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# Effective environmentalism: leveraging social cognition to promote effective climate change mitigation

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## Abstract:

Effective climate change mitigation is a social dilemma: the benefits are shared collectively while the costs are often private. To solve this dilemma, we argue that we must first understand the nature of human cooperation. This constitutes a shift in the field of psychology and climate change, which has traditionally focused more intensely on risk-perception, miscommunication or time discounting, to explain the lack of climate action. We review three social cognition mechanisms that regulate cooperation: norm detection, reputation management, and fairness computation. We show that these cognitive mechanisms can prevent behavioral change and lead to ineffective policies. At the same time, the very same mechanisms can be leveraged as powerful solutions for effective climate change mitigation.

## Keywords:

Climate Change, Social Cognition, Reputation, Fairness, Social Norms

Over the past three decades, a number of reasons have been put forward to explain the absence of behavioral change to address climate change. Behavioral scientists have studied issues related to risk perception<sup>1,2</sup>, misinformation<sup>3,4</sup>, and time discounting<sup>5,6</sup> among others to explain people's collective apathy. The resulting common view is that climate change is hard to address because it is a complex, long-term, and diffused phenomenon. However, individual climate engagement around the world has now hit an inflection point. Today, a majority of people believe that climate change is a serious threat<sup>7,8</sup>, that it is already happening<sup>9</sup>, and that more should be done to curb CO2 emissions<sup>10-12</sup>. Yet, despite increasing levels of climate change awareness, mitigation efforts have been disappointing<sup>13</sup>. People often fail to adopt behaviors that would be impactful, such as saving home energy or reducing air travel, even when they have access to personalized information about their carbon footprint<sup>14</sup>. Given the high level of concern around climate change, what is keeping people from adopting behaviors or supporting policies that effectively reduce CO2 emissions?

Recently, empirical evidence has confirmed that the social dimension of climate change mitigation both explains the absence of behavioral change and offers potential solutions. Climate change is a large-scale collective action problem where outcomes are shared but the cost of behavioral change is often individual. Thus people must resist the urge to free-ride on the sacrifices of others while enjoying collective benefits without making any effort. One might initially think that humans' unique capacities to cooperate provide fertile ground to address the collective action problems posed by climate change. Yet, the cognitive mechanisms supporting cooperation evolved to increase individual fitness, not to maximize total social welfare<sup>15</sup>. As a result, the cognitive mechanisms involved in regulating cooperation do not necessarily lead to the most effective outcome from a societal standpoint.

Evolutionary biology has demonstrated that cooperation can only evolve if it is conditional: for individuals, the only evolutionary stable strategy is to cooperate if others cooperate, and stop cooperating when others do not cooperate<sup>16,17</sup>. The consequence of this constraint is that humans must develop cognitive mechanisms to detect social norms (i.e. whether the norm is to cooperate in my environment), to manage their reputation (i.e. to convince others that I am cooperating), and to compute what is fair and what is not (i.e. to assess whether my benefits are proportionate to my contribution, and to others' contribution). In this review, we present evidence that these three mechanisms - norm detection, reputation management, and fairness computation - push people to favor reciprocity, observability and equity over effectiveness in climate change mitigation. We contrast this with the behavior that people would adopt if they acted as "effective altruists" (see Box 1 for a definition of effective altruism). We then show that the very same cognitive mechanisms can be leveraged to be part of the solution, as shown in Figure 1. By carefully considering the social dynamics involved, policy makers can make climate change mitigation efforts more effective.

## **Norm detection**

To contribute to a collective effort, people need to have sufficient evidence that others will also take action. In fact, people's perception of the right thing to do very much depends on what others are actually doing. Far from acting as strict moral consequentialists who maximize the positive impact of their actions, people often rely on what others believe to determine what is appropriate<sup>18–20</sup>. For example, although people may know that travelling by plane or eating meat is detrimental to the climate, they may continue to engage in these behaviors if they see others doing so<sup>21</sup>. Previous studies have shown that social norms have a large influence on people's pro-environmental behavior<sup>22</sup>. Yet, social norms have also been shown to be ineffective or even to backfire in the context of pro-environmental behaviors<sup>23–25</sup>. Drawing on recent research, we discuss three aspects of norm detection that can be both a problem and a solution for the emergence of effective climate-friendly social norms.

