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Establishing the transferability of best practice in EV policy across EU borders

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Abstract

In supporting the growth of the electric vehicle market within Europe, incentives will play a significant role. The paper presents the case that the success of incentives is contextualised. On the basis of 110 expert responses from Austria, Germany, Spain and the UK, the paper evaluates the effectiveness of different incentives, financial and non-financial, under different market and policy environments. Although incentives are invariably perceived as effective by our expert respondents, it is observed that the distribution in acceptance levels were dependent on the region in which they have been deployed. Interrogation of the supporting commentary provided the basis for the interpretation of these differences. The research therefore makes a positive contribution to the understanding of the linkage between the success in electric vehicle incentives and regional market framework and policy environments. This opens the door for best practice transferability of incentives and optimally combining different incentives dependent on the social and institutional environments into which they are deployed.

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1. Introduction

The challenge facing Europe on Greenhouse Gas (GHG) emissions is a considerable one. Increasing the number of Electric Vehicles (EVs) within the vehicle fleet offers a viable solution to the challenge of reducing GHG emissions (Davies, 2015), since they are the most efficient means of utilizing renewable energy for road transport. However, increasing the uptake of EVs is especially challenging because the ‘benefits’ of EV use accrue mainly to society and to the environment in the form of reduced pollution and carbon emissions, whereas the performance penalty (reduced range, long recharging time, inadequate facilities for recharging, higher purchase cost and uncertain rates of depreciation) accrue mainly to the driver and owner of the vehicle.

One approach to increase the number of EVs within the vehicle fleet is to provide incentives. Within Europe the largest market for EV is Norway. This market acceleration has been supported in part by the following incentives (EVU, 2015): Removal of import tax (car tax) decided in 1989 by the Minister of Finance, approved and implemented in the State Budget for 1990 by the National Parliament; Free parking on public roads, decided by the National Parliament in 1996; Free access to toll roads, decided by the National Parliament in 1996; Introduction of EL registration plate 1998; 0 % VAT agreed by the National Parliament autumn 1999 and implemented into the State Budget of 2000; Access to the bus lane started in 2004 as a 2 year test by the Minister of Transport and prolonged as permanent rule 2007; Free access to road transport ferries decided by the Minister of Transport in 2009; Establishment of a State Project for environmental friendly transport (Transnova) in 2009 by decision in the National Parliament in 2008; and Fusion between Transnova and ENOVA (energy efficiency and renewable energy governmental body).

However, each of these incentives has a cost to the providing entity, and in many cases the funding comes from taxes (either direct or indirect). Therefore, there is a clear requirement to ensure that the impact of incentives is maximised, in terms of the introduction or use of EVs, and that the incentives achieve a high benefit - cost ratio. With an increasing number of European countries choosing to incentivise the purchase and use of EVs comes the opportunity to learn from past experience and share best practice. However, the present system of incentivisation is highly contextualised with incentives being conceived and tested based on national and local requirements, in terms of the social and institutional environments into which they are to be deployed (Davies et al., 2014). This makes learning and exchange of best practice across European borders difficult.

It was the purpose of this study, supported by the Intelligent Energy Europe funded ICVUE project, to establish the influence of incentives and policy upon EV uptake based on stakeholder knowledge and perception. Further to this, the study looked to establish if the variation in the strength of these relationships between the regions. This study therefore contributes a vital cornerstone to support best practice exchange.

2. Background

2.1. EV and European Policy

The road transport sector is one of Europe’s fastest growing sectors in terms of CO₂ emissions; with a growth of 36% over the last 18 years (Pasaoglu et al., 2012). In response, and also to comply with its commitments under the Kyoto Protocol, the European Union (EU) has taken a number of actions to significantly reduce dependence on imported oil and cut carbon emissions in transport. The EU aims to reduce overall CO₂ emissions by 20% by 2020 and 80% by 2050 (European Climate Foundation, 2010). For transport, this involves a 60% reduction target for 2050, compared to 1990 levels (European Commission, 2011). To enshrine this commitment, a legislative framework was introduced in order to provide drivers for the EU automotive sector towards a set of specific CO₂ reduction targets, thus in April 2009, the EU adopted Regulation 443/2009/EC which established a CO₂ emission target of 130 g/km for the average of new cars sold by 2015. Perhaps the most attractive option on this pathway towards implementing low-emission vehicles is electric propulsion, which is a market ready technology alternative to the internal combustion engine (Hacker et al., 2009).

