – would be favourable, because, it is cheaper, faster and easier to implement than harsher measures such as taxes (Taufique et al. 2022). Furthermore, the side effects or harm caused if done incorrectly seem less costly and more easily correctable. If one chooses a tax that is too high, that can have drastic consequences since people might no longer buy it. Because of this possibility of unfavourable consequences, it might be better to not even try to find the optimal tax.

Scholars have identified two types of misperceptions. The first one is about how much a product or certain behaviours contribute to climate change. This first misperception can be categorised into two groups based on whether the study is effective or not. The second misperception is regarding social norms, and others' willingness to act against climate change. In most cases, there is an underestimation of both. Scholars have tried to provide information to subjects to correct these misperceptions and achieve behavioural change.

Misperception I.

I categorise the following studies looking at the first misperception into two groups for the analysis: those successful in achieving behavioural changes, and those not. Information provision – regarding the harmfulness of a product or behaviour – changed behaviour of consumers (Rodemeier and Löschel 2022), in particular of those consumers who were sceptical about scientific findings (Diamond et al. 2020). Whether or not information provision affects behaviour also depends on how precise it is. Other studies do not find that behavioural change followed information provision. While some of these studies are in different contexts, both geographically and regarding the concrete product or behaviour, it is interesting to still look at them together, since if the behaviour is similar in different contexts then that can have broader implications. Lastly, it is important to note that the malleability of behaviour varies with the context; that is, consumers are more stubborn with consuming certain products.

Diamond et al. (2020) study the support for climate policies and foods containing genetically modified organisms (GMOs). For both, GMOs and climate change, there seems to be a large gap between scientific consensus and public opinion. Diamond et al. (2020), therefore, run a representative survey experiment in the United States and Germany to examine if information provision can bring public opinion closer to the scientific consensus. By providing different messages, from scientific and governmental sources to the treatment groups, they test whether information provision has an impact on their evaluation of the importance of climate change and GMOs. Moreover, Diamond et al. (2020) investigate whether this change depends on the source of the information. They measure how strongly beliefs are held on a scale of 1-6, thus scoring low would result in weakly-held beliefs. They find that individuals whose weakly-held prior beliefs opposed the scientific consensus, state policy preferences that are more supportive of the scientific opinion in response to the provided information. While they also looked at prior beliefs, such as trust in science and in the source of the message, they do not find overall evidence that the source of the message is directly relevant.

There are, however, several concerns with their measurement and methodology in Diamond et al. (2020). They measure the impact of the information provided by the respondent's rating on a scale from 1-6 on how well certain statements describe them. First, since no action is required, the participants' dedication to the alleged support of policies is questionable. Second, respondents might sense what answer is expected – e.g., proenvironmental behaviour – and might give a response accordingly. Once they return to the setting they come from, possibly with fellow climate sceptics, this might change again. Third, the survey itself was conducted in 2016, and as newer reports show, today there seems to be both more awareness and consensus regarding scientific facts about climate change. Thus, while this study might find a small but positive effect of information provision on climate support, the magnitudes of these effects might change with fewer sceptics of science (Painter et al. 2023). Furthermore, it seems those sceptical about man-made climate change today, have more strongly held beliefs, and it would be harder to change these beliefs.

Rodemeier and Löschel (2022) study whether informing consumers about the energy efficiency of LED lights compared to alternatives increases demand for more efficient products. As information provision is used to complement taxes and subsidies, they look at whether these are truly effective and optimal. In a large-scale field experiment, they provide information provisions regarding the energy efficiency or the financial benefits. There are three information groups, one receiving a less informative information intervention, the second receives a more informative one, and the third do not receive any. The less informative information was that LEDs are 90% more efficient compared to incandescent. The more informative one was that this 90% efficiency corresponds to 11 euros annually. Interestingly, they find that providing less accurate information leads to higher demand of LEDs compared to no information at all. However, if more accurate information is provided consumers would choose less efficient products. This is because with less-precise information, while the misperception of which product is better might be corrected, a new one is created: an overestimation of the benefit (what the 90% corresponds to). This new misperception might result in "better" behaviour from a social and environmental perspective. Thus, if pro-environmental behaviour is the objective, in some cases less precise information will lead to behavioural changes.

