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Carrot or Stick? How Policy Type Influences Consumer Intention to Purchase Electric Vehicles

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Abstract

The potential for widespread electric vehicle adoption is contingent on the effectiveness of policy interventions. The types of potential policy interventions that governments can implement are seemingly wide ranging but are effectively a core set of policy functions that are implemented in the way that is most appropriate for the area in question. Policy makers need to take into account the different types of responses that may be triggered as a result of an intervention. Due to the novelty of EVs, assumptions need to be made about consumer attitudes and behaviour in order to establish policies with the intention of encourage growth. Previous research indicates that policy interventions that people are more likely to respond favourably to policy interventions that incentivize rather than those that disincentivise. Analysis of responses to planned and existing policy interventions in London supports this insight.

Keywords: electric vehicles, policy, policy interventions

1. Introduction

Public policy is a set of decisions made by governments and other political actors address a public issue through influence or change (Hassel, 2015). Policy ultimately seeks to change behaviour by changing attitudes and beliefs, offering new technology or providing financial or material incentives (Stern, 1999). Electric vehicle (EV) adoption can be influenced by both environmental policy and transport policy. In the context of pro-environmental behaviour, policy measures are used to attempt to curb unsustainable behaviours which have contributed to climate change and poor air quality (Hargreaves, 2011). Whereas one of the goals of transport policy is to manage and regulate existing transportation activities (Rodrigue, 2020).

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Government policies can help to make the economics of an EV more attractive to potential consumers (Kampman, Delft and Braat, 2011) which is important because the cost of an EV is such a barrier for some that they are unlikely to make the change from internal combustion engine (ICE) vehicle to EV voluntarily. Until EVs become competitive in their own right as a result of improvements in technology and a shift in the cost of oil, government policies will be needed for EVs to establish market share (Kampman, Delft and Braat, 2011). Therefore, understanding the potential influence of interventions will be key to driving widespread EV adoption.

In 2020, it was announced that the Ultra Low Emission Zone in London would be expanded to cover a majority of the city meaning non-compliant vehicles would be charged £12.50 when entering or driving through the zone. Although the policy effectively disincentivised London drivers, the novelty of the intervention made it interesting for analysis into public response.

1.1. Policy Types

Transport policy relating to EV adoption can be categorised in different ways and policy in can fall into more than one category (Darnton *et al.*, 2006). When categorised by the main mechanisms they employ, policy can be segmented into four categories: economic, regulatory, social/voluntary and other (Darnton *et al.*, 2006). When viewed by their objective, as opposed to the mechanism, EV policy can be segmented into regulations, infrastructure investments and price instruments (Berg *et al.*, 2017). Finally, policies can be categorised into simpler dichotomous categories such as financial and non-financial or incentivising and disincentivising – both of which encompass the aforementioned categories.

Regulatory policies set restrictions on activities and effectively set the foundation for other policy variants to be built upon. This would include the regulation of market structure, codes of practice and prohibition (Darnton *et al.*, 2006). Common examples are driving restrictions or fuel emission standards. Another example is a mandate for property developers to include charging infrastructure in the parking provision of newly built flats, offices and retail buildings (Bakker and Jacob Trip, 2013).

Economic policies are those related to costs or budgets and can encompass both financial and non-financial incentives. Price incentives such as subsidies and taxes can influence mode choice and/or transport behaviour (Berg *et al.*, 2017). Tolls, parking fares, government loans, grants, charges and benefits are other examples of policy instruments that fall under the economic category (Darnton *et al.*, 2006). Financial incentives address the barrier of cost and are seen to be necessary in order to encourage EV growth (Harrison and Thiel, 2017) as they lower the cost of EVs and make them a more feasible alternative to ICE vehicles (Newbery and Strbac, 2016).

Social/voluntary policy influences consumer knowledge through the provision of information and education in the hopes that it encourages willingness to change. Public education campaigns, disclosure requirements, labelling and advisory services are the types of interventions that would fall under this category (Darnton, 2008).