2.2. EV and National / Regional Policy

To stimulate and develop the market for EV, the different regions of Europe have conceived and initially tested and evaluated incentive programmes. However, the goals for these incentive programmes shift depending on the market. This implies that the structure of direct incentives differs between countries, and also the associated cost. Furthermore, at a regional and local level, the support to a strategic planned charging infrastructure can work towards reducing thresholds. This coherent program of incentives based on substantial lowered purchase tax, usage taxes and prioritising road access, which give EV buyers and users a clear and long term advantages in terms of cost of mobility and travel time to overcome the hurdles for driving an EV, has led to significant differences in the rate of EV uptake (Figure 1).

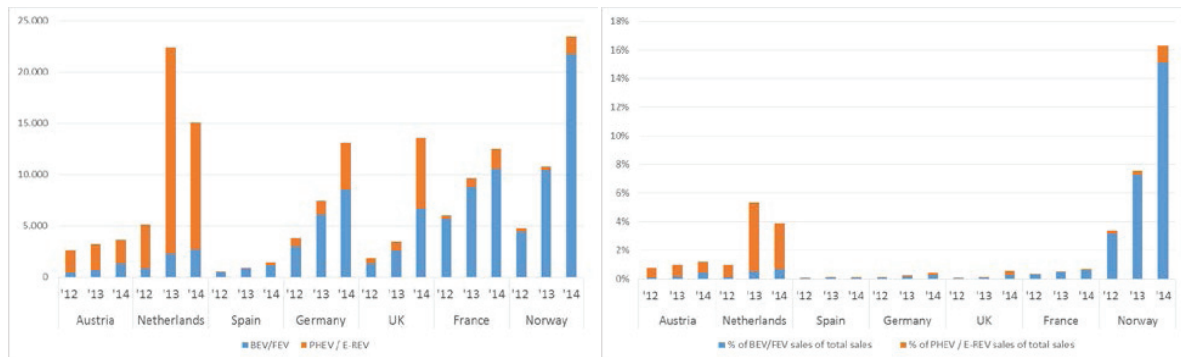


Fig. 1. EV (divide into PHEV and EV) sales for a number of European regions shown as absolute figures (LH image) and a percentage of new vehicle sales (RH image). Source: ICVUE project.

3. Methodology

It is clear from the literature that incentives are contextualised to best fit the local needs of a given city or region. However, given such a diverse range of approaches to incentivisation, the transferability of incentives is therefore difficult to ascertain and opportunities for learning are lost. The study therefore seeks to establish the relationship between incentives and the uptake of EV based upon expert knowledge for a number of different European regions.

Within I-CVUE the first figures on uptake of EV are gathered and incentive systems in each of the countries are studied in depth. By analysing the uptake and the incentives, the first conclusions have been drawn on the causal relations between uptake and incentives. Given the primary objective of this study – to explore the relationship between incentives and (subsequent) uptake of EV – the inclusion of as many stakeholders as possible was vital. To be able to draw constructive conclusions a call for evidence has to be done to study the actual attitude and experience of the stakeholders on buying and using EV's and to what extent they are influenced by incentives. A general call for evidence was issued in Germany, the UK, Spain and Austria. The questionnaire was designed to allow respondents to quantitatively score the impact of a spectrum of incentives and policy-driven initiatives on EV uptake. The structure of the questionnaire was based on a review of the external factors impacting the EV undertaken using a PESTEL analysis (Davies et al., 2014). A qualitative section within the questionnaire also allowed respondents the opportunity to discuss their answers and communicate their experience, knowledge and opinions on the impact of policy on their investments.

The call for evidence had a very positive response rate – receiving 110 fully completed questionnaires containing some 50,000 words. The sample quality was also notable – respondents spanned the entire spectrum from director or CEO-level, or equivalent, down to end user and represented a fairly balanced view of the EV landscape – and the quantity of responses was appropriately balanced across the regions under discussion. This paper presents the results in three levels: Highlights and analysis of the text replies, the condensed data presented in the PESTEL structure and a normalized analysis as trend overview in the concluding remarks.