## **Pluralistic ignorance**

Because of the costs associated with cooperating with a cheater, people's cheater detection mechanism functions as a smoke detector: people minimize the risk of false negatives (not detecting a cheater) while allowing more false positives to occur (mistaking a cooperative individual for a cheater)<sup>26</sup>. This means that people are likely to believe that others are not cooperating. This can lead to pluralistic ignorance, a situation in which people privately reject a norm (such as driving SUVs) but go along with it because they falsely assume that most others accept it. For example, Americans hold the inaccurate belief that a majority of their fellow citizens do not care much about mitigating climate change<sup>27</sup>, and are overly pessimistic about the views of conservatives on climate change<sup>28</sup>. A study conducted with a representative sample in the USA suggests that part of the reason why the poorest and ethnic minorities are underrepresented in environmental organisations and US government environmental agencies is the widespread false belief that they are not interested in environmental protection<sup>29</sup>. Because people are very sensitive to cheating, a few visible cheaters may also be enough to make an entire cooperative system collapse<sup>30,31</sup>. By identifying important areas of pluralistic ignorance, governments and other entities can promote cooperation through simple information campaigns<sup>32,33</sup>.

## **Credibility of norms**

For a social norm to be effective in promoting cooperative behavior, people must find it credible. Credibility comes both from the source promoting the social norm and from the content of the norm<sup>34</sup>. People are more sensitive to social norms when they are promoted by leaders in their community<sup>27</sup> or when the individuals promoting the norm have themselves adopted the behavior. For example, a study of a programme that promotes residential solar panel installation in 58 towns in the United States found that community organizers who themselves installed panels through the programme recruited 62.8% more residents to install solar panels than community organizers who did not<sup>35</sup>. For governments to effectively promote social norms, they

must first earn the trust of their constituents. In addition, norms about behaviors tend to be more effective than simple injunctive norms, such as telling people what most others approve of<sup>36,37</sup>. For example, saying that most people recycle their waste is more effective than saying that most people *approve of* recycling waste. Finally, in some situations norms are more effective if they do not appear as coercive<sup>38,39</sup>. Normative appeals that seem to limit people's freedom may have the opposite effect because of 'psychological reactance' - a negative feeling arising from threats to one's freedom. For example, telling people to "have fewer children, do your part" may be counter productive. Policy makers can leverage credible sources such as the scientific community to promote norms, and make sure that the content of a norm is descriptive and describes a behavior that reveals preferences. Finally, people are more likely to respect social norms within a group that they expect to cooperate with again in the future. The more local a social norm is, the more effective it will be<sup>40,41</sup>.

### **Dynamic norms**

People care not only about current social norms, they also anticipate what will be normative in the future. Hence, they are more likely to adopt a new behavior if they anticipate the change to persist than if they believe the change is a passing fad. Many behaviors that fuel climate change such as driving alone, eating meat, flying, or having multiple children, are currently the norm. In such cases, using normal social norm messaging will fail to promote change as the norm is indeed unsustainable<sup>42</sup>. Evidence shows that instead, communicating about the dynamic norm -- that is the current direction of change in people's behavior -- can have a major impact<sup>43,44</sup>. For example, Loschelder has shown that by conveying to people a dynamic norm about using a reusable coffee cup rather than a disposable one ("Our guests are changing their behavior: More and more are switching from the to-go-cup to a sustainable alternative."), the proportion of consumers using reusable cups increased by 17.3%<sup>45</sup>. This component of people's norm detection mechanism provides a powerful tool for policy makers. By emphasizing a new trend and showing evidence that it will last, they can promote behaviors that are not yet normative.

### **Reputation management**

Given the high benefit of collective actions, being perceived as a good cooperator is crucial for humans. Thanks to their reputation management system, people can anticipate how others will perceive their actions and act accordingly. Having a good reputation is considered so important that people often would prefer enduring physical injury (e.g. losing their dominant hand), rather than having people believe that they are not trustworthy (e.g. becoming known as a Nazi)<sup>46</sup>. Beyond being simply perceived as trustworthy, people compete on traits that signal their willingness or ability to confer benefits upon others such as intelligence, athleticism, but also generosity and benevolence<sup>47</sup>. Indeed, cooperation takes place in a competitive social market, such that people can abandon a cooperation partner in favor of another. When deciding between different options, people take into account both their direct costs and benefits and their indirect reputational costs and benefits, often without any conscious awareness of such considerations.