1.2 Incentivisation

Ultimately policy interventions are designed to encourage a shift in behaviour, therefore understanding what impact the intervention has on the target audience is an important part of the policy planning process. Whether regulatory, economic or otherwise, policies either incentivise (pull) or disincentivise (push) the public (Brückmann and Bernauer, 2020). Policy measures which disincentivise effectively make the behaviours in question less attractive through measures like taxes. Policy measures which incentivise encourage the desired behaviour through interventions like subsidies.

2. EV Policy Progression in London

Although the paper focuses on London policy, there were a range of national interventions that are worth mentioning as they could be accessed by London drivers in order to make the switch from ICE to EV more

favourable. These include Vehicle Excise Duty (VED) Exemption, the UK Plug-In Car Grant and the Electric Vehicle Home Charge Scheme.

Vehicle Excise Duty, also known as road tax, is an annual tax on the ownership of road vehicles. It is sometimes referred to as car tax but applies to all vehicles that are used or kept on a public road (Butcher, 2017). Since 1997, VED was designed to incentivise drivers who use lower emission vehicles and places vehicles in bands based on how much emissions the registered car emits (Butcher, 2017). At the end of 2017, the government introduced a new system of VED, based primarily on carbon dioxide emissions, for cars registered on and after 1 March 2001 (Butcher, 2017). Under this new system, which came into effect in April 2018, EVs were exempt from VED ultimately incentivising drivers of low emission vehicles.

The UK Plug-In Car Grant was introduced in 2011 and at the time of its launch, gave drivers up to £4500 off the cost of a new, low emission vehicle. Eligible vehicles, typically EVs, emitted less than 50g of CO2 per km and could travel at least 112km without any CO2 emissions for £4500 grants. The value of the grant gradually decreased until June 2022 when it was eventually stopped.

The Electric Vehicle Homecharge Scheme (EVHS) provided grant funding of up to 75% towards the cost of installing electric vehicle charge points at residential properties in the UK (Office for Zero Emission Vehicles, 2019). In 2015 the grant was capped at £700, in 2021 the cap had reduced to £350. This policy was designed in response to evidence that potential EV drivers would mostly charge their vehicle at home (Office for Low Emission Vehicles, 2016).

2.1. Policy Types

Transport Policy in London tends to be aimed towards decreasing congestion and reducing emissions. There has been a concerted effort to decrease emissions from transport in the capital for many years with policy interventions becoming increasingly aggressive over time.

The policy intervention that effectively laid the foundation for the most recent interventions was the Congestion Charge Zone. In 2003, this policy was introduced to reduce congestion on inner London roads. The principle of the Congestion Charge Zone was that vehicles with four or more wheels that drove through the zone between 0700 hrs and 1830 on Monday to Friday would have to pay a charge or receive a Penalty Charge Notice (PCN). Less than a year later after its launch, ‘congestion within the charging zone was reduced by 30 percent, and the volume of traffic in the charging zone has reduced by 15 percent’ (Transport for London, 2004, p. 1).

In October of 2017, a toxicity charge (T-Charge) was launched in London to address London’s air pollution (London City Hall, 2017b). The principles of the charge were that any car that doesn’t meet the Euro IV standard or motorcycle that doesn’t meet the Euro III standard would be required to pay a charge when driving through Central London – the same zone as the Congestion Charge zone. The T-Charge zone operated from 0700hrs to 1800hrs, Monday to Friday and the charge to drive through the zone is £12.50 in addition to the Congestion Charge (London City Hall, 2017b).

2.2. Ultra Low Emission Zone (ULEZ)

In April, 2019, the T-Charge was phased out in lieu of an Ultra-Low Emission Zone (ULEZ). The ULEZ was purported to be one of the toughest emissions standard zone in the world at the time (London City Hall, 2019) and operated in much of the way of the T-Charge, except that it is in effect 24 hours a day, 7 days a week. The charge for driving through ULEZ in a non-compliant vehicle was £12.50. While the T-Charge mostly affected motorcycles and passenger vehicles, ULEZ affected all vehicles, including emergency vehicles, breakdown recovery vehicles, snow ploughs and gritters.

