



**The Influence of Subsidies on Social Norms in the Case of Electric Vehicles**

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### **Abstract**

Considering that the consequences of the climate crisis are becoming increasingly noticeable, CO<sub>2</sub> emissions need to be reduced drastically. As a major emissions contributor, the transportation sector requires a swift transition toward sustainability. A low-emission alternative to predominantly used internal combustion engine vehicles (ICEVs) are electric vehicles (EVs) that are often subsidized. Subsidies were shown to be effective in promoting EV adoption, but the financial benefits do not solely account for the subsidies' effectiveness. Rather, a governmental subsidy, additionally, signals that EV adoption should increase, potentially affecting social norms this way. Therefore, we investigated whether governmental subsidies have an influence on social norms regarding EVs. We tested whether descriptive, dynamic, and injunctive social norms differ for EV drivers who are either aware or unaware of the subsidy for EV purchases. Results from a sample of 2392 Dutch-speaking EV drivers indicated that subsidy awareness is positively associated with the individuals' perceived descriptive norms that EVs are not driven by the majority. Moreover, people who are aware of the subsidy have stronger dynamic norms and, hence, perceive that more and more people are driving EVs, compared to those unaware of the subsidy. Due to methodological issues, injunctive norms were not included in the analyses. Trying to understand the mechanisms underlying the effectiveness of subsidies, this study demonstrates the relatedness of subsidies and social norms.

*Keywords:* subsidies, social norms, descriptive norms, dynamic norms, injunctive norms, electric vehicles

### **The Influence of Subsidies on Social Norms in the Case of Electric Vehicles**

Climate change has become a highly urgent threat and requires immediate action to mitigate its effects on our planet (IPCC, 2022). The global climate is getting warmer and human-caused CO<sub>2</sub> emissions are the central reason for that. A systematical change is needed in all CO<sub>2</sub>-emitting sectors to lower their overall impact on the climate (IPCC, 2022). A highly relevant sector is transportation, being responsible for over 20 % of energy-related CO<sub>2</sub> emissions worldwide (IPCC, 2018). A large proportion of this percentage is accounted for by internal combustion engine vehicles (ICEVs) that, with 1.2 billion on the roads worldwide, pose an immense burden to the environment (Yale E360, 2021).

To reduce CO<sub>2</sub> emissions, a promising mitigation behavior is the use of electric vehicles (EVs), offering an emission-lean alternative to ICEVs. Depending on the energy source and battery production, EVs hold the potential to produce significantly fewer CO<sub>2</sub> emissions than ICEVs, on average producing only a quarter of ICEVs' emissions (U.S. Department of Energy, n.d.). The change towards electric transportation is not easily implemented, however. That is because new infrastructure such as charging points is required and implementing EVs instead of ICEVs is expensive (Micari et al., 2017; Liu et al., 2021). Hence, governments play a crucial role in stimulating a systematical change, for instance through subsidizing environmentally friendly behavior. While subsidies can be an effective tool to stimulate pro-environmental behavior, such as the change towards electric modes of transportation (Helveston et al., 2015), it is not clear through which psychological mechanisms subsidies operate and why they are effective in promoting EV adoption. One possibility that, so far, has not been investigated is the influence of subsidies on pro-environmental behavior through social norms. Social norms are an important determinant of behavior (Burnkrant & Cousineau, 1975) as they assert socially approved rules on how to behave (Hechter & Opp, 2001). In the current study we, therefore, investigated whether

subsidies might strengthen social norms in the context of EV adoption.

### **The Role of Governments for Individual Pro-Environmental Behavior**

Policymakers possess the tools to stimulate environmentally friendly behavior in the population. These tools include taxation, legislation, and the provision of information (Henstra, 2016), all of which can be directed at climate-friendly behavior. The popular method of subsidy schemes helps finance investments that support mitigating climate change or adapting to its consequences (Henstra, 2016). Areas in which subsidies are offered include, for example, the installation of green roofs, improved insulation, solar panels, and the purchase of EVs (Helveston et al., 2015; Mees et al., 2013; Simpson & Clifton, 2017). The latter is offered to reduce the initial purchase prices of EVs since they are currently more expensive than ICEVs (Liu et al., 2021; Nickel Institute, n.d.). Thus, subsidies for EVs were used increasingly by policymakers in recent years (Helveston et al., 2015).

### **The Effectiveness of Subsidies on Pro-Environmental Behavior**

One country in which a subsidy for EVs was implemented are the Netherlands. In 2020, the government introduced a subsidy scheme that grants 4,000 Euros for the purchase of a new EV and 2,000 Euros for the purchase of a used EV. In the Netherlands, an EV purchase is eligible for a subsidy if the vehicle costs between 12.000 and 45.000 Euros (Wettenbank, n.d.). Since the introduction of the subsidy, it has greatly impacted the EV market. As of May 2022, a market share of 20% of all new vehicle sales has been recorded (Kane, 2022), suggesting that the Dutch subsidy scheme is effective in promoting EV adoption. Studies in Sweden and the USA also corroborated the effectiveness of subsidies in purchases of pro-environmental technologies (DeShazo et al., 2017; Mundaca & Samahita, 2020). Similarly, a recent study in the Netherlands also demonstrated that the subsidy worked as a motivator for EV adoption (Valkengoed & Van der Werff, 2022).