When indirect reputational benefits are larger, people are more likely to be cooperative. For example, studies show that people are more cooperative when they believe that they are being observed, even when simply being exposed to an image of eyes<sup>48,49</sup>. It is however important to distinguish between the ultimate advantages of having a good reputation and the proximate psychological level. Far from being Machiavellian, evidence shows that people genuinely enjoy helping others, without any conscious representation of the fitness advantage their behavior may lead to<sup>50</sup>. In the following paragraphs, we detail how people manage their reputation and how it can be leveraged to promote effective climate mitigation<sup>51</sup>.

### **Observability**

When behaviors can be easily identified as signals of cooperation, people are more likely to engage in them. This is the case in the so-called “prius effect”, by which individuals are more likely to buy a hybrid Toyota Prius rather than another electric car model as the unique design of the Prius makes it conspicuously green<sup>52,53</sup>. Researchers have identified that many pro-environmental behaviors have a signaling function<sup>52,54,55</sup>. However, many behaviors related to climate change are invisible such that reputational gains cannot take place<sup>56</sup>. This is true of all invisible efforts (e.g., adding a layer of insulation under one’s roof), private voting practices (e.g., going to the polling station to support green policies) and, by definition, of abstinent choices (e.g., not taking the plane or not eating beef). An obvious solution to this problem is to make pro-environmental behaviors more visible. For example, in the Spring of 2020, the British government adopted a new regulation allowing all electric vehicles to have a green flash on the left hand side of the license plate (see Figure 2). This not only makes it easier for local authorities to enforce policies such as reserved parking space for electric vehicles, it also allows people to display their green behavior. In addition, given that governments have limited financial resources to promote mitigation behaviors, they should focus their subsidies on hard-to-observe behaviors such as renovating one’s home insulation<sup>57</sup>.

### **Competence and Effort**

People care a lot about enhancing their value to their social network as this will impact how they are perceived and thus whether they are chosen as a cooperation partner<sup>58</sup>. Appearing competent, wealthy, or well-connected are all potential ways to demonstrate a high value to others. However, appearing competent or wealthy can sometimes conflict with appearing pro-environmental. For example, residents in a neighborhood might continue watering their lawn despite calls to save water in order to maintain their image as wealthy neighbors who tend to their lawn. Because environmental activists have on occasion been associated with negative stereotypes such as being eccentric or too militant, people may be reluctant to adopt the behaviors they promote<sup>59</sup>. Similarly, environmentally friendly products are associated with warmth, a trait that is not always desirable for consumers<sup>60</sup>. When mitigation behaviors are aligned with traits that people value, such as openness or innovation, then they are more likely to be adopted.

Beyond competence, humans also care about how much effort people are investing when cooperating, because all else equal, it is better to cooperate with someone who is willing to go the extra mile. In addition, someone's efforts may be the only available information to evaluate their quality as a cooperation partner. In many cooperative exchanges, the outcome or the impact is hard to determine. For example, it may be hard to estimate someone's carbon footprint, while it is easier to observe how much effort a person is making to reduce it, such as making long journeys by train or boat instead of by plane. As a result, people are often insensitive to true impact when evaluating others' reputation. In an experiment on charity donation, Burum et al. show that people are insensitive to the impact of donation when evaluating the donor's character, but they are sensitive to the effort<sup>61</sup>. By aligning effort with impact, policy makers can orient citizens towards more effective mitigation behaviors.

## **Intentions**

Evidence shows that intentions matter a lot when people judge each other's character<sup>62</sup>. Achieving a good outcome based on bad intentions is often perceived as much worse than achieving a bad outcome based on good intentions<sup>63</sup>. Indeed, as consequences are the product of many factors, intentions may be a more reliable cue than impact for someone's value as a cooperation partner. In addition, when consequences or efforts are not visible, intentions may be the only available information to judge someone. Recent empirical research shows that people even punish others if they appear to act too rationally<sup>64</sup>. Montealegre et al. conducted a number of experiments revealing that participants judged people who deliberate more about the consequences of their charity donations to have less positive moral character and to be less desirable as social partners than individuals who relied more on empathy to make their choice<sup>65</sup>. In other words, although prioritising the impact of one's altruistic behavior is good from a societal standpoint, it may come with a reputational cost. This may explain why despite bulletproof rational arguments in favor of effective altruism, this movement is still confined to a small group. For impact to matter as much as intentions, it must be easily measured and known to people. Making the link between people's action and their environmental consequences more clear will allow people to take impact into account more easily. Once causes are linked to consequences, it is much easier to make a case for choosing the most efficacious course of action<sup>66</sup>. Thankfully, there has been much progress in that direction in recent years. Impact assessments have become a common practice in many areas of public policy, and even researchers have called for impact-focused environmental psychology<sup>67</sup>.