While Rodemeier and Löschel's (2022) study has valuable insights, some concerns still arise, especially regarding its sample selection, generalizability and ethics. The paper does not

claim to be representative, and some of these concerns are unavoidable due to the nature of the field experiment. However, when looking at the findings, we should keep in mind that the results might be impacted by sample selection bias. This is because people who go online to the shop's website, already have preferences. While the researchers exclude consumers buying in bulk – assuming they are buying for a company – but others might also have preferences. Furthermore, there was no check for whether the consumer saw the message and understood it. Additionally, regarding the implication of the informativeness of information labels, there is no explicit note on the ethical considerations. Information interventions aiming at changing behaviour can have unintended consequences. This power puts the policymaker or label designer in a position where they influence the consumers' choices, and this power can be abused. An example of this is greenwashing: producers make their products seem environmentally friendly when in fact this is not true. Thus, even if we achieve socially favourable impacts, using labels to mislead consumers on purpose has ethical concerns.

The second group of studies are cases where information provision did not lead to behavioural changes. Staying in the lightbulb market, Allcott and Taubinsky (2015) look at whether correcting misperceptions would be enough to encourage consumers to switch to energy-efficient products. This is because they find that incomplete information or inattentiveness to energy costs causes energy inefficiency (Allcott and Taubinsky 2015). For this, they conduct two experiments, one with a nationally representative online platform, and one natural field experiment. In the first experiment, consumers choose between two options: one more and one less energy efficient one at different prices. The respondents are then randomly assigned an information treatment, after which they make their choice between the two options. Allcott and Taubinsky (2015) find that many still chose the costlier option even though the respondents understood the information, namely that one option is better than the other, both in terms of personal and environmental benefits. They find that people don't adapt easily even if the alternative would be cost-efficient. They point out that this raises concerns about the effectiveness of information-disclosing labels. However, it also raises concerns about the experiment itself.

Even though this particular case might no longer be relevant, the point could still stand. The lightbulb market changed and LEDs are more popular and overtook the energy-efficient option of the experiment, the adaptation period was quite long. Thus, although the exact light types change, human behaviour most likely does not – or at least not as much as the product preference. However, several other issues arose regarding the effectiveness. In a normal setting where the shop does not check whether consumers understood the information and the consumers have further distractions, the attempts to correct misperceptions seem even more ineffective. Allcott and Taubinsky (2015) argue that this is partially due to incomplete information or inattentiveness, but simply correcting these is not enough. However, if correcting these does not help, how do we know that it was about incomplete information or inattentiveness in the first place? Another way to look at it is that human perceptions are on several levels. There are misperceptions that can be corrected on a superficial level – for the duration of an experiment, or part of it, but there are underlying more deeply-rooted beliefs which were not changed. I will expand on this in the section on the directions for future research.

In a different context, Imai et al. (2022) examine the impact of beliefs about the carbon impact on demand for consumer products. First, in a climate survey, they elicit beliefs about carbon emissions, and they find widespread underestimation of several products' carbon emissions, although the heterogeneity in estimates is large. They also find that respondents are willing to pay to offset the carbon impact, but this varies with groups. In an experiment with meat consumption, they find that correcting the misperception regarding carbon emissions is not enough to achieve behavioural change with beef products. This is true even for contexts where there are large misperceptions, and respondents claim to be willing to pay to offset emissions. This lack of response to the information correction is a common finding. Imai et al. (2022) report other studies which found either small and short-term effects or got null results, with certain products such as detergents (Imai et al. 2022; Kortelainen, Raychaudhuri, and Roussillon 2016). This finding is particularly important as it points out the fact that information provision will have different effects in different contexts, and meat consumption seems to be one, with which consumers are more stubborn. The concern that arises with this study, is whether they truly changed the underlying beliefs. In the survey it seems like respondents had to essentially memorize the right answer for a given product/behaviour emissions. Thus, giving a correct answer might not reflect them truly understanding and changing more deeply rooted beliefs about carbon emissions, but rather correcting the misperception on a more superficial level, more memorizing than understanding.