While it is expected that the subsidy helps overcome financial obstacles associated

with EV purchases, it is not fully clear whether the reduced costs are, indeed, the cause of subsidized EV purchases. In the study by Valkengoed & Van der Werff (2022) amongst Dutch EV drivers, applicants for subsidies for EVs indicated that the financial incentive was not the primary reason for EV adoption. While the subsidy also seemed to attract a minority that had not yet considered purchasing an EV, the majority of subsidy applicants were already intending on buying an EV before applying for the subsidy scheme. Most of the people who applied for the EV subsidy claimed that the subsidy functioned as a cue to action to go through with the purchase that they already had planned anyways (Simpson & Clifton, 2017; Van Valkengoed & Van der Werff, 2022). Evidently, the financial benefits provided by a subsidy on EVs seem not to be the only reason for their relative effectiveness. Other factors must, hence, also explain how EV subsidies operate and why they are effective.

### **How Social Norms Influence Behavior**

To understand the role of subsidies in EV adoption, the underlying psychological processes that determine how subsidies assert influence need to be identified. Thereby, social norms could possibly explain why and how subsidies work. That is because subsidies convey a public message that could reinforce social norms regarding EV adoption. Generally, social norms can be described as the predominant rules, behaviors, and dispositions of a social group (Cialdini & Jacobson, 2021). Existing research suggests that behavior is closely linked to social norms that give an indication of what others would do or think should be done (Cialdini et al., 1990).

Social norms work as social guidelines, instructing people to behave morally, stick to commonly accepted rules, or strengthen their social status by conforming to trends (Hechter & Opp, 2001). Not adhering to the dominant social norms often involves sanctions of some form and are usually not intriguing. These sanctions often occur on a social level. For example, a person can experience a feeling of guilt after stealing. They might also feel

ashamed after the act of stealing has become public (Posner & Rasmusen, 1999). These negative feelings seem to arise both innately and via moral influence by others (Posner & Rasmusen, 1999). To avoid these unpleasant feelings, social norms are generally followed, if possible, and, hence, play a considerable role in determining our thoughts and behavior (Gross & Vostroknutov, 2022).

Many pro-environmental behaviors were found to be motivated by social norms. For example, a study showed that normative messages about towel reuse in hotels lead to a significant increase in towel reuse, as opposed to using a new towel for each occasion (Goldstein et al., 2008; Scheibehenne et al., 2016). Recycling behavior was also shown to be linked to social norms (Miliute-Plepiene et al., 2016; Sidique et al., 2010). Furthermore, a study about energy usage managed to effectively decrease energy consumption using normative messages (Schulz et al., 2007). Moreover, social norms were also established to influence EV adoption (Rezvani et al., 2015), meaning that the attitudes and behaviors of others influence the individual's dispositions with regard to EVs. Based on these findings, social norms are investigated in the context of this study.

### **The Influence of Subsidies on Social Norms**

One way social norms can be changed might be through a governmental subsidy. Normative perception changes over time and is malleable (Tankard & Paluck, 2016). Therefore, norms might be influenced and even changed by external factors such as subsidies. As a certain behavior gets subsidized, it is more likely to be adopted, so more people shift their preference toward the subsidized behavior (Green, 2006). More specifically, subsidies might make the pro-environmental behavior (i.e., EV adoption) more salient. Through the increased salience of the pro-environmental behavior, subsidies might strengthen the pro-environmental norm. This is because the more salient a norm is, the more people will act in line with it (Cialdini et al., 1990). Consequently, the norms are reinforced over time,

leading to a self-sustaining pattern of norm formation and stabilization (Paluck & Shepherd, 2012; Markus & Kitayama, 2010). In this case, the governmental subsidies could, thus, act as a precursor and motivator for this change in social norms.

Depending on the type of social norm, the influence of *subsidy awareness* on EV adoption could be either beneficial or unfavorable. The focus theory of normative conduct distinguished between *injunctive* and *descriptive norms*, which have been discussed thoroughly since (Cialdini et al., 1990). More recently, *dynamic norms* were introduced as a relevant social norm to consider, especially in the context of pro-environmental behavior (Sparkman & Walton, 2017; Sparkman & Walton 2019). Therefore, this paper will focus on descriptive, dynamic, and injunctive social norms.

### ***Descriptive Norms***

Descriptive norms refer to what is considered normal or how the majority already behaves. In general, people are motivated to act according to the behavior that aligns with the descriptive norm (Cialdini, 2007). The underlying argument is that behavior prompted by the descriptive norm was tested a great amount, thus it is likely to be effective (Cialdini et al., 1990). For instance, the vast majority of vehicles on the roads are not electric. The descriptive norm regarding EV usage states that only a minority is driving EVs, whereas the majority is driving ICEVs, indicating that ICEVs are likely to be a decent choice. Subsidizing EV adoption could highlight that a lot of people do not use an EV, thereby strengthening the descriptive norm of using an ICEV. Accordingly, people considering purchasing a car could be steered away from an EV as it is not the descriptive norm. In this case, the subsidy is expected to demote EV adoption as it entails information that supports ICEV adoption.

Investigating the influence of EV subsidies on the descriptive norm is relevant since the subsidy might foster the status quo of unsustainable transportation. However, contradicting this assumption, a previous study showed that descriptive norms were not



influential in an EV adoption context (Barth et al., 2016). This was attributed to the fact that the technology is still relatively new and descriptive norms take time to develop (Barth et al., 2016). So even though descriptive norms highlight the unsustainable current situation, this does not necessarily reduce pro-environmental behavior. However, investigating what influences the unsustainable descriptive norms is relevant since, in the long run, a change toward a sustainable descriptive norm is desirable. Therefore, we aim to test whether the subsidy fosters the current unsustainable descriptive norms, preventing change toward a more pro-environmental norm.