4. Results

4.1. Political

“New technologies require...support at its initial stage until there is a sufficient market. The government has a key role in helping new developments...to reach a commercial stage. ”

Energy Provider, Spain

Political factors relate to how and to what degree a government intervenes in the market economy. Each of the regions included as part of this study benefits from a portfolio of subsidies and/or tax-breaks for those choosing to purchase and use an EV (whether applied nationally or regionally). These ‘political instruments’ have an associated financial cost and hence are designed with the intention of providing a certain level of stimulation to the market that is commensurate with the ability of the national government to fund the initiative.

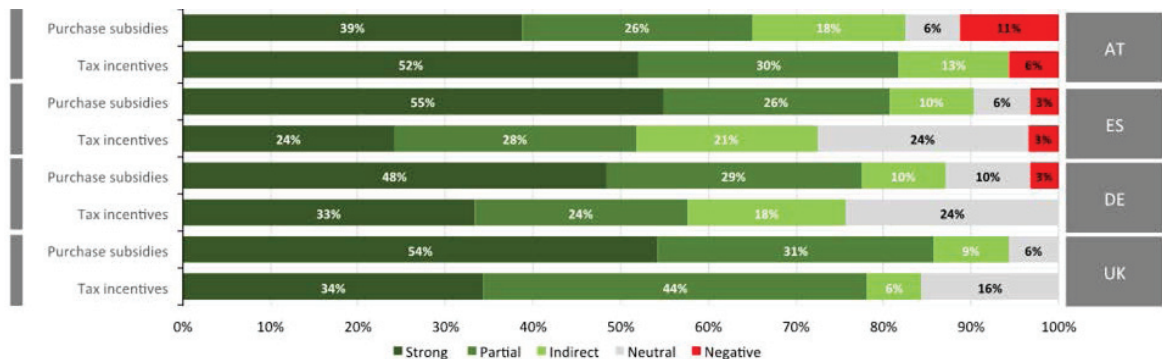


Fig. 2. Influence of subsidies/tax-breaks on Electric Vehicle market in UK, Germany (DE), Spain (ES) and Austria (AT) according to our respondents.

Comment: When considering the impact of subsidies and tax-incentives, including both regional and national initiatives, the majority of respondents in the call for evidence answered that across the board, influence on EV uptake was positive. In all but one region, the influence of purchase subsidies was rated higher than for tax-breaks. This correlates well with the fact that in the UK and Spain there are direct subsidies for the purchase of low emission vehicles. In Austria, although there was broad support for both purchase subsidies and tax-breaks, it was noted that ‘taxes are high in Austria, [and] incentives in [the EV] sector will probably be perceived very well’ and whilst ‘Austria has been very active in supporting the purchase of clean vehicles’ the role of purchase subsidies in promoting the uptake of EV has so far been limited to certain sectors of the market ‘because there are no purchase incentives for private users’. However, whilst in Germany there are no national subsidies for EV purchase, the commentary indicated that regional interventions, ‘for instance, a grant...for the purchase of electric taxis’ (tested in demonstration projects ‘Schaufenster-projekte’ in Germany) were having a positive influence, although also cautioning that price alone was not the only business relevant factor.

4.2. Economic

“The government is trying to avoid shortfall in receipts regarding taxes. Thus, the possibilities of economic policy are not exploited”

Engineering Consultancy, Germany

The tax and spend relating to transport is part of a wider economic policy in the region – transport can be a net contributor to the tax receipts of a region, whilst public transport can be a net beneficiary. This can impact upon the way in which alternative form of transport and different drivetrain technologies are both promoted and supported. The

requirement to balance budgets may impact on the willingness to prioritise pro-environmental and symbolic motivations ahead of investments for functional motivations in choosing vehicles. One of the strongest economic instruments in determining mobility patterns is fuel taxation. In several studies fuel prices (gasoline or diesel) have been identified as one of the most powerful predictors of EV adoption and EV diffusion [Gallagher and Muehlegger, 2011]. The comparative costs (the difference between the carbon based road transport fuels and electricity) differ greatly between Norway at one extreme and Germany at the other extreme (Davies et al. 2014).