There are several overarching concerns that arise with the previous studies, these include lack of long-term effects, decreasing sceptics who drive the results and context dependence. The concern regarding the lack of long-term interventions, and checking of effects arise with several studies (Allcott and Taubinsky 2015; Diamond, Bernauer; Mayer 2020; Imai et al. 2022, and Rodemeier and Löschel 2022). Since it is only a one-time short-term information intervention, it would be interesting to see whether there would be a behavioural effect change if the information intervention is repeated. Included in this is whether the misperceptions and the underlying beliefs are truly changed. As with the previously mentioned studies, it is not clear whether beliefs were actually changed. In the context of Diamond et al. (2020) for example, there is no examination of whether respondents are more likely to buy something that has a GMO label on it, or whether respondents continue to have their beliefs in line with the scientific consensus. Another common concern is that the results – when information intervention is effective – are driven by those who were sceptical (Diamond, Bernauer, and Mayer 2020; Rodemeier and Löschel 2022). There are more and more people are

aware of man-made climate change, and the number of sceptics is changing. Similar to the concern with Diamond et al. (2020), if the number of people unaware or sceptical about manmade climate change is shrinking, so would the effects driven by them. However, it also seems that one possibility is that the effect is driven by those who have never really thought about climate change and were relatively open-minded. If these respondents are all convinced and the sceptics left have strong opinions and will not react to any information and then the intervention might be ineffective. Furthermore, it seems from Painter et al. (2023) that while science scepticism is shrinking in some ways but it is also changing into response scepticism, which is more about our ability to act against climate change. Furthermore, the results in terms of the country context, were similar in general in the European and the U.S. samples, suggesting that information intervention effects are broadly similar in different contexts. However, the countries are also similar in many ways, thus generalizations should not be made without caution.

Overall, the findings are that providing information to correct misperceptions regarding the severity of the issue and the difference that behavioural changes can make are not enough to generally achieve behavioural effects. There are cases where information provision is successful but it depends on the type of information, the way it is presented, and prior beliefs, but these findings are a minority. In the experiments, there were checks to make sure that the respondents understood the content in most cases, however, while shopping many might have many further distractions, limiting their comprehension. While the context – geographical and product types – are different, the fact that effects are consistent, suggests that information is not as effective for changing demand as anticipated. While in most cases not effective to achieve behavioural change, information provision should not be completely disregarded. There is evidence that while it is not enough for behavioural change, it could help climate policy support, and shrink the gap between scientific consensus and public opinion (Diamond, Bernauer, and Mayer 2020). Furthermore, in the long run, there might be other advantages that come with having more informed consumers (Imai et al. 2022).

Misperception II.

While increasingly more people are becoming aware of the pressing issue of climate change, another misperception that persists is regarding social norms. There is a growing literature on how observability (Kraft-Todd et al. 2015) and social norms interventions (Nolan 2021; Farrow, Grolleau, and Ibanez 2017; Nyborg 2018) can motivate action. Specifically, in the case of environmentally friendly behaviours. From the existing literature, it seems that similar to the first misperception, there is an underestimation of the prevailing social norms. This could be a driving reason why the desired behaviours are not prevalent. If people underestimate others' willingness to act against climate change, and the prevalence of climate-friendly behaviours this could cause them to partake in fewer pro-environmental behaviours. Furthermore, consumers do not fully internalise the externalities of behaviours. It is also in this way that climate change is a collective action problem.

First, to clarify, a social norm refers to behaviours and beliefs that are prevalent. The literature distinguishes descriptive norms, which refer to the prevalent behaviour (i.e., "what others do;" see Farrow, Grolleau, and Ibanez 2017), and injunctive norms, which are about what people think should or should not be done (i.e., "what most people approve of doing;" see Farrow, Grolleau, and Ibanez 2017). These prevalent beliefs and behaviours are examined in this second part, as these studies examine whether correcting misperceptions regarding descriptive or injunctive social norms, creates change in behaviour.