### ***Dynamic Norms***

Dynamic norms refer to how behaviors develop over time (Sparkman & Walton, 2017). More specifically, dynamic norms provide an idea about recent trends in norms. For instance, due to the progress in EV technologies over the past years, many people have switched to an EV. The corresponding dynamic norm describes this development over time stating that more and more people drive EVs. Given that the subsidy facilitates EV purchases, the number of EV purchases is likely to increase further. As a result, the dynamic norm is strengthened as more people become aware of this trend. The subsidy, therefore, might reinforce the dynamic norm. Usually, people are motivated to comply with their perceived norms. The subsidized technology might be seen as the future and people want to avoid missing out on technological advances (Çelik et al., 2019). Thus, the subsidy might signal that more people are driving EVs, motivating others to comply and engage in the desired behavior of EV adoption in turn.

### ***Injunctive Norms***

Injunctive norms, meaning the expected or supposed behavior or attitude in a given situation, depend on the individual's perception of how they ought to behave or think (Cialdini, 1990). Injunctive norms provide an idea of a morally approved course of action and

influence behavior with the threat of social sanctions if behaving differently. In the context of sustainable transportation, many people are aware that EVs are better for the environment than ICEVs. Therefore, the injunctive norm is that individuals assume that other people or the government think that more EVs should be driven, leading the individual to think they should conform to the norm (Reno et al., 1993).

In correspondence with that, a subsidy could also function as a signal of urgency (Tankard & Paluck, 2016). If the government is investing in the adoption of EVs via a subsidy, it is the logical conclusion that they think urgent change is needed and more people should drive EVs. Thus, the subsidy might strengthen the injunctive norm for EV adoption, leading individuals to assume that the government thinks more people ought to adopt EVs. Subsidies might not only influence what the individual assumes the government to think, but also the assumed population's attitude toward EV adoption. In the perceived population's opinion, the injunctive norm might help promote EV adoption if the general consensus that EVs are beneficial for the environment has been established. The EV becomes, thus, the perceived morally superior choice. Therefore, the subsidy might indirectly influence the moral guidelines that individuals consider when purchasing a vehicle.

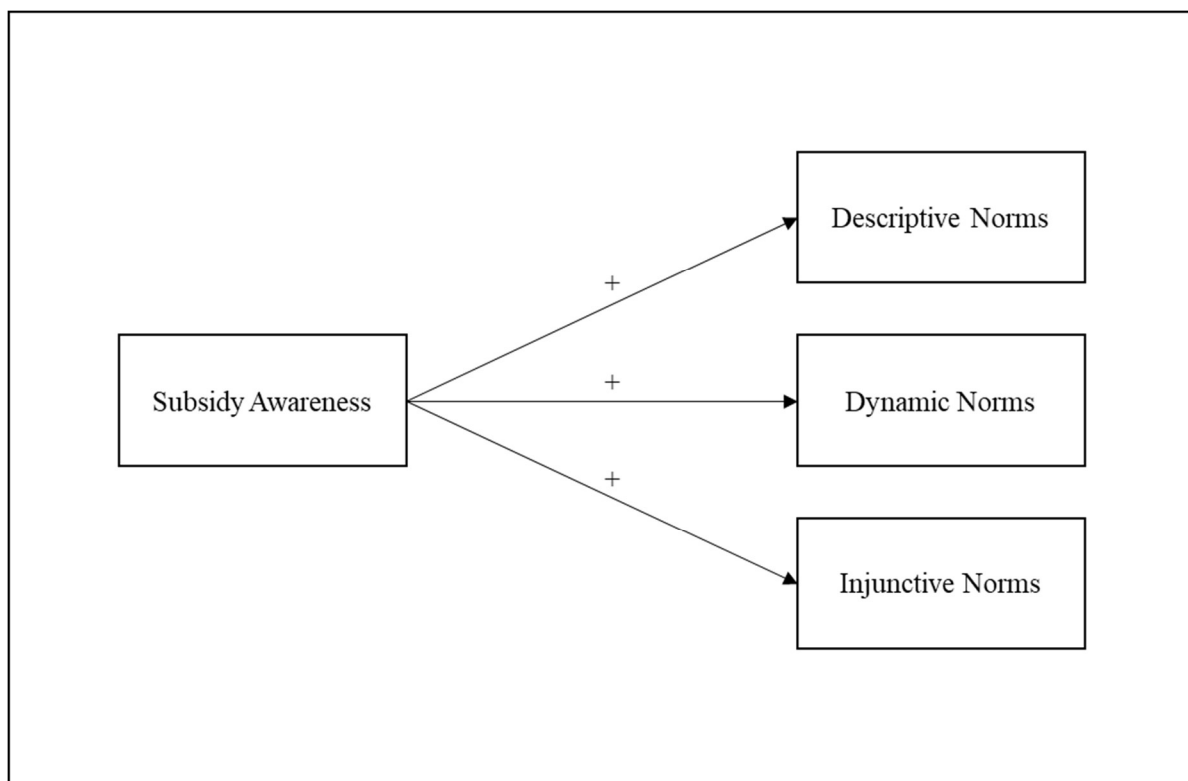
### **The Current Study**

Aiming to explore mechanisms via which subsidies are effective, the current study innovatively investigated the influence of subsidies on social norms (see Figure 1). In the context of sustainable transportation, we tested whether subsidies for EV adoption influence people's social norms. To test the influence of the subsidy on people's social norms, EV drivers who are aware of the subsidy were compared to EV drivers who are unaware of the subsidy. It was expected that (H1) people who have heard of the governmental EV subsidy perceive a weaker descriptive norm that others adopt EVs compared to people who have not heard of the subsidy. Moreover, we hypothesize that (H2) people who have heard of the