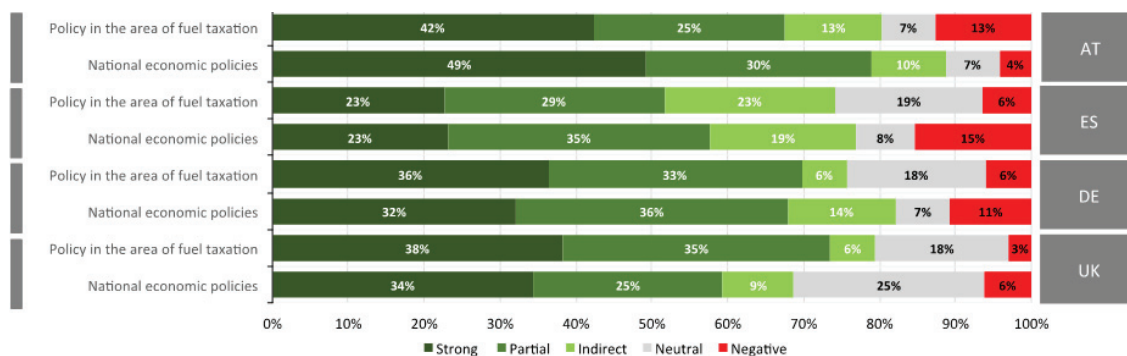


Fig. 3. Influence of economic policies on Electric Vehicle market in UK, Germany (DE), Spain (ES) and Austria (AT) according to our respondents.

Comment: On the whole, the stakeholders that participated in this study viewed economic policies as beneficial to the uptake of EV in their region. Focusing first on the national economic policy and the share that sustainable transport has from the overall tax and spending, it is seen that Austria has the highest share of positive respondents and the UK, the lowest although Spain has a higher proportion of negative respondents. The stakeholders in Austria are in general positive about the national economic policy and the role this has in supporting the R&D necessary to ‘achieve long-term goals by transforming the mobility habits of the people and foster new forms of mobility such as e-carsharing’. Within Spain, those stakeholders with negative views state that ‘general policies favour the consumption of non-renewable energies and the production and commercialization of vehicles with conventional technology’ whilst actions in support are limited and not necessarily cohesive ‘there are neither policies encouraging recharging networks nor active policies to discourage the use of combustion vehicles’. However, there are also positives with the ‘high petrol + diesel prices help make the financial case for purchasing an EV’, in line with economic theory regarding complement and substitute goods, but the commentary also has a word of caution that ‘fuel taxation is a highly political and populist arena’ and that in one region at least the ‘government has sought to back away from previous policy of escalating fuel tax (as an incentive for buyers to select lower carbon vehicles) to reduce motoring costs – reducing one of the motivators for change’.

4.3. Social

“The general lack of knowledge and information is one of the main obstacles for the implementation of the EV”

Communications Company, Spain

Trends in social factors will affect the demand for mobility (the frequency and distance travelled) and mobility choice (the distribution across the different transport modes). Policies to incentivise the EV need to take into account the utility and the knowledge about EVs. Utility of the EV is related to the journey type and suitability of other modes of transport available to the user. It is generally acknowledged that a higher population density together with access to efficient public transport options leads to an increase in the proportion of commuting using public transport (Balcombe et al., 2004; Cervero, 1998), whilst an increase in the cost of public transport can see that share reduce (Santos et al., 2013). Information and education campaigns are usually seen as instruments which may impact behavior. Santos et al (2010) argue that these types of measures are necessary, but not sufficient for behavioural

change. The move to EV can also be supported, and the overall experience improved, through local pilots (Newman et al., 2014).