There were more than 18,000 responses to the public consultation on the ULEZ, with nearly 60 per cent showing strong support for the principle of ULEZ and 63 per cent supporting an earlier implementation of the initiative (London City Hall, 2017a). Road transport emissions were expected to lower by 20 per cent in 2019 as a result of ULEZ (London City Hall, 2017b). In the first two weeks of the ULEZ, 70 per cent of the vehicles that entered the

zone were compliant – higher than what was projected. Six months after the ULEZ launched, City Hall reported that the ULEZ was responsible for a 29 per cent reduction in NO2s within the and 4 per cent reduction in carbon dioxide emissions in the ULEZ zone (City Hall, 2019).

In November 2017 a consultation to extend the ULEZ zone to the boundaries of the North and South Circular was launched and in In June 2018 it was announced that the extension of the ULEZ would happen in October 2021 (London City Hall, 2018). In addition to extending the zone, the standards were applied to heavy vehicles like buses, coaches and lorries from 26 October 2020 and for light vehicles like cars, vans and motorbikes from 25 October 2021. The expansion was met with more resistance than the first iteration of the ULEZ.

In contrast to how the first iteration of the ULEZ was received, the extension was met with some resistance. Some London residents expressed their opposition to the scheme through an online petition calling for the proposal to be scrapped, which by August of 2021 had attracted more than 160,000 signatures (Wyszomierski, 2018). At government level, some politicians openly opposed the scheme and one London mayor candidate pledged to stop the ULEZ expansion if he was elected in the 2021 London Mayoral elections (Greater London Authority, 2021).

Research indicates that policy measures that pull are more favourable than those that push because they garner grater public support and reduce the perceived cost of a desired behaviour (Brückmann and Bernauer, 2020) and this was established by understanding which type of policy would be more favourable to respondents. This study looks at responses to different planned and existing policies (at the time) to determine the influence of incentivisation by observing which of the incentives were more likely to encourage EV adoption among respondents.

3. Methodology

An online survey was distributed to 476 London drivers of ICE vehicles. Responses to the range of planned and existing EV policy interventions were analysed using a mixed methodology approach. At the time of the survey, the Ultra Low Emission Zone was a planned intervention. Six policy interventions were tested for awareness (prompted and unprompted) and likelihood to motivate the respondent to purchase an EV:

- Grant towards Low Emission Vehicle
- Vehicle Excise Duty Exemption
- Ultra Low Emission Zone (ULEZ)
- Home Charging Point Installation
- Congestion Charge Exemption
- Discounted Parking

Respondents were asked which of the listed interventions would be the main reason they would consider purchasing an EV. Respondents were also asked how likely they would be to lease or purchase an EV before the expansion.

4. Results

Responses from this sample indicate that the sample responded more favourably to the interventions that incentivised. Of the six interventions tested, the ULEZ was the only intervention that disincentivised and was the third likely reason respondents would consider switching to an EV after a grant towards a low emission vehicle and VED exemption as shown in Table 1.

The ULEZ was the intervention that respondents were most aware of (prompted and unprompted) yet, only 13% of respondents cited the ULEZ as the main reason they would consider switching to an EV. Responses to the incentives that would most encourage respondents to switch to an EV were not attributable to respondent's awareness of the incentives. When respondents were asked to state the EV related policies that they were aware of, ULEZ was the most cited policy when unprompted and the most recalled when prompted.

When respondents were asked to state the EV related policies that they were most aware of 32 respondents recalled the ULEV grant, and 33 respondents recalled the ULEZ expansion. When prompted, respondents were less aware of the ULEV grant (32%) than the ULEZ expansion (50%). These results are shown in Table 2. Calculations were not done for unprompted responses that were not one of the policy interventions tested in the study.

Table 1. Motivators for purchasing an EV Responses to the question: 'Which of the following would be the main reason that you considered purchasing an EV?'