governmental subsidy have a stronger dynamic norm that an increasing number of people is adopting EVs than people who have not heard of the subsidy. Lastly, it is expected that (H3) people who have heard of the governmental subsidy have a stronger injunctive norm to adopt EVs compared to people who have not heard of the subsidy.

### Figure 1

#### *Conceptual Visualization of the Research Model*



*Note.* The hypothesized relationships between the predictor variable and the descriptive, dynamic, and injunctive norms are depicted in the conceptual model. The + signs indicate a positive interrelation between two main variables of interest, implying an increased amount of one variable to be linked to a heightened amount of the second variable as well.

## Method

### Participants

The present study was part of a larger-scale research project of the consumer organization electric drivers association (Vereniging Elektrische Rijders, VER) in

collaboration with the governmental institution Enterprise Agency Netherlands (Rijksdienst Voor Ondernemend Nederland, RVO) and the University of Groningen. Participants were Dutch-speaking EVs drivers who were recruited using paid advertisements on Facebook and LinkedIn as well as the social media pages of the VER and RVO. We used a cross-sectional study design that was approved by the ethical committee of the University of Groningen.

The sample size requirement for the present study's research model (see Figure 1) was established by means of a post-hoc power analysis using the program G\*Power (Faul et al., 2009). A small effect size appropriate for social sciences at  $f^2 = .02$  compared with our study design resulted in a required sample size of  $n = 860$  (Cohen, 1988; Rhodes et al., 2020). As 2392 participants were included in the analyses, sufficient power to detect a small effect size was ensured. Before data clearing, the sample consisted of 3472 Dutch-speaking EV drivers. However, 383 participants had to be removed, because they did not give consent to use their data and, consequently, did not fill in the questionnaire. Additionally, 697 more participants were removed due to missing data on the main variables of interest. Participants' age ranged from 21 to 88 years ( $M = 53.95$ ,  $SD = 11.95$ ), whereby 159 participants did not indicate their age. Out of all participants ( $n = 2243$ ), 2064 were male, 159 female, 2 other, and 18 preferred not to say. These highly unequal group sizes for gender are somewhat in line with previous research reporting over 70% of EV drivers to be male (for possible explanations see Caparello et al., 2014 and Sovacool et al., 2019). Furthermore, the yearly income before taxes of the participants ( $n = 2237$ ) was measured in ranges and most people earned between € 70,001 - € 110,000 ( $n = 671$ ). Moreover, the participants' highest level of education was assessed, with most participants indicating a higher professional education ( $n = 1069$ ), followed by scientific education as the second most frequent answer ( $n = 629$ ).

## **Procedure**

Participants were directed to the present study's digital questionnaire implemented by

means of the software program Qualtrics via invitation links that they received via advertisements and community posts. After having given informed consent, they were guided through the entire questionnaire. This self-report measure entailed questions concerning participants' demographics (e.g., age, gender) and assessed their EV experience. For the purposes of this study only the questions on subsidy awareness (i.e., independent variable) and the descriptive, dynamic, and injunctive norms (i.e., dependent variables) as described below were used. All items assessing norms were arranged randomly to avoid order effects. There was no reward for participating in the study. The questionnaire was conducted entirely in Dutch and took approximately 20 to 25 minutes to finish.

### ***Subsidy Awareness***

The independent variable *subsidy awareness* was assessed by means of the question “Have you heard of the subsidy for new or used electric cars?” with the dichotomous answer options *yes* or *no*. Depending on their answer, that is, contingent on whether they were aware of the subsidy or not, participants were grouped based on subsidy awareness.

### ***Descriptive Norms***

*Descriptive norms* were assessed with the items “Most Dutch people do not drive an EV” ( $M = 4.42, SD = .98$ ) and “Most Dutch people are driving a combustion vehicle” ( $M = 4.56, SD = .81$ ) and measured on a 5-point Likert-type scale from 1 = *strongly disagree* to 5 = *strongly agree*. This way, participants could indicate to which extent they agree with the statements. The items were adapted by combining the syntactical structure of White and colleagues (2009) with the norm-specific contents of Sparkman and Walton (2017). The two items were combined to a scale using their mean ( $\alpha = .64, M = 4.49, SD = .77, n = 2387$ )

### ***Dynamic Norms***

*Dynamic norms* were measured with three items: “An increasing number of Dutch people is driving EVs” ( $M = 4.19, SD = .99$ ), “More and more people that I know are driving

an EV” ( $M = 3.18$ ,  $SD = 1.07$ ), and “More and more Dutch people are driving electric” ( $M = 3.98$ ,  $SD = .85$ ) on a 5-point Likert-type scale from 1 = *strongly disagree* to 5 = *strongly agree*. The three items for measuring the perceived dynamic norms of the participants were also adapted from White and colleagues (2009) and Sparkman and Walton (2017) and combined to a scale by computing the mean ( $\alpha = .66$ ,  $M = 3.78$ ,  $SD = .75$ ,  $n = 2388$ ).