## **Fairness computation**

When engaging in cooperation, people not only decide who they should cooperate with, but also how the costs and benefits of cooperation should be shared. Research shows that our fairness computation mechanism evaluates the costs and benefits based on the outside options available to people<sup>68</sup>. Individuals with more valuable outside options are usually given a larger share of

the benefits, thus ensuring that a cooperative interaction is advantageous to all parties involved. To sustain cooperation, people constantly monitor the costs and benefits accrued to others, for example how much effort people from other countries are making to reduce CO2 emissions. This helps people identify the appropriate response, such as changing their lifestyle drastically or spending little effort on reducing emissions. This sort of computation is constantly happening in people's minds, most often beyond their conscious awareness<sup>68</sup>. When people feel like the cost and benefits of cooperation are not fairly distributed, they will refrain from cooperating. The allocation of costs and benefits depends on specific principles, and is often deemed more important than the aggregate outcome of cooperation. A good illustration of that is the fact that citizens in low-income countries are less supportive of international agreements forcing their country to take climate change mitigation measures than are citizens in wealthier nations and tend to think that high-income countries should make more effort to protect the environment<sup>69</sup>. By understanding how fairness is computed, policy makers can design mitigation policies that gather more support.

#### **Fairness depends on perceived status quo**

The fair allocation of costs and benefits to individuals who are cooperating depends on the perceived status quo. Indeed, costs and benefits are calculated according to a given baseline, which includes the outside options of each individual<sup>70</sup>. People who have different perceptions of the status quo may have a hard time agreeing on what constitutes a fair outcome. Perhaps the most dramatic instance in which status quo perception matters is for a country's pledge to reduce CO2 emissions<sup>71</sup>. If people consider that the status quo is the current emissions level, then all countries should make commitments proportional to their current emissions and to their ability to mitigate them<sup>72</sup>. However, if people consider that the appropriate baseline is the status quo *ante*, which corresponds to the state of the world before the industrial revolution, then western countries such as the United States, Canada or members of the European Union, who have already contributed to more than 50% of the global cumulative CO2 emissions should compensate this disproportionate historical contribution to climate change<sup>73</sup>. Status quo considerations may also affect more local decisions, such as how to allocate public space between drivers, pedestrians and bicycles. If one considers that the baseline is that streets are mostly designed for cars, then any policy aiming at increasing bicycle paths will be seen as a loss for car drivers. However, if one considers that the relevant baseline situation is one where cities are built for all people and not just car drivers, then such policies will be construed as claiming back what rightfully belongs to pedestrians and cyclists. Changing our frame of reference can therefore have a huge impact on how we see the world<sup>74</sup>. By reframing the status quo, policy makers can increase the perceived fairness of environmental policies and thus garner more support.

#### **Fairness over effectiveness**



People often value fairness above and beyond the aggregate outcome of a given action. In other words, people's sense of fairness does not follow consequentialist principles, which favor "the most good for the most people". For example, a majority of people are unwilling to increase cure rates for a large group if it comes at the cost of reducing cure rates for a smaller group<sup>75</sup>. Additional examples include that most people will favor income distributions that are more equal rather than those with higher total income<sup>76</sup>; prefer retributive justice (in which the punishment is proportional to crime) to deterrence, even though basing punishments on deterrence leads to lower crimes than basing punishments on retribution<sup>77</sup>; and condemn pushing one person off of a footbridge to stop a trolley from killing five people further down the tracks<sup>78</sup>. When individuals must decide between different environmental policies, they will favor fairness as much as effectiveness<sup>79–81</sup>. Policies that are seen as unfair have very little chance of success, as the recent example of the "Yellow Vest" movement in France has shown<sup>82,83</sup>. The movement started after the government announced a new tax on carbon that would lead to increases in gas prices (which predominantly would affect poorer rural communities commuting by car to work), without impacting kerosene prices (which would affect richer individuals travelling by plane). If policy makers are to gain support for far reaching regulations such as a universal carbon tax, they must take into account their perceived fairness by the general population.