In the following, I review two studies that find a positive effect of information provision about social norms on behaviour. Andre et al. (2022) investigate predictors and motivators for individual willingness to fight climate change in a large, representative, US sample (N=8000).

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This is important because they observe misperceptions regarding prevalent behaviours and social norms, as they are systematically underestimated. They check whether information provision can correct the misperception and motivate behavioural change. They do this by collecting data in two phases. The first phase forms the basis for the descriptive analysis and provides the information presented in the treatments in the second phase. Then, in the second phase, they include an experiment with two treatments and a control group. Respondents receive information on perceived behaviour: the proportion of the population trying to fight climate change (descriptive norm) or information on perceived norms, that is, information about people thinking that the population should try to fight climate change (injunctive norm). Then through an incentivized donation experiment, where respondents divide 450 dollars between themselves and an organisation of choice that fights global warming, they measure willingness to fight climate change. They find that several human traits such as altruism, patience, positive reciprocity and moral universalism predict the willingness to act. These traits are based on the Global Preferences Survey (Falk et al. 2018). As the term "fight climate change" is quite abstract, Andre et al. (2022) check for more concrete behaviours and find that there is an underestimation of these as well, such as reducing meat consumption, and airplane and car use. They find that correcting the misperceptions can have a positive effect on respondents' willingness to contribute to the fight against climate change.

Similar to the concerns regarding the lasting effect of the first misperception, long-term effects also arise as a question in Andre et al. (2022). There is no follow-up to see whether the respondents' underlying beliefs actually changed. Furthermore, although they check for a set of concrete behaviours such as reducing meat consumption or avoiding flights, the next step would be to see whether these changes actually happen. While they suggest that large-scale information provision efforts, such as campaigns that are repeatedly announced could be a solution, there was no check for this. Similar to previous studies, the treatments are mostly

effective for climate change deniers and sceptics. The positive treatment effect is "almost entirely driven by those individuals whose prior[belief]s are below the actual shares" (Andre et al. 2022, 22). Thus, it is only effective in a context where social norms are underestimated. In uncertain cases, since they do not find a backfiring effect, there seems to be no risk. Lastly, they try to capture the trade-off respondents face when acting against climate change by having to give up some of their money. However, there are cases where climate-friendly behaviour is less costly – in terms of monetary value, more efforts might be required in the transitioning period. Perhaps this is also an unidentified misconception, that climate-friendly behaviour is always costly.

Allcott's (2011) paper adds to the academic work showing that correcting misperceptions regarding social norms can help conserve energy. By examining data from large-scale randomized natural field experiments in the US (N=588,446), the paper finds statistically significant effects of informing people about social norms. The paper evaluates a company's – OPOWER – success in creating behavioural effects by comparing the energy consumption of households to their neighbours and providing tips in letters they mail over the course of two years. The effects are constant during this time. Importantly, there is no back-firing effect found: low-consumption households do not increase their energy usage when informed about the treatment, namely being below the average, the social norm. Overall, the finding is that non-price interventions such as sending letters with information about where the household is compared to the prevalent social norm, along with energy-saving tips and an injunctive norm intervention can be successful in achieving behavioural change. This is most effective with those whose energy use is higher than their neighbours. Converting the results into price increase effects, they calculate that the treatment is equivalent to an 11-20% short-term and 5% long-term price increase.

It is a remarkable study as it covers a much larger sample size than previous studies, and it goes on for a longer period of time. However, it is important to note, that it is questionable how many companies are willing to take part in such a programme in the first place. Although it is a low-cost intervention, on such large scales, providing detailed information – including personalised energy-saving tips – there are efforts with it, and it should be supervised, by possibly several people.