### ***Injunctive Norms***

*Injunctive norms* were measured for two different social reference groups, namely the government and the Dutch population. More specifically, participants were shown the following items: “The government thinks that Dutch people should drive electric” ( $M = 3.70$ ,  $SD = 1.09$ ) and “Most Dutch people think that Dutch people should drive electric” ( $M = 2.76$ ,  $SD = .89$ ). The statements were, again, rated on a 5-point Likert-type scale from 1 = *strongly disagree* to 5 = *strongly agree* and adapted from research by White and colleagues (2009). A reliability analysis revealed that the scale was not reliable ( $\alpha = .35$ ,  $M = 3.23$ ,  $SD = .77$ ,  $n = 2389$ ), indicating that the two items assessing injunctive norms did not reliably measure this construct as intended.

### **Factor Analysis**

To test whether the created items, indeed, measured the assumed constructs, a factor analysis was conducted. Two latent variables seemed to underly the seven items (i.e., two components have an eigenvalue  $> 1$ ), as opposed to the expected three underlying constructs. A look at the rotated component matrix showed a clear distinction between the two items for the descriptive norms from the remaining five items (see Table 1), indicating that the descriptive norm measure was successful. The other latent variable is composed of the three items assessing dynamic norms. However, the two items intended to measure injunctive norms also showed correlations with the same component as dynamic norms. This indicates that the items for injunctive norms and dynamic norms did not measure distinct concepts to a

sufficient extent. Since injunctive norms did not seem to be reliably measured in the present study, the construct was not included in any further analyses.

**Table 1**

*Rotated Component Matrix Showing the Constructs Underlying the Measured Items*

Item	Component	
	1	2
Descriptive 1: Most Dutch people do not drive an EV.	.079	.803
Descriptive 2: Most Dutch people are driving a combustion vehicle.	.066	.819
Dynamic 1: An increasing number of Dutch people is driving EVs.	.695	.335
Dynamic 2: More and more people that I know are driving an EV.	.668	-.100
Dynamic 3: More and more Dutch people are driving electric.	.732	.312
Injunctive 1: The government thinks that Dutch people should drive electric.	.577	.162
Injunctive 2: Most Dutch people think that Dutch people should drive electric.	.594	-.298

*Note.* The correlations between the items and the respective component are depicted. Varimax Rotation with Kaiser Normalization was used.

## Results

### Preliminary Analyses

In line with the proposed research model, the hypothesized variable interrelations were tested by means of a multivariate analysis of variance (MANOVA) in IBM SPSS Statistics version 27. First, the MANOVA assumptions were tested to ensure the suitability of the data for subsequent analyses (see Appendix A). First, the assumption of independence was met since the study used a convenience sample from the population of Dutch EV drivers and the observations were entirely independent of one another. Second, the independent

variable was categorical, and the dependent variables were scale variables. Third, Q-Q plots indicated that the dependent variable dynamic norms showed a normal distribution, thus meeting the normality assumption. However, the dependent variable descriptive norms gave reason to believe that there might be a significant deviation from normality. Lastly, homogeneity of variance, meaning the equal variance between the groups, was tested using Box's M test. This assumption was not met at  $p < .001$ . However, due to the large group sizes of  $n > 30$ , MANOVA can be assumed to be robust against this violation (Allen & Bennet, 2008). The analysis was continued knowing that the results need to be treated with caution due to partial violation of the assumptions.

### **Hypothesis Testing**

The influence of the independent variable subsidy awareness on the two dependent variables descriptive and dynamic norms was analyzed using MANOVA. First, testing the effect of subsidy awareness on descriptive norms yielded significant results. The strength of people's descriptive norms differed depending on whether they were aware of the subsidy or not. More precisely, EV drivers who were aware of the subsidy showed an increased subjective norm ( $M = 4.51, SD = .75$ ) compared to the group unaware of the subsidy ( $M = 4.25, SD = .95$ ). The effect of subsidy awareness on descriptive norms was small ( $F = 22.63; p < .001; \eta^2 = .009$ ). That is, H1 was accepted, indicating that people who were aware of the subsidy were more likely to think that most Dutch people are driving a combustion vehicle. To test H2, we investigated the influence of subsidy awareness on dynamic norms and found a significant effect with a small effect size ( $F = 18.75; p < .001; \eta^2 = .008$ ). More specifically, people who were aware of the subsidy showed a significantly higher dynamic norm ( $M = 3.80, SD = .74$ ) than those who did not know about the subsidy ( $M = 3.57, SD = .82$ ). People aware of the subsidy are, hence, more likely to think that an increasing number of people are driving EVs, providing evidence in favor of H2. As we did not find injunctive norms to form



a reliable variable, the influence of subsidy awareness on injunctive norms (H3) remained untested.

