

## Article

# Tackling Traffic Congestion with Workplace Parking Levies

Georgina Santos <sup>\*</sup>, Anna Hagan <sup>†</sup> and Orla Lenehan <sup>‡</sup>

School of Geography and Planning, Cardiff University, Cardiff CF10 3WA, UK; Hagan.Anna@gmail.com (A.H.); orla\_95@hotmail.co.uk (O.L.)

<sup>\*</sup> Correspondence: SantosG@Cardiff.ac.uk

<sup>†</sup> Currently at WSP, Cardiff CF10 4BZ, UK.

<sup>‡</sup> Currently at Arcadis, Cardiff CF3 0EY, UK.

Received: 20 December 2019; Accepted: 25 February 2020; Published: 12 March 2020



**Abstract:** On the basis of 17 interviews with employers and 272 survey responses from employees, we explore the perceptions of a Workplace Parking Levy (WPL) in Cardiff, with the aim of understanding if a WPL would be an acceptable traffic demand management policy to tackle traffic congestion. We find that employers would not be very supportive of a WPL, whilst employees would, provided employers were to absorb the costs. Despite this support, the majority of those who drive to work would not be prepared to change mode. An important theme throughout the study was the perception of public transport and active travel provision in Cardiff being inadequate. Most study participants felt that investment in public transport and active travel is needed before a WPL is introduced. We conclude that, although a WPL would not be overwhelmingly acceptable to employers and employees, it would be more acceptable than congestion charging, and there is a possibility that acceptability could be increased with the help of feedback from a public consultation.

**Keywords:** traffic congestion; workplace parking levies; traffic demand management; transport policy; road pricing; commuting; congestion charging; parking; parking policy; parking cash-out

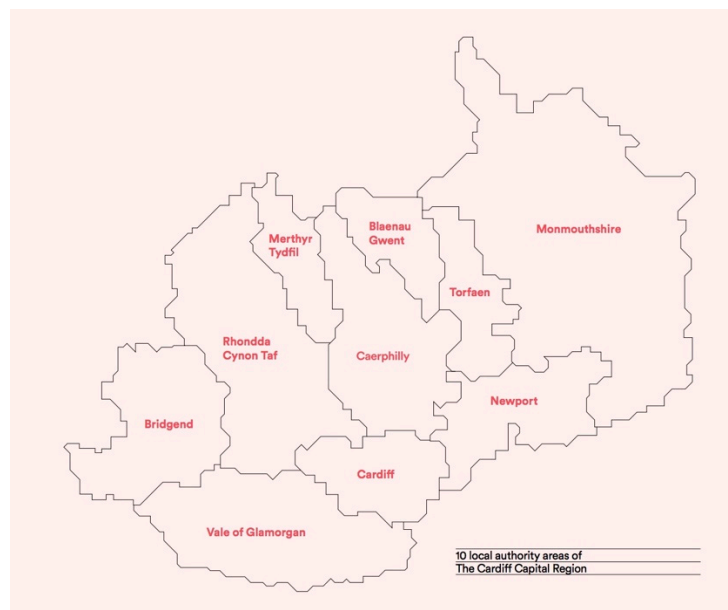
## 1. Introduction

Traffic congestion, characterized by slower speeds and longer trip times, is a problem throughout the world. In Europe, for example, the costs of congestion are around €130 billion per year, or just over 1% of the EU's GDP [1] (p. 7). Sustainability and sustainable travel are at the core of most European governments' policy agendas, including the Welsh Government's. The Active Travel Wales Act 2013 [2], and the Well-being of Future Generations (Wales) Act 2015 [3], alongside objectives set out in the Cardiff Local Transport Plan 2015–2020 [4] and in the Cardiff's Transport White Paper [5], show a clear vision of encouraging a modal shift within Cardiff, towards more sustainable transport modes.

Cardiff is a city located in South Wales, UK, with an estimated population of almost 400,000 [5] as of 2020. The city forms the core part of the Cardiff Capital Region, which consists of Cardiff and nine surrounding local authorities, as seen in Figure 1 [6]. Recent, and planned regeneration projects in Cardiff, such as the regeneration of Cardiff Bay, and the planned development of Central Square (a large business development project in the city centre), aim to encourage economic growth within the city.

As of 2019–2020, there are 100,000 people commuting into Cardiff from outside the city's boundaries; 80,000 of whom travel by car [5]. On top of that, there are 190,000 trips made by Cardiff residents, with 160,000 of these within Cardiff, and 30,000 travelling to work outside [5]. Of the 190,000 trips made by Cardiff residents, 100,000 are made by car [5]. This has caused a traffic congestion problem across the region, and within Cardiff, and the problem is set to worsen without intervention [4]. Traffic

congestion is the transport problem that most respondents (64.1%) to the 2017 Transport Survey in Cardiff would like to see solved [7].