Overall, it seems that correcting the second misperception has more reliable behavioural effects. Thus, it seems to be more important to correct beliefs about social norms and the willingness of others in order to change consumer behaviour. Besides the previous analysis, this argument derives from work in cognitive science and economics on collective action problems as well as the importance of social image concerns. First, an individual alone will not make a difference in fighting climate change. Hence, if someone believes that others are not willing to contribute their part, there is no point in changing one's own behaviour. Moreover, what other people think of us, and our actions, can have strong motivational effects. Hence, correcting the misperception about others' willingness to do more might create social pressure on the individual to also do more. I explore these premises further in the section discussing policy aspects.

DIRECTIONS FOR FUTURE RESEARCH AND LIMITATIONS OF EXISTING WORK

There is more and more focus on climate change and the literature on the identified misperceptions is growing. However, as discussed in my analysis, there are some systematic limitations of existing work. Future research should aim to correct the concerns arising from previous studies. One overarching concern is that of correcting the misperception vs. the underlying beliefs, as it seems that while some studies claim to correct the misperceptions, they do not correct more deeply rooted beliefs. And this causes the lack of behavioural change to information interventions. Another overarching concern is checking for long-term effects, as most – studies only have a one-time short-term experiment. Furthermore, the context problem arises due to similarities of the examined Western countries. Lastly, looking more into variables, such as age, gender, education, and ethnicity might also uncover reasons for the lack of action.

One limitation is the uncertainty of whether deeply rooted beliefs are truly changed and not just misperceptions on a more superficial level. These two are not distinguished in the literature yet, but it is one of my contributions to look at them separately. In some cases where studies try to correct misperceptions, the information intervention is not successful even when there is a check to make sure respondents understood correctly. Thus, as I argued before one possible explanation could be that there are deeply rooted beliefs, which can come from upbringing, the parents' views, what one sees in the media again and again, forming beliefs that we might not even be aware of. And since some studies in the process of making the treatment clear they do not check whether the underlying beliefs are changed. In some cases participants might even sense the expected answer, or simply memorize what is expected. One way to check would be with longer term studies, to repeat the questions after time passed, if the answers are the same or similar then the underlying beliefs have likely been changed.

Some of the covered studies claimed that they changed beliefs. However, as noted in the analysis these claims seem to be questionable. Findings on understanding that climate change is a threat show that most people – in this case in Europe, but there are also results from the US – are aware of the existence of man-made global warming and that they find it an important issue. The European Commission's report of 2022 shows that a large majority (80-90%) believe climate change to be a serious - or very serious - problem (European Commission. Directorate General for Climate Action. 2021). Regarding environmentally friendly behaviours, they find that almost all (96%) of Europeans have taken action to help fight climate change. This, however, does not tell us how often they take part in these behaviours, and the respondents might exaggerate their contributions, as they sense - or know from other sources - that this is the desired behaviour. Furthermore, it might be driven by incorrect information. For example, while recycling is often a desired behaviour, reducing waste is much more important. Similar to the studies presented before there are cases where consumers do not have the right idea about how harmful certain behaviours and products are. Thus, there can be an exaggeration of what consumers think their contribution has, with environmentally friendly behaviours. And an underestimation of the effects harmful behaviours have. As an overall overestimation of consumers understanding of how everyday objects work is an occurring phenomenon (Camilleri et al. 2019, Attari, Poinsatte-Jones, and Hinton 2017), this could also be the reason why they severely underestimate certain behaviours' harm to the environment.

Part of the problem is, that although it is clear that there are misperceptions, the way to correct these remains uncertain. Some studies achieve limited success. But even if there was an attempt to change the misperception, it seems like the deeply rooted, inaccurate beliefs did not change. This concern also arose in the analysis, specifically regarding the study by Allcott and

Taubinsky (2015), since even after checking whether the consumer understood the treatment, the consumers chose the less efficient product. It seems that people's understanding of the existence of the problem – climate change – does not mean they have an accurate idea about the actual emissions, the severity of the issue, or how harmful certain behaviours are. This lack of awareness might lead to reducing some less harmful behaviours, but sticking to some relatively more harmful ones. Furthermore, it might drive more deeply rooted beliefs. The reason why raising awareness is not enough, is that if it is only in the short-term, they might not actually change the beliefs.