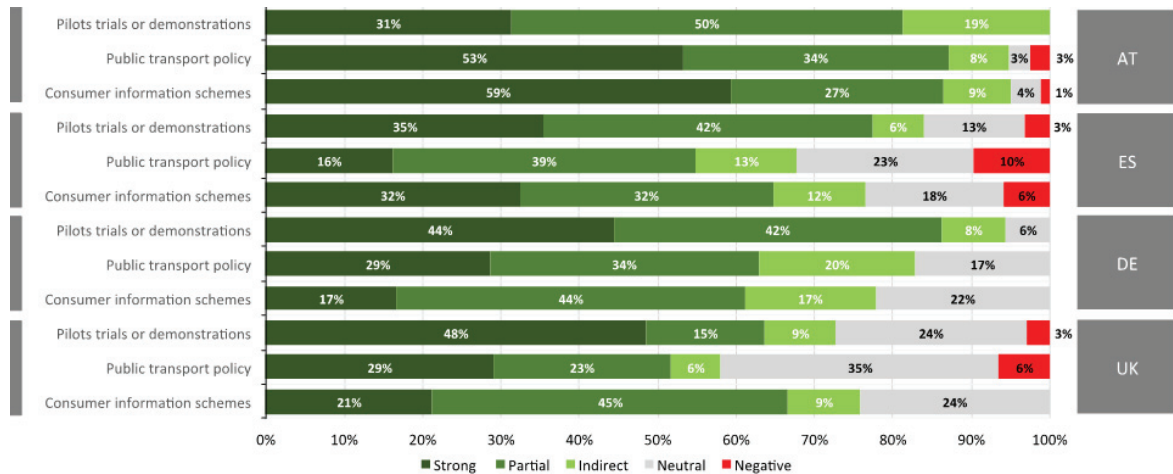


Fig. 4. Influence of social factors on Electric Vehicle market in UK, Germany (DE), Spain (ES) and Austria (AT) according to our respondents.

Comment: Pilots and trials of EV technologies and mobility solutions have overwhelming support in Austria and also in Germany. ‘Many of the vehicles and EV services available in Austria were financed by publicly funded pilots, ... [these] trials focused on specific regions or companies (e.g. postal services) provide significant visibility which helps of course’. Whilst there is less positive support in the UK and Spain, with comments primarily relating to the limited exposure of these schemes and the technical issues that such schemes encounter, the overall picture is one of an overall benefit to the uptake of EV: ‘sales of EVs are stronger in areas where trials took place’. Moving onto the role of public transport policy and how this interacts with and influences EV uptake, there is a difference between the four regions. In Austria, the policy on public transport has had a positive impact on EV, with only 6% indicating a neutral or negative impact. ‘It is a strong element of Austrian Transport Strategy to view electromobility as an integrated part of an overall transport system with a strong public transport component’. This contrasts with the UK, where the figure is 41%, and Spain and Germany, where the figures are 33% and 22%, respectively. In these regions the role of EVs within the broader transport mix is unclear for some of the stakeholders who responded negatively taking a view of EV as competing with as opposed to complementing existing public transport options – displacing mass public transport in urban settings and being less than suitable in rural settings. The final question related to consumer information. This is related to pilots, but is concerned with the existing benefits rather than trailing new approaches. In most cases three quarters of the respondents found favour with existing approaches, with the figure in Austria being higher still. The general consensus expressed in the commentary was that ‘There is considerable number of persistent clichés about e-vehicles which seem to be widespread among people. Targeted information about price, range, positive ecological impacts and fields of application might help transforming the image of e-vehicles’.

4.4. Technology

“Funding for research and development are crucial, particularly for not yet marketable technologies to cushion the economic risk inherent in each technical innovation”

Local City Authority, Germany

Technological factors include aspects such as R&D activity, automation, technology incentives and the rate of technological change. For the EV this includes both the supply of hardware (the vehicle), but also the provision and suitability of the charging infrastructure. Investments in the energy generation and supply side are on-going in each of the different regions. For the automotive industry the expenditure on development of new technologies is higher in

regions with established automotive manufacturing facilities. The target of the investment is also dependent on the structure of the established industry.