**Figure 1.** The Cardiff Capital Region. Source: Welsh Government [6] (p. 8).

Parking management is key to more sustainable transport because parking pricing and availability affect private car ownership and use [8]. The parking provision adopted by Cardiff Council attempts to be consistent with transportation policies and strategies that seek to reduce congestion [9]. Cardiff Council operates a number of on-street and off-street parking facilities, including over 2000 spaces in off-street car parks and 2500 on-street pay and display spaces [10] (p. 3). Many car parks operated by the Council are linked to specific facilities being provided for the public, such as libraries, community centres and green parks [9] (p. 11). In addition, there are a number of privately-operated non-residential car parks supplying at least another 5000 spaces [9] (p. 11).

Those commuting by car, park in parking spaces provided by their employer, typically for free or heavily subsidized, or in paid parking spaces. As of 2019–2020, the parking spaces managed by the Council typically cost around £10 (€12, US\$13, at December 2019 exchange rates) for 8 hours, which is quite substantial, especially bearing in mind that the median full-time gross weekly earning in Wales in 2019 was £535 (€633, US\$705, at December 2019 exchange rates) per week [11] (Table 12).

Several transport infrastructure improvements have recently been implemented in Cardiff to support the growing economy. These include the reintroduction of a passenger rail service between Cardiff and Ebbw Vale, and several major road infrastructure improvements across the city [6]. In addition to this, the South Wales Metro, an integrated public transport network, including rapid bus services, trains, tram-trains and active travel, is being developed by the Welsh Government and Transport for Wales [5].

Cardiff Council has set targets for travel to work journeys by Cardiff residents of 37% by foot and bicycle, and 27% by bus, rail or tram by 2025 [5], in line with the Cardiff Local Development Plan 2006–2026 [12].

In 2000, workplace parking levies (WPL) became a policy instrument available to local authorities in England and Wales thanks to the Transport Act 2000 [13]. WPL is a pricing mechanism which allows local authorities in England and Wales to levy a charge on organizations for the number of car parking spaces they have for employees, regular business visitors, and students. The organizations may reduce the number of car parking spaces they make available to employees, and/or they may absorb the cost or pass on all or part of the cost to those using the parking spaces they provide. The revenues are then

fed back into the transport system to help achieve the aims of the local transport plan. In the UK, WPLs have currently only been implemented in Nottingham, where they are used as a tool to decrease congestion, reduce car use, improve public transport, and encourage modal shift. Cardiff Council had never considered implementing a workplace parking levy to reduce congestion until 2018, when they published their Green Paper [14], which was followed by a White Paper in 2020 [5].

In the present study, we explore whether WPLs would be relevant and acceptable in Cardiff as an instrument to help reduce traffic congestion and encourage sustainable transport. We do this by exploring the perception of a sample of 17 employers and 272 employees. The paper proceeds as follows. Section 2 presents an overview of the literature on the experience of congestion charging in the UK, parking cash-out in California, and WPLs in Australia and Nottingham. Section 3 discusses the research approach. Section 4 analyzes the results and Section 5 concludes, gives policy recommendations and suggests lines for future research.

## 2. Overview of the Literature

Delays and unreliability on the transport network impact people and businesses directly. Over time, various transport policies to reduce congestion have been suggested, and these have developed in two directions: policies targeting the ‘demand side’, and policies targeting the ‘supply side’ [15]. ‘Supply side’ measures focus on increasing the supply of infrastructure to manage the increasing demand, e.g., building more roads. Building roads is not typically possible in dense towns and cities, and is a policy better suited to the strategic highway network. Even in this context, it has not always delivered the expected congestion reduction and in many cases, it has increased congestion due to the induced demand effect. Essentially, when a new road is built, travel times initially decrease because average speeds are higher, faster travel times then attract more drivers to that road, and the final result is more traffic than there was to begin with [16,17].

‘Demand side’ policies focus on reducing the demand on the infrastructure, and they do so by reducing car dependency and car travel, and encouraging public transport use, car share schemes and active travel (walking and cycling). ‘Demand side’ policies include congestion charging, parking charges and/or parking controls/restrictions, car-free zones, parking cash-out programs at the workplace, and workplace parking levies. They also include interventions to attract car users to other modes of transport, such as improvement and/or subsidies to public transport, and the improvement of cycling lanes and pedestrian areas. Discussing each of these measures falls outside the scope of the present paper, so we concentrate on workplace parking levies. We also briefly discuss the experience of congestion charging in the UK, as this is a policy that was made legal at the same time as workplace parking levies, and parking cash-out, as this is a policy also aimed at discouraging parking in the workplace but through subsidies rather than charges.

### 2.1. Parking Cash-Out

Parking cash-out is typically an employer-funded program, under which employees can either park at work for free or get a cash allowance instead [18]. The Parking Cash-Out Program, a state law in California enacted in 1992, requires certain employers who provide subsidized or free parking for their employees to offer a cash allowance option in lieu of a parking space, so that they can cash-out their subsidized or free parking space and use an alternative mode of transport to commute, such as for example, public transport, walking or cycling [19]. Employers with over 50 employees in areas which do not meet air quality standards must offer parking cash-out to those employees who have free or subsidized parking available to them [20]. The law applies to parking spaces that businesses rent rather than own, so when an employee opts for the cash instead of the free or subsidized parking space, the business can pay the cash allowance with the money saved by not paying the rent [18] (p. 27).