## **Outstanding questions**

Our review highlights a critical need for further research on at least three fronts. First, more research should be done on the dynamic component of social norms. Experiments should be conducted to identify how new social norms can emerge rapidly in a group and how to use network analyses to target individuals who will accelerate the adoption of the norm. By understanding the dynamics of social norms, we can steer groups towards reaching a moral tipping point: a threshold beyond which it will become a moral obligation to adopt environmentally virtuous behaviors. Second, more research should be done around the promotion of effectiveness as a moral standard. To mitigate global warming, people will not only need to change their behavior, they will have to systematically adopt those behaviors that are most effective at reducing their carbon footprint. Making people adopt an "effective environmentalist mindset" is a central issue for climate change mitigation. Finally, as many economists and climatologists have argued, large scale policies such as a carbon tax are essential tools for effective climate change mitigation. As such, further research on the acceptability of these policies and the factors influencing perceived fairness is crucial.

## **Leveraging people's social cognition to accelerate the sustainable transition**

Cooperation is supported by dedicated cognitive mechanisms and can be seen as an adaptation to solve humans' collective action problems. By detecting social norms, managing their reputation and computing what is fair, people ensure that they benefit from their cooperative endeavors. Climate change is a perfect example of a social dilemma in which people's social cognition plays a large role. Even seemingly unrelated issues, such as informational deficits, can make more

sense when studied through the lense of social cognition. For example, one might wonder why many people are unaware of the most effective ways to mitigate climate change. A simple answer would be that people do not have access to enough information. However, careful consideration might reveal that the real problem lies in people's motivation to become informed. People have the ability to become very knowledgeable in domains where information is hard to access, such as medical information about rare diseases, when they are motivated enough. In the case of climate change, a lot of information is accessible online for free on how to reduce one's carbon footprint. Yet, people do not actively seek this information because they would gain little benefit from it. Indeed, one's marginal impact is negligible and the reputational benefits from being more effective are also trivial, or could even be negative. By studying this issue from a cooperation perspective, it becomes clear that people have little incentive to identify effective strategies when the benefits are shared collectively. Worse, they may think that knowing the true cost of their behavior will force them to align their behavior with this new information or run the risk of appearing hypocritical. People's social cognition can often act as a barrier for change as people will consider reciprocity, observability and equity over efficiency. However, by understanding people's social motivation, policy makers can leverage people's social cognition to accelerate the sustainable transition.

### **Box 1: Effective altruism**

Effectiveness is often defined as the size of the impact relative to the resources used to create such an impact. Under this definition, someone spending 100 euros to avoid 1 ton of greenhouse gas emissions is more effective than another individual spending 200 euros to avoid the same amount. This concept has gained some traction, moving from the field of engineering and economics to a diversity of domains such as organisation management or even charity.

The movement “Effective Altruism” was created in the late 2000’s around individuals such as Toby Ord, William MacAskill, and Peter Singer. This movement advocates being impartial and prioritizing causes that are great in scale, highly solvable, and tractable<sup>84</sup>. This movement encourages its members to donate to charities that are effective, leading to the largest positive impact per amount spent. It also helps people define what career to choose to maximize their positive impact given their skill set <sup>85</sup>.

We define effective environmentalism as giving priority to mitigation efforts that have the most impact per amount of resources invested. For example, an individual deciding between spending 100 euros to buy organic groceries or spending 100 euros to finance a solar powered stove in a developing country should prioritize the latter as the environmental impact will be larger. Similarly, policy makers deciding between allocating resources to providing all citizens with a composting bin or improving public transportation should prioritize the latter.

So far, the effective altruism movement has been confined to an active but small community, located mainly in the United States and United Kingdom. In order for this movement to gain traction, it should take into account people’s social cognition. Many studies have shown that people’s intuitions often go against principles of effective altruism, such as the idea that geographic distance should not affect our willingness to help people. By taking people’s psychology into account, the effective altruism movement can become more popular.