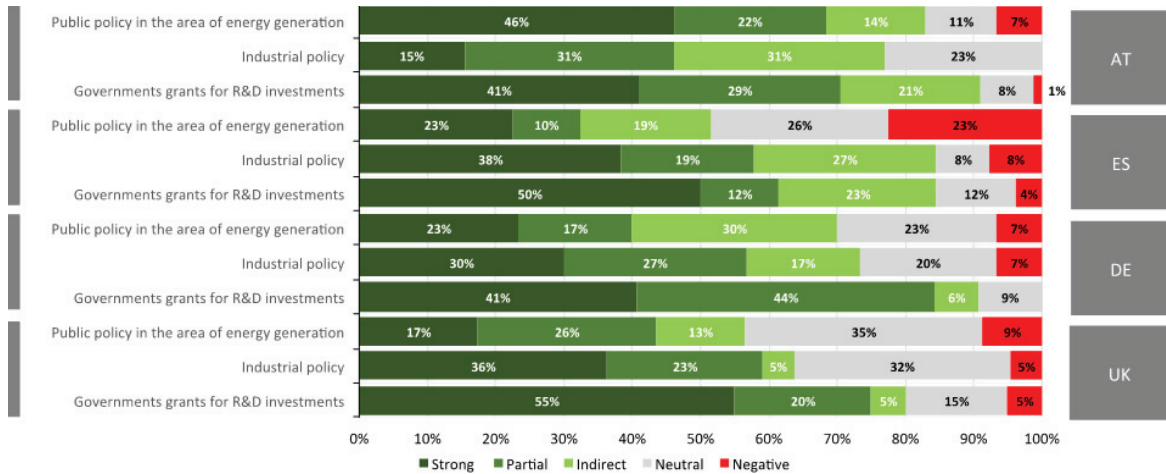


Fig. 5. Influence of technology policies on Electric Vehicle market in UK, Germany (DE), Spain (ES) and Austria (AT) according to our respondents.

Comment: The view that public policy in the area of energy generation has a positive impact on the success of EV varies from a high of around 82% in Austria down to 56% in the UK and 52% in Spain, which also had the highest percentage of respondents that expressed a negative view (23%). In support of the above a number of interesting points emerged from the commentary. Various Spanish stakeholders commented on the regulation and the disincentive to take advantage of balancing energy load and demand via renewables *'the policies are not enough, contradictory and often have a negative impact'*. UK stakeholders commented on the present disconnect between the vehicle user and the energy generation *'consumers in the main are not interested in any public policies concerning the energy mix'* and that an opportunity is therefore being missed because *'[there is] great potential for public policy in the area of energy generation to influence EV uptake, but it is still a well-kept secret'*. This contrasts with the experiences of stakeholders in Austria that commented on the opportunities for energy suppliers and consumers from the integration of EV. Industrial policy received a relatively even spread of responses with around two-thirds of respondents in each of the regions stating a positive influence on EV uptake. The strongest support for industrial policy was in the UK and Spain, with commentary from stakeholders highlighting the addition of EV manufacturing capacity as having a strong influence on EV uptake. Government grants for R&D activity also received broad support from stakeholders across all four regions.

4.5. Legal

"Legal regulations fostering E-Mobility are necessary in all areas that directly (or indirectly) can have an influence on the implementation of E-Mobility"

Automotive Supplier, Germany

Legal factors in this context are chosen as relating to laws/policy within the region with respect to EV ownership and use. To promote the purchase and use of EVs, regions implement a raft of different non-financial incentives including priority access to the road network, free parking and congestion tax exemption/discount. Also determinate upon regulatory and legal factors is the provision of (and access to) charging infrastructure. There is also evidence of local policies that discourage the use of traditional technologies, but are neutral in terms of behavioural change (not specifically targeting a shift to EV).

