Transport Policy 60 (2017) 34–46

Contents lists available at ScienceDirect

Transport Policy

journal homepage: www.elsevier.com/locate/tranpol

Exploring the effect of local transport policies on the adoption of low emission vehicles: Evidence from the London Congestion Charge and Hybrid Electric Vehicles

Craig Morton *, Robin Lovelace, Jillian Anable

Institute for Transport Studies, University Road, University of Leeds, LS2 9JT, Leeds, United Kingdom

ARTICLE INFO

Keywords:
Hybrid Electric Vehicle demand
Congestion charging
Local transport policy
Spatial diffusion

ABSTRACT

The London Congestion Charge (LCC) is a transport policy with a precise spatial footprint. As such, its impact on the transport system can be expected to vary over space, providing an opportunity to explore the geographical reach of local transport interventions. This paper assesses whether the exemption of Hybrid Electric Vehicles (HEVs) from the LCC affected the registration rate of these vehicles in Greater London and the surrounding areas. The analysis uses official data on the number of HEVs registered across the local authorities of the United Kingdom. This dataset is assessed using [1] exploratory spatial analysis to determine the degree of spatial variation in HEV registrations, [2] area classifications to consider if HEV registrations diminish as nearness to the LCC recedes, and [3] spatial regression models to evaluate the association between distance to the LCC and HEV registrations, controlling for other area characteristics (i.e. socioeconomic, household, and transport system variables). The results clearly show that nearness to the LCC is positively associated with HEV registrations, implying that this form of transport policy is effective at promoting the adoption of low emission vehicles.

1. Introduction

Cities across the globe are facing a series of complex and interrelated challenges relating to the structure and operation of their urban transport systems (Banister, 2008; May, 2013). Of particular concern is traffic congestion and the resulting emission of global and local pollutants, which contribute to climate change and harm the health of citizens. Developing effective strategies which address these issues represents an important challenge for urban governance and public policy (Kennedy et al., 2005; Santos et al., 2010).

One strategy for addressing these issues involves restricting the entry of motorised road vehicles to certain areas within the city (Hensher and Puckett, 2007). Such strategies are referred to by Dotter (2016) as Urban Vehicle Access Regulations and can take on multiple forms. Congestion charging, which involves the levy of a fee on particular vehicles from entering marked zones during a specified time frame, has seen application in various urban settings including Stockholm, Milan, and Singapore and has been extensively evaluated. These evaluations cover issues including the effectiveness of the schemes in delivering improvements to relevant policy objectives (Goh, 2002; Olszewski and Xie, 2005; Santos and Fraser, 2006; Santos, 2008; Eliasson et al., 2009), the additional impacts of the schemes on ancillary issues such as social equity (Santos and Rojey, 2004; Eliasson and Mattsson, 2006; Levinson, 2010) and economic activity (Quddus et al., 2007), alongside the reactions of citizens to such schemes (Jones, 1998; Jakobsson et al., 2000; Schade and Baum, 2007; Schuitema et al., 2010; Jagers et al., 2017).

A somewhat underexplored issue relates to the potential effects of congestion charging on the composition of the vehicle fleet. With these schemes having the capacity to specify graduated fee levels for different types of vehicle, the opportunity exists for schemes employing such a strategy to promote vehicle variants which benefit from a reduced fee. The London Congestion Charge (LCC) scheme incorporates such a feature, offering a charge exemption to certain low emission vehicles. From the initial introduction of the LCC up until June 2013, new Hybrid Electric Vehicles (HEVs) purchased in the United Kingdom (UK) met the criteria for exemption. The purpose of this paper is to consider if this exemption is connected with the uptake of HEVs in the areas surrounding the LCC. Particular attention is paid to the hypothesis that the association between the LCC and HEV registrations diminishes as nearness to the charging zone decreases. This hypothesis is considered by analysing the spatial distribution of vehicle registrations from the Department for Transport's Vehicle Licensing Statistics database.

* Corresponding author.
E-mail address: c.morton@live.co.uk (C. Morton).

http://dx.doi.org/10.1016/j.tranpol.2017.08.007
Received 2 February 2017; Received in revised form 17 June 2017; Accepted 21 August 2017

This paper proceeds by providing an overview of the LCC followed by a summary of the relevant literature on congestion charging policies as well as the research which examines the demand for HEVs. After this, the methodology section details the data utilised in the analysis and the statistical approaches employed to consider the research hypothesis. The results of the analysis are interpreted in the discussion and conclusions section with insights for policy offered.

2. Background

2.1. Overview of the London Congestion Charge

Introduced in February 2003, the LCC involves the application of a fee to qualifying vehicles that enter an area of 21.42 square kilometres in the centre of London (Santos and Shaffer, 2004; Leape, 2006). This area was later enlarged through a western extension in February 2007 and then subsequently removed in January 2011. Fig. 1 illustrates the extent of the LCC in the context of the Greater London.The charging period for the scheme runs from 07:00 to 18:00 Monday to Friday with the charge initially set at £5 per day which has been iteratively increased to £11.50. Automatic Number Plate Recognition cameras are employed to track vehicles entering the charge area. The registered keepers of the vehicles are required to pay the charge either before or on the day of travel, with fines imposed for non-compliance.

The primary objectives of the LCC are to reduce congestion, improve journey time reliability, enhance the efficiency of goods and service distribution, and improve bus services through the redistribution of the revenue generated from the scheme to public transport projects (Santos and Fraser, 2006). These primary objectives were subsequently extended to include a series of ancillary goals covering improvements to road safety and enhancing the local environment (Transport for London, 2008). Increasing the market for HEVs is not an explicit objective of the LCC.

A series of exemptions are in effect which exclude qualifying vehicles from having to pay the LCC's daily fee, one of which relates to the characteristics of car propulsion systems. From the introduction of the LCC up until December 2010, an Alternative Fuel Discount (AFV) applied to vehicles which operated wholly or partly from a fuel different to petrol and diesel. This discount was superseded in 2011 by the Greener Vehicle Discount (GVD), which required vehicles to emit 100 g of carbon dioxide per kilometre or less to qualify. The GVD was replaced in July 2013 by the Ultra Low Emission Discount (ULED), which is presently in effect and requires vehicles to emit no more than 75 g of carbon dioxide per kilometre. Thus, from the introduction of the LCC up until June 2013, all new HEVs sold within the UK would have been exempt from having to pay the LCC's daily fee. An overview of these different propulsion system exemptions is provided in Table 1.

2.2. Impacts of congestion charging

The implementation of a congestion charging scheme has the

Table 1
Overview of the car propulsion system exemptions to the London Congestion Charge (expanded from Santos and Fraser (2006)).

Exemption	Time Span	Requirement
Alternative Fuel Discount	February 2003 to December 2010	Vehicle must run wholly or partly from an alternative fuel (i.e. not Petrol or Diesel) and require emission savings of 40% over Euro IV standards
Greener Vehicle Discount	January 2011 to June 2013	Vehicle must emit 100 g of carbon dioxide per kilometre or less
Ultra Low Emission Discount	July 2013 to present	Vehicle must emit 75 g of carbon dioxide per kilometre or less

Fig. 1. Map illustrating the area covered by the London Congestion Charge and the defunct Western Extension.