### **Discussion**

To counteract the high emissions from the transport sector, a transition toward more sustainable transportation such as EVs needs to occur (IPCC, 2022). Subsidies are an effective tool that is commonly used by policymakers to stimulate behavior change such as EV adoption (Helveston et al., 2015, Langbroek et al., 2016; Van Valkengoed & Van der Werff, 2022). However, why subsidies are effective as a motivator of behavior is not entirely clear yet. To test the mechanisms underlying the effectiveness of subsidies, we investigated whether and how they relate to social norms. Based on previous research indicating that social norms influence EV adoption and other pro-environmental behaviors, we looked at the effect of subsidies for EVs on drivers' descriptive, dynamic, and injunctive norms (Rezvani et al., 2015; Jansson et al., 2017). We conducted a study amongst EV drivers in the Netherlands to test whether subsidy awareness might have an influence on social norms. More specifically, we expected that subsidy awareness comes along with stronger descriptive, dynamic, and injunctive social norms because the subsidy highlights EVs as a relevant option for modern transportation. We argued that the governmental subsidy signals that there is a need for more EVs, thus showing that the majority is not driving an EV. In line with that, we found that people being aware of the subsidy had a stronger descriptive norm regarding EV usage (H1). Due to the subsidy making EVs more affordable, there is reason to believe that an increasing amount of EVs is being purchased. Correspondingly, subsidy awareness came along with stronger dynamic norms in EV users (H2). Furthermore, we argued that the subsidy is conveying that the government considers EV adoption to be the right thing to do, as they would not offer it otherwise. However, due to methodological issues we decided to drop injunctive norms and could, therefore, not investigate whether EV users

who were aware of the subsidy had stronger injunctive norms regarding EV use (H3). A cross-sectional correlational study on the effects of the subsidy on social norms was conducted in a sample of Dutch EV drivers.

### **Descriptive Norms**

Our results indicated that, as predicted in H1, the descriptive norms were stronger for people who were aware of the subsidy. More specifically, our findings showed that EV drivers who were aware of the subsidy believed more strongly that most Dutch people do not drive an EV. We suspect the underlying reason for this to be that the subsidy has an effect on how people perceive the spread of EVs. A subsidy might imply that EVs are not used by the broad majority (yet), and, therefore, need to be promoted through a subsidy. Consequently, knowledge of the subsidy seems to strengthen the dynamic norm that most people do not use an EV at present. While currently the descriptive norm is ICEV use, the EV subsidy potentially has the power to be a starting point towards a new descriptive norm implying EV use as a dominant behavioral option.

Descriptive norms reflect how the majority is behaving, indicating that the behavior has been tested by the majority and seems to be adaptive (Cialdini, 1990; 2007). Thus, the behavior of driving an ICEV seems to be a valid and proven choice for people who are aware of this descriptive norm, even though driving an ICEV does not necessarily align with the general goal of reducing CO<sub>2</sub> emissions. Interestingly, descriptive norms can be influential on behavior, even if the descriptive norm is not consistent with the goal (Schultz et al., 2007; Perkins, Haines, & Rice, 2005). Thus, the subsidy might unintentionally demote EV adoption by conveying descriptive norms that showcase that not driving an EV is normal and accepted. This is reflected in our findings since subsidy awareness was associated with a stronger descriptive norm in favor of ICEVs. However, this study did not include measures about EV adoption, so further research is necessary to test whether subsidies can, indeed, have a

detrimental effect by strengthening the descriptive norm of ICEV use.

Even though subsidy awareness comes along with stronger descriptive norms in favor of ICEVs, that does not necessarily mean that this descriptive norm hinders EV adoption. Since our study was conducted only amongst EV drivers, it becomes evident that people can hold strong descriptive norms about the dominance of ICEVs, but still act against this norm. This is in line with a study by Barth et al. (2016) that showed undesirable descriptive norms to have no effect on the adoption of EVs. So even though the descriptive norm promotes behavior that is not environmentally friendly, the environmentally friendly behavioral choice is not necessarily impacted therefrom. This finding could be attributed to the fact that EVs are still a relatively new technology and might, therefore, not yet be considered an area in which descriptive norms apply. Adopting EVs might just not yet be a well-established behavior that provides an estimate of future developments (Barth et al., 2016). While EV subsidies seem to be in relation to the strength of the descriptive norms about EVs, it is not entirely clear whether and how the descriptive norms impact EV adoption. Further research focusing on the effect of descriptive norms on EV adoption is needed.

### **Dynamic Norms**

As predicted in H2, dynamic norms were found to be stronger for people aware of the subsidy. More explicitly, people who knew about the subsidy on EVs were more likely to perceive that an increasing number of people are driving EVs.

This can be explained by the signaling value of the subsidy, influencing people's perception of EVs as trending. The subsidy implies that a change toward EVs is promoted. Accordingly, the dynamic norm that more and more people are adopting EVs is strengthened. However, people unaware of the subsidy might not perceive EVs as a current trend promoted by the government. Our research, thus, indicates that pro-environmental subsidies might act as a signal of change and highlight trends toward pro-environmental behavior.

The findings give an idea about mechanisms underlying the effectiveness of pro-environmental subsidies. Through their effect on dynamic norms, subsidies might influence pro-environmental behavior indirectly. Since previous research on dynamic norms found that holding strong pro-environmental dynamic norms is a precursor of pro-environmental behavior (Loschelder et al., 2019; Mortensen et al., 2017), a consequence of strengthened dynamic norms might be that people are more inclined to use an EV. However, since the study at hand is correlational in nature, it remains unclear whether subsidies do, indeed, cause a change in dynamic norms. More research using experimental or longitudinal designs is needed to investigate causalities.