Another arising concern was the lack of checking for long-term effects. One way to check whether the beliefs are actually changed in the long-term and not only in the short term, is to conduct research with follow-up questions, examination and even interventions. Uniquely in Allcott's (2011) paper, we see this, as the study looks at interventions for two years and finds these to be constantly effective. Thus, changing beliefs and misperceptions in the long-term should be explored in more detail.

Furthermore, while the findings so far, in terms of behaviour are similar from different contexts, the scope is limited to mostly Western countries and other areas should be encouraged as well, since climate change is a global issue. However, it is important to note that the global north is more responsible for climate change and we should bear the burden of responsibility.

Lastly, differences in risk perception have been explored by Slovic (1999) along the lines of characteristics such as gender, race and age. While these are more context-dependent, since being a minority or having social stability can influence the sense of security and risk, regardless further research could also investigate these more. Similar to other contextual and environmental factors (Farrow, Grolleau, and Ibanez 2017). This is in line with Ostrom's theory on cooperation, and that contextual variables should be further explored (Ostrom 2000).

Further adding the need of understanding better the processes of learning and teaching of social norms and how different cultural and institutional settings might have an impact (Ostrom 2000).

POLICY IMPLICATIONS

Regarding the policy implications, several aspects need to be considered. These include the findings in cognitive science regarding promoting cooperative behaviour, whether information provision could be enough and the positive externalities of well-informed citizens.

The findings from cognitive science are in line with the results of the analysis. Kraft-Todd et al. (2015) argue that social interventions, such as information about the observability of behaviour, are consistently effective as opposed to what they call "cost-benefit interventions". They define cost-benefit interventions as interventions that "seek to change the (actual or perceived) costs and benefits of cooperation to increase its attractiveness: material rewards decrease the cost to the actor, and increased efficacy increases the benefits to the recipient" (Kraft-Todd et al. 2015, 96). Since climate change is a collective action problem, cooperation is the desired behaviour, Kraft-Todd et al. look at how this can be best achieved. They elaborate that social interventions include actions observable by others, or about the contribution and behaviour of others (descriptive norms). Furthermore, cost-benefit interventions are cases where an individual either receives material rewards to make the contribution less costly, or efficacy is increased by matching the funds donated to increase the benefits (Kraft-Todd et al. 2015). They argue that this is because of human traits such as reciprocity, and the anticipation of future consequences for choices that happen in the present. Furthermore, since these operate on a more intuitive level, engaging emotional processes increase cooperation. The impact of social norms interventions is also backed up by (Nolan 2021; Farrow, Grolleau, and Ibanez 2017; Nyborg 2018). Combining these findings with the results of the previous analysis, it seems reasonable to state that the second misperception is more important to correct as it more effectively and reliably brings behavioural change. Thus,

if the goal is achieving consumer behavioural change, information interventions regarding social norms and behaviours should be preferred.

While the results of social interventions seem promising, it is important to keep in mind that these effects are not enough. Although compared to cost-benefit and information interventions regarding the first misperceptions, social interventions are more successful, the effect is often still small. Furthermore, although the studies in the analysis found a positive effect, these were not big enough considering how drastic changes would be necessary to effectively fight climate change. For more effective changes stricter policies are needed to sufficiently combat climate change. An example of this could be taxes on environmentally harmful behaviours and on carbon – for both of which there is vast literature.

This, however, does not mean information provision should be completely disregarded. The effects of social and information interventions are not enough to completely change behaviour to be more environmentally friendly on a social level. However, efforts such as "large-scale information campaigns that repeatedly announce and effectively communicate the actual prevalence of climate norms" (Andre et al., 2022, p.27) can still be useful. This is bringing up a previously raised limitation of existing studies; namely, that most do not check whether repeating the message would make it more successful. And since these interventions are quite low cost, they would serve as great complements for stricter policies like taxes.