Policy intervention	Policy Type	%
Grant towards Low Emission Vehicle	Incentive	43%
Vehicle Excise Duty (VED) Exemption	Incentive	21%
Ultra Low Emission Zone (ULEZ)	Disincentive	13%
Home Charging Point Installation	Incentive	11%
Congestion Charge Exemption	Incentive	10%
Discounted Parking	Incentive	2%
n=424		

Table 2. Awareness of EV related policies

	Unprompted Responses	Prompted
VED Exemption	22	46%
ULEV Grant	32	32%
Charging point grant	5	22%
Congestion Charge exemption	19	42%
ULEZ	33	50%
Charging infrastructure	9	
Petrol diesel ban	18	
Scrappage scheme	11	
Other	10	
None	153	
Don't know	67	
Did not answer	125	

More than 2 out of 5 respondents stated that the grant towards the purchase of an EV, an incentive, was the main reason they would consider purchasing an EV. Vehicle Excise Duty (VED) exemption, also an incentive, was the second most popular reason for considering the purchase of an EV. This is notable because it is highly unlikely that the money saved through VED exemption is more than the difference in the cost of the respondent's current vehicle compared to the cost of a ULEV. The ULEZ was the third most popular reason respondents stated they would consider purchasing an EV, supporting the notion that interventions that incentivise are more impactful than those that disincentivise.

The policies that were least selected as the main reason respondents would consider purchasing an EV were the Home Charging Point Installation Grant (11%), Congestion Charge exemption (10%) and discounted parking (2%). Collectively, the ULEV grant and VED Exemption were the key motivators for 64% of the sample and the Ultra Low Emission Zone, was a key motivator for only 13% of respondents.

5. Discussion

These results from this study highlight the potential for incentivising policies to have a greater impact on the target audience, however, the planning and implementation of policy cannot be done from a one-dimensional perspective. The interventions tested in this study were scrutinised in silo, but in reality, were delivered as a part of an integrated overarching strategy which encompassed different policy mechanisms that influence differently. While it is encouraging to be able to identify incentivising policies as the most effective, it would be advantageous to understand how the relationship between different policies influences an individual's decision-making. For example, the ULEZ has been credited for a significant reduction in emissions in inner London and an increase in the number of compliant vehicles in the zone. It could be argued that the interdependent relationship between improved access to an EV (pull) and a fee for driving a non-compliant vehicle in the zone (push) resulted in the desired behaviour change.

Furthermore, while favourability to an intervention goes some way into measuring intention, which is a precursor to behaviour, encouraging the actual behaviour is the intention of the policy. Initial responses to the first iteration of the ULEZ met with favourable responses and resulted in the desired change in behaviour as well as a reduction in emissions. However, responses to the introduction of the second phase of the ULEZ were less favourable to the public but resulted in much greater impact. Despite not being cited as the main reason for adopting an EV in this study, the results of the ULEZ have had a significant impact on air quality in the capital. According to City Hall, in the first 10 months of its operation, the ULEZ helped reduce road transport nitrogen oxides (NOx) emissions by 35 per cent (London Assembly, 2023).

In addition to the air quality benefits, the ULEZ has led to a reduction of around 800,000 tonnes of CO2 emissions from vehicles across London over since its launch compared to the projected levels without the ULEZ. Finally, the number of non-compliant vehicles in the zone dropped by 60 per cent since the expansion came into operation in October 2021 resulting in a 94.4% share of compliant vehicles driving in the zone (London Assembly, 2023).

There is still more work to be done to reduce air pollution to safe levels for London residents, the results after the introduction of the expanded ULEZ zone are encouraging and demonstrate meaningful progression towards ambient air quality which arguably outweighs the negative public response to the concept.

6. Conclusion

Policy interventions have the potential to convert ICE drivers into EV drivers if implemented strategically and effectively. In this study, policies that incentivised were more likely to elicit a desired response among London drivers than those that disincentivised. This is particularly remarkable considering that the intervention that disincentivised was novel and disruptive.

Policies related to the improvement of air quality are arguably the most challenging to design as the negative impacts of air quality are less evident to the public than the negative impacts of other public health concerns such as obesity or cardiovascular disease. This puts a greater responsibility on policy makers to design and implement the most policies that are likely to produce the best results.

Gaining greater insight and clarity into the influence of policy on the public helps policy makers to understand the nuance of behaviour and design more effective policies in future. Care must be taken to balance the ideal outcome of a policy intervention against public reaction at concept phase. It is encouraging when the target audience responds favourably to the concept of a policy, and where possible incentivising policies should be utilised. However, if the target benefit of the intervention is to be achieved, impact must take precedence over likeability.

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