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## Box 2: The case of meat eating

Reducing meat consumption represents a major opportunity to mitigate climate change<sup>86</sup> with 14.5% of all anthropogenic greenhouse gas emissions coming from the livestock sector<sup>87</sup>. In addition, there are few structural barriers to adopting a plant-based diet. Not only is such a diet often cheaper, it is nutritionally adequate and may provide health benefits for the prevention and treatment of certain diseases<sup>88</sup> and plant-based alternatives are easily accessible in most developed economies. Some informational barriers may still be an obstacle to adopting a plant-based diet, such as the belief that eating meat is important to stay healthy<sup>89</sup> or a lack of information regarding the environmental footprint of meat. Yet, many people frequently eat meat despite being well-aware of the negative impacts of these behaviours and having the means to make different choices<sup>14</sup>.

Taking into account people's social psychology is essential to encourage them to reduce their meat consumption<sup>90</sup>. Wyker & Davison have shown that **normative beliefs** regarding how much one's friends, family, and colleagues believe one should follow a plant-based diet are strong predictors of intentions to do so<sup>91</sup>. People may suffer from **pluralistic ignorance** on the issue of reducing meat consumption. Although many people may privately believe that reducing meat consumption is important to mitigate climate change, they may hold the false belief that a majority of people would disagree with them. In addition, eating meat is the current norm, offering little social pressure for people to change their behavior<sup>92</sup>. However, as Sparkman and colleagues have shown in multiple experiments, when given information about the **dynamic norm** - that is the increase in the number of people switching to vegetarian diets - people are more willing to select vegetarian options<sup>43,44</sup>. From a **reputation management** perspective, reducing meat consumption raises two issues. First, people's dietary choices are hard to observe, creating little incentives for people to reduce their meat consumption, for example when eating at home. Second, eating less meat may conflict with other aspects of one's reputation, such as appearing like a generous host<sup>93</sup>. As a result, people may gain little reputational benefits from adopting a vegetarian diet. By making dietary choices more conspicuous and by aligning people's values with plant-based diets, policy makers and companies can encourage people to reduce their meat consumption. Finally, **equity concerns** may also impact people's dietary choices. People may perceive the reduction in meat consumption as an unfair cost placed on meat producers. Policy makers should thus ensure that no segment of the population is unfairly affected by such dietary changes.

Figures:




## Cognitive Mechanisms Supporting Cooperation



## Adapted Policy Interventions






### NORM DETECTION

-  People tend to underestimate the proportion of cooperators.
-  People are sensitive to the credibility of social norms.
-  People only respond to norms that are already prevalent.



- ✓ Make social norms more visible.
- ✓ Focus on action rather than opinions, use local community leaders to promote a norm.
- ✓ For behaviors that are not widespread, communicate about the dynamic norm.<sup>5</sup>



### REPUTATION MANAGEMENT

-  People prefer engaging in observable behaviors.
-  People are insensitive to impact when judging other's efforts.
-  Maximizing impact can backfire as people will be seen as too calculating.



- ✓ Make sustainable behaviors more visible.
- ✓ Make the impact more direct and understandable.
- ✓ Make the most impactful behavior the default option.

### FAIRNESS COMPUTATION

-  People will often prefer fairness over efficiency when deciding between policies.
-  People base their fairness computation on their perceived status quo (e.g. "streets are for cars").



- ✓ Include redistributive programs in policies and communicate about their impact.
- ✓ Provide information to help people change their vision of the status quo (e.g. "streets are for pedestrians and cyclists").

**Figure 1.** Cooperation between humans is supported by three cognitive mechanisms, (1) norm detection, (2) reputation management, (3) fairness computation. These cognitive mechanisms evolved to make cooperation beneficial at the individual level, which can often lead to ineffective outcomes at the collective scale. For example, people's fairness computation mechanism induces them to favor equity over effectiveness when supporting public policies. By taking into account the nature of human social cognition, policy makers can promote more effective behaviors. For example, by including redistributive programs in policies and communicating about their impact, policy makers can gather more support for environmental policies.



**Figure 2.** In the fall of 2020, the UK government implemented a green number plate policy for electric vehicles. The government argues that “the plates will make it easier for cars to be identified as zero emission vehicles, helping local authorities design and put in place new policies to incentivise people to own and drive them.” This policy will also allow individuals to signal more easily their commitment to reduce their CO<sub>2</sub> emissions and thus improve their reputation.

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