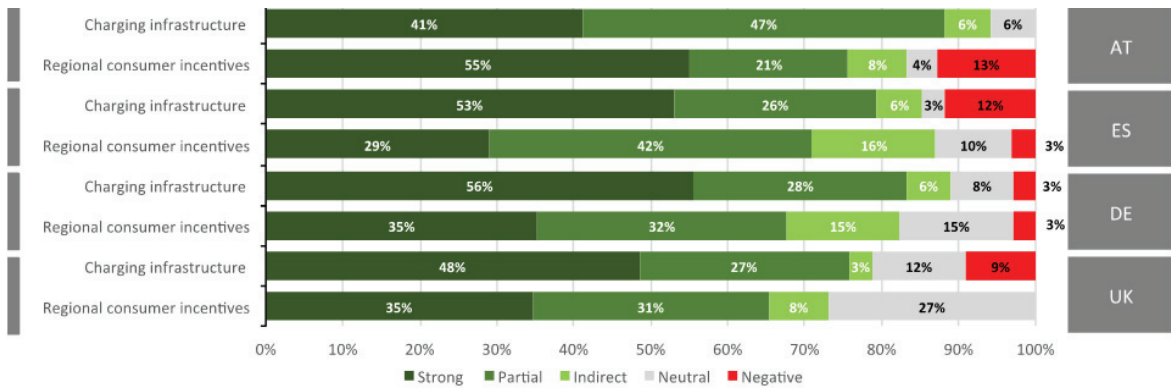


Fig. 6. Influence of legal policies on Electric Vehicle market in UK, Germany (DE), Spain (ES) and Austria (AT) according to our respondents.

Comment: Charging infrastructure is part of the package of measures targeted at facilitating EV uptake. The rollout of charging networks has had a positive impact and is ‘seen as vital to the success of the market’. However, regulatory and legal factors can both determine the location, accessibility, costs and permissions to access charging infrastructure leading to some negative comments, these primarily from the UK and Spain. A further measure to accelerate the uptake of EV has been preferential access to the road network and/or parking. Unsurprisingly, such measures were viewed as having a positive influence on EV uptake, even though the interrogation of the commentary revealed that the exact package of measures was different across the four regions. However, ‘these policies [local regulatory dispensations] won’t be sustainable once the use of [EV] becomes more popular’.

4.6. Environmental

“It is clear that transport policy, including policies to push EV market development, should play a significant part in meeting carbon reduction targets”

Government Representative, Austria

Environmental factors include ecological and environmental aspects and can also be extended to geographical factors. It is acknowledged that the EV is best suited to a narrow range of climatic and topological conditions if the range is to be maintained (FleetCarma, 2013). Air quality is an issue in all the city regions with emissions exceeding guidelines (EEA, 2015). This would be a significant motivator to provide incentives to promote EV.

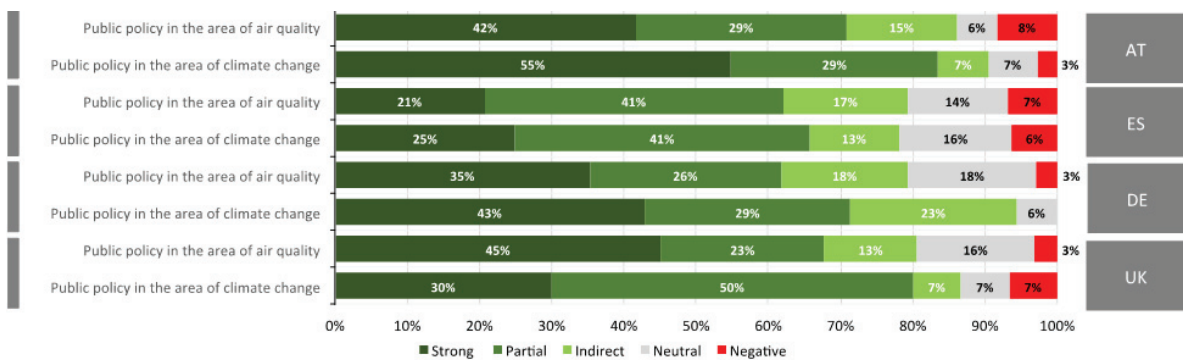


Fig. 7. Influence of environmental policies on Electric Vehicle market in UK, Germany (DE), Spain (ES) and Austria (AT) according to our respondents.