A debated alternative option to complement stricter policies would be nudges, such as setting the default choice for cooperation and pro-environmental behaviour (Kraft-Todd et al. 2015; Benartzi et al. 2017). This way individuals would have to purposefully put effort into not cooperating. Here, however, besides the potential success, moral issues arise as nudges can be viewed as paternalistic.

Furthermore, there might be positive externalities of well-informed citizens that were not checked - especially regarding the first misperception. Such as reinforcing other environmentally-friendly behaviours. This only works if the misperception is truly corrected in the long-term. Several studies point out that information provision can raise support for climate policies (Andre et al., 2022.; Diamond, Bernauer, and Mayer 2020) and since political opposition is often the obstacle, this would be desired. It may also increase the acceptance of harsher measures like taxes. Furthermore, it might lead to other desired behaviours, or a motivation to learn more about pro-environmental behaviours. As Allcott and Taubinsky (2015) also point out that price-based solutions are in some cases not politically feasible. If correcting misperceptions regarding climate-friendly behaviours and norms can help this might be one way how information provision not only complements but aids other measures, which is an argument also made by Andre et al. (2022). Furthermore, understanding the issue of climate change correctly is important, since policymakers are responding to public opinions (Slovic 1999). Thus, while not all information interventions were successful, they are still important and should not be disregarded. We should rather find ways of more effectively informing consumers and correcting their misperceptions.

Lastly, Bolderdijk and Jans (2021) point out ways in which minority behaviour can influence the majority. Thus, if small behavioural change is created and encouraged, it might further indirectly lead to bigger changes, as others implement it too.

CONCLUSION

This thesis systematically analysed and reviewed the literature examining the two misperceptions among the general public that have been identified to contribute to the lack of social action to address climate change. Previous literature has found that there are two misperceptions. First, people's underestimation of the severity of the problem and the difference that behavioural changes can make. Second, people underestimate others' willingness to change their behaviour. This thesis argued that overall efforts to inform consumers and correct the misperceptions are by themselves not bringing as much behavioural change as expected. Nonetheless, the analysis showed that the second misperception is more important to correct in order to achieve some behavioural change. Lastly, there is reason to believe that even if behavioural change is not always successful, having well-informed citizens can have benefits.

Regarding the limitations of the analysed studies, there are some overarching concerns, which should be addressed in future research. For example, it is unclear whether misperceptions can truly be corrected, especially in one-time, short-term experiments. Studies conducted over longer periods could discover whether repeating the information interventions proves more successful and whether successful information provision leads to other environmentally friendly behaviours. Thus, this paper argues for the need to explore correcting more deeply rooted beliefs, preferably in long-term experiments.

Additionally, there are limitations to this thesis. I address two misperceptions but the possibility of the existence of further important misperceptions cannot be excluded. Furthermore, I am examining individual behaviour, which cannot address systemic change. Furthermore, I would like to note that the aim of this thesis is to give a sense of the state-of-the-art and to analyse current studies and their findings on the topic. It is not a point for

generalisation as that would need further careful work since most of the countries participating in these studies are Western and similar in many ways – such as income levels, and political systems, further research should also include other parts of the world. However, it is also important not to shift responsibility, as the global north is more responsible for man-made climate change happening now.

To conclude, with the policy implications, the overall finding is that information interventions are not enough, and stricter policies are needed to sufficiently combat climate change. However, having well-informed citizens can have other advantages such as increased climate policy support. Information interventions to correct consumer misperceptions can be an effective tool to complement stricter policies and to help increase support for climate policies. Since these are low-cost and low-effort interventions, they can serve as an aid to complement other measures, especially in places where there is scepticism regarding climate change and climate action. However, as more and more people are aware, and the desired behaviour is not prevalent, there is a need to further motivate consumers, possibly with harsher options such as taxes. These harsher measures can include carbon taxes, and policies targeting producers, on which there is vast literature on these.

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