### **Injunctive Norms**

The effect of subsidy awareness on injunctive norms could not be assessed in this study as the score reliability of the scale was not sufficient and the factor analysis revealed the items not to be represented by an underlying construct. Items constructed to test injunctive norms appeared to not have measured the intended concept. We aimed to examine the perceived injunctive norms of (1) the government and (2) the Dutch population in terms of EV adoption. However, the factor analysis revealed that the items were too closely related to those constructed to measure dynamic norms. We assume that the phrasing of the items was not suitable for this purpose since we used very broad reference groups, namely the government and the Dutch nation. Previous studies on injunctive norms used wording that referred to more personal reference groups, such as “people who are important to me” (White et al, 2009). Future studies should employ a similar approach, asking about reference groups that are personally relevant to participants. Furthermore, investigating the high correlational overlap of injunctive and dynamic norms might give more insights into the distinctiveness and practical relevance of the two types of norms in the context of sustainable innovations like EVs.

### **Limitations**

The preset study comes along with some limitations. First, not all assumptions for a MANOVA were met. Normality appeared to be somewhat violated for the descriptive norms. Also, equality of variances was not given between the two groups “subsidy awareness: yes” and “subsidy awareness: no”. Therefore, all presented results need to be considered with caution.

Second, the effect sizes of the findings regarding both the descriptive and dynamic norms were small. While our study showed a difference in descriptive and dynamic norms about EV use depending on subsidy awareness, the difference was small and conclusions about the meaningfulness of the effects should be drawn with caution. Since the effect of subsidies on norms seems to be small, investigating other factors via which subsidies might exert their influence on pro-environmental behavior might be worth investigating. Previous studies found that perceived behavioral control, so the extent to which people feel that they can easily switch to EV use, influences EV adoption and policies like subsidies strengthen this effect (Li et al., 2020). Therefore, investigating alternative explanations for the effectiveness of subsidies that yield larger effect sizes and, thus, explain the effect of subsidies better should be subject to further research. Moreover, future studies should aim to replicate the findings for social norms.

Third, the sample consisted of only EV drivers, possibly implying a biased sample. Generally, EV drivers could have stronger norms concerning EVs as they might be more positive toward them and have more information about the status quo and trends regarding EVs. Therefore, the findings of this study should be replicated in a more representative sample to also include non-EV drivers, since they are also a target group of the subsidy.

Lastly, the current study is correlational in nature, limiting the power of conclusions that can be drawn. While subsidy awareness correlates with descriptive and dynamic norms,

it cannot be said whether the subsidy, indeed, causes changes in norms. Therefore, future research should explore what the relationship looks like and explore possible causality or a mediation model with social norms as a mediator between subsidy awareness and EV adoption.

### **Theoretical and Practical Implications**

The findings complement current psychological theory regarding social norms. We found that norms seem to be influenced by subsidies, which is an insight warranted to be considered in future research. Moreover, we found evidence in line with the premise that the effectiveness of subsidies comes along via their effect on social norms. Future studies should explore this relationship further, testing whether social norms act as a mediator between subsidies and EV adoption.

The finding that people aware of the subsidy hold stronger descriptive norms gives reason to believe that the subsidy might produce unwanted effects that demote EV adoption. However, stronger dynamic norms for people aware of the subsidy might implicate a promoting effect of the subsidy on EV adoption. This implies different approaches to how the respective norms can be used most efficiently and with the desired effects. The focus theory of normative conduct suggests that others will behave according to the norms that are most salient (Cialdini et al., 1990). Thus, if the current state (i.e., descriptive norm) is less salient than the development (i.e., dynamic norm), the focus is assumed to be on the shift towards pro-environmental behavior rather than the current state. Subsidies might shift the focus away from the undesired social norm (i.e., ‘the majority drives ICEVs’) toward a favored norm (i.e., ‘more and more people are driving EVs’). Through this normative message conveyed by the subsidy, behavioral change in the population might be achieved (Cialdini et al., 2006). While the subsidy seems to highlight the change toward pro-environmental behavior, it simultaneously appears to foster the descriptive norm. Therefore, subsidies should be

administered with care to reinforce behavior change through dynamic norms rather than strengthening the current unsustainable descriptive norm further.

Social norms seem to relate to pro-environmental transportation subsidies.

Policymakers should take that effect into account when designing a subsidy, since promoting pro-environmental behavior via financial incentives seems to influence not only people's financial possibilities but also their norm perception. By highlighting a trend in popularity instead and the current, unsustainable norm, subsidies might motivate pro-environmental behavior. However, the effect of subsidy awareness on social norms was small, raising the question of whether policy instruments other than subsidies influence norm perceptions more effectively. Further research and policymakers should, therefore, also consider other, maybe less expensive ways to change social norms and, thereby, influence pro-environmental behavior.

### **Conclusion**

In the present study, we looked into the effectiveness of subsidies on EVs by assessing how being aware of the subsidy may relate to social norms. Subsidy awareness was associated with higher descriptive norms that highlight EVs being the minority. Further, subsidy awareness was associated with dynamic norms that showcase the current trend toward EV adoption. These results suggest that one way in which subsidies exert their effectiveness could be by reinforcing the dynamic norm associated with EV adoption. In order to mitigate climate change and reduce CO<sub>2</sub> emissions caused by conventional cars, policymakers could consider focusing on dynamic normative messaging when promoting the subsidy and EVs.