Comment: The response to policy in the areas of air quality and climate change and the influence on EV uptake drew similar responses from across the four regions. The primary difference was between those who indicated a strong influence and those who indicated a partial or indirect influence. In the UK the policies in the area of air quality were perceived as having a strong influence on EV uptake. In London for example, *'the impact of LEZ and to come ULEZ will help drive forward EV or Fuel Cell technology'*. Commentary from Germany however states that whilst *'current public policy has not yet made the connection between climate change and the need to electrify vehicles'*, *'forthcoming CO2 emission limits...are the main lever for the introduction and commercialization of these vehicles'*. In Austria the percentage of respondents stating that environmental policies were having a strong influence on EV uptake was the highest of all four regions. The programmes for the purchase of clean vehicles, the policies that link EV with clean energy production and the establishment of zones within urban areas for clean vehicles were all activities that respondents noted as having a strong influence. Within Spain, commentary puts the division between those stating that policy has a strong influence and those stating it has a partial influence as a question of *'public and collective awareness in Catalonia on the need to reduce air pollution'* but that for the present *'the most active policies are focussed on the field of energy saving, especially in the building and industry sectors'*.

5. Concluding Remarks

The research reported as part of this paper was based upon a call for evidence to seek stakeholder experience and knowledge on the role of incentives in the uptake of EV across a number of EU regions. The analysis sought to understand how different incentive measures have been received. The key result was that each of the incentives saw positive (strong/partial/indirect) outweighing the non-positive and the distribution (the division between strong/partial/indirect). A further result was the difference between the incentives in terms of the positive value across the regions (see figure 8).

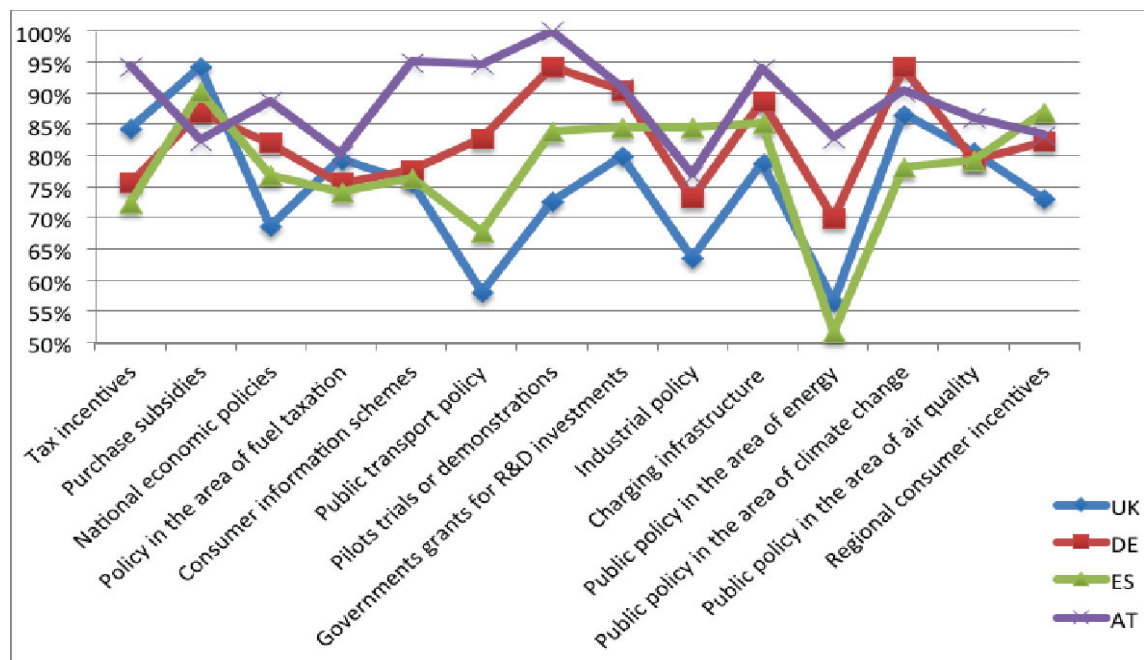


Fig. 8. Stakeholder view of the positive (strong, partial and indirect) influence on EV uptake in each of the regions for the incentive areas investigated as part of this study.

In all cases, the variations in acceptance levels were supported by analysis of the commentary. What is clear is that the results of this analysis support the hypothesis that the way the different regions are structured in terms of the political, economic, social, technical, environmental and legal (the PESTEL framework) is leading to a divergence of responses. The data and the interpretation of the data therefore provide a vital next step in the understanding the

success of incentives in different markets. Work is ongoing at the time of writing to include Norway and The Netherlands.

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