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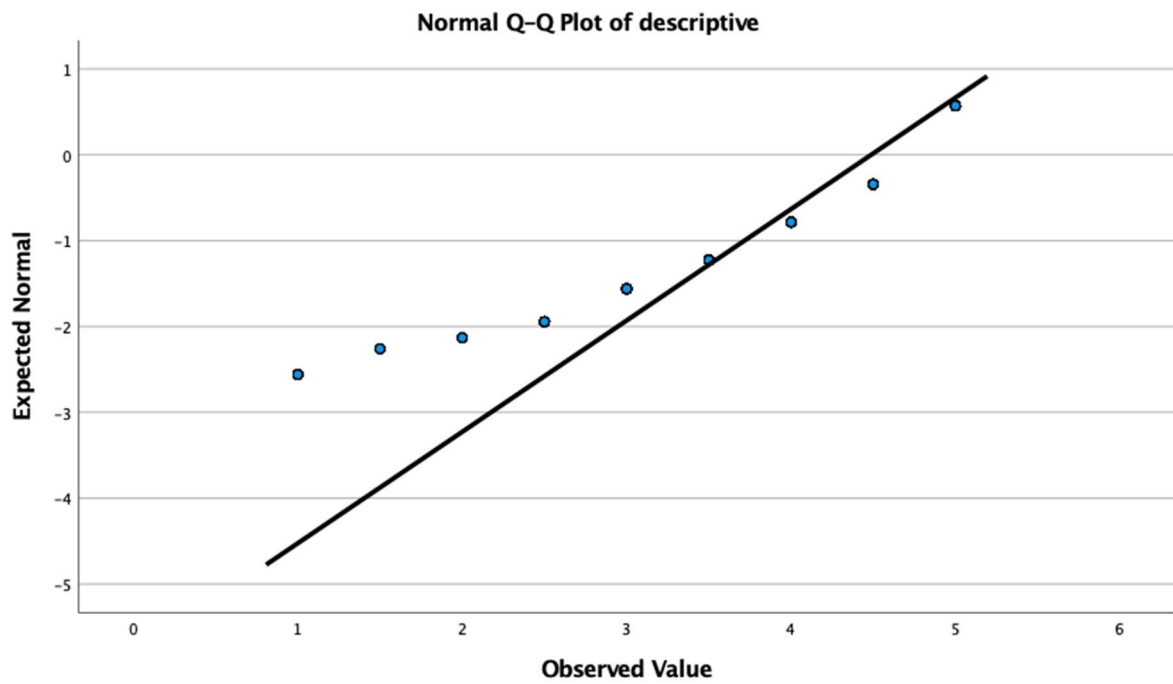
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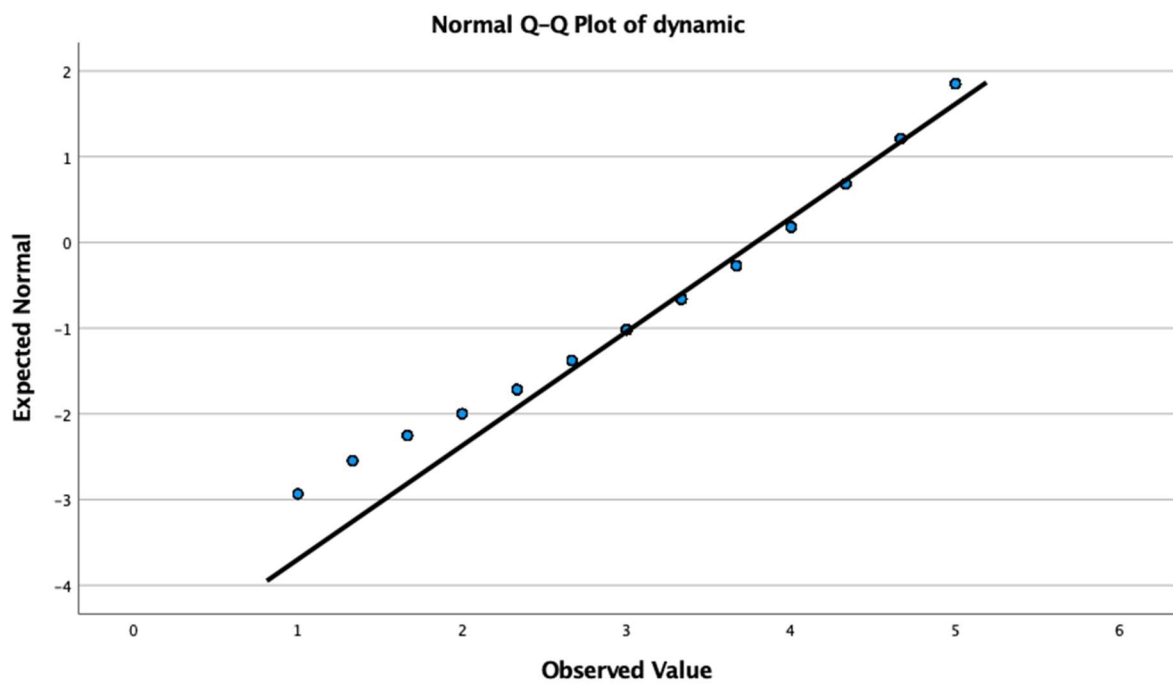
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**Appendix A**

Assumption Checks



*Note.* The Q-Q plot indicated that the normality assumption for the descriptive norms item was violated.



*Note.* The Q-Q plot indicated that the normality assumption for the dynamic norms item was met.