Parking cash-out in the UK is rare. It is not embedded in any piece of legislation, although there is no legislation preventing employers from implementing cash-out programs for their own travel plans. In the late 1990s and early 2000s there were a few small programs. Two examples of these

programs were the ones run by Vodafone in their offices in Newbury, Berkshire, and by Pfizer in their premises in Sandwich, Kent, and Walton Oaks, Surrey [21]. Vodafone offered its employees £85 (€98, US\$136, at December 2019 exchange rates) per month, and Pfizer offered its employees £2 (€2.37, US\$2.63, at December 2019 exchange rates) per day in Sandwich and £5 (€5.93, US\$6.58, at December 2019 exchange rates) per day in Walton Oaks for not parking at work. None of these programs is in operation any longer. Pfizer stopped the scheme in Sandwich in 2010, and the one in Walton Oaks, in 2016 [22]. Vodafone phased out the scheme in Newbury over 18 months from mid-2017 [23].

## 2.2. Congestion Charging and Workplace Parking Levies

Various pieces of legislation were passed in the UK in 1999, 2000, and 2001. These were the Greater London Authority Act 1999 [24], the Transport Act 2000 [13], and the Transport (Scotland) Act 2001 [25]. The Greater London Authority Act 1999 [24] and the Transport Act 2000 [13] gave the Mayor of London and local authorities in England and Wales, powers to introduce congestion charging and/or WPLs. The Transport (Scotland) Act 2001 [25] included provisions for congestion charging, but not for WPLs, although these were eventually introduced in the Transport (Scotland) Act 2019 [26].

One key aspect of these acts is that they require spending of (net) revenues on measures for improving local transport and guarantee that the revenues will be hypothecated for at least ten years to the local authority introducing congestion charging or WPLs. Pricing mechanisms are a controversial transport policy, because adding a charge can make roads and parking less accessible, but combined with hypothecation, they can provide the balance between reducing demand and raising funds to support improvements to public transport infrastructure.

Despite congestion charging being a policy available to local authorities in the UK, the policy has not taken off. There were several attempts and consultations to introduce congestion charging in Edinburgh, Cambridge, and Manchester, but the plans never materialized, mainly because of lack of public acceptability. To date, Durham and London are the only two UK cities to have implemented congestion charging.

### 2.2.1. The Durham Congestion Charging Scheme

In October 2002, Durham County Council implemented a £2 (€2.37, US\$2.63, at December 2019 exchange rates) congestion charge, which is still in place as of 2020. The charge, the first one of its kind introduced in the UK following the Transport Act 2000, is levied on all vehicles, with a number of exemptions such as motorcycles, residents, and emergency vehicles, amongst others, using Saddler Street and the Market Place between 10 a.m. and 4 p.m., Monday to Saturday, except public holidays [27]. The scheme is small, as it only operates on one road, which runs through the historic city centre. The daily number of vehicles using the road before the scheme was around 2000. Being a narrow road, this level of traffic presented a risk to the 14,000 pedestrians that also used the road every day [28]. The aim of the congestion charge was originally to reduce traffic levels in order to improve pedestrian safety and access for the disabled [28], but improving air quality and encouraging ‘out-of-hours’ use of the area are now also aims of the Durham congestion charge, according to Durham County Council [27]. The number of vehicles using the road from the Market Place to the Cathedral fell by between 50% and 80%, depending on the traffic count used as the base [28]. Until 2011, traffic was controlled by a bollard on the road, but in July that year, the bollard was replaced with an automatic number plate recognition system.

### 2.2.2. The London Congestion Charging Scheme

In February 2003, congestion charging was introduced in London with the aim of reducing traffic congestion. All vehicles entering, leaving, driving or parking on a public road inside the Charging Zone between 7 a.m. and 6 p.m. Monday to Friday, excluding public holidays, must pay a congestion charge. This was initially £5 per day, but was increased to £8 in 2005, to £10 in 2011, and to £11.50 (€13.61, US\$15.16, at December 2019 exchange rates) in 2014. Payment of this charge allows road users

to enter and exit the Charging Zone as many times as they wish to and drive inside the Charging Zone as much as they want on that day. The Charging Zone, which only covers 21 km<sup>2</sup>, representing 1.3% of the total 1579 km<sup>2</sup> of Greater London, was extended to the West, and doubled in size, between 2007 and 2010.

Enforcement is undertaken with automatic number plate recognition. Between 2002 and 2014, car traffic entering central London fell by 39% [29] (point 3.1, p. 22). Despite this fall, speeds have decreased and travel times have increased since 2006, three years after the charge was introduced. The reasons for this are: (a) interventions that have reduced the effective capacity of the road network, mainly to increase road safety and give priority to public transport, pedestrians and cyclists [30] (p. 12); (b) road works by utilities and general development activity since 2006 [30] (p. 12); and (c) an increase in van traffic across London since 2012, partly driven by London residents being more likely to order goods and services online and having them delivered by a third party [31] (p. 133).

In addition to the above, whilst the number of licensed taxis has been more or less constant and even slightly declined since 2008–2009, the number of licensed private hire vehicles circulating in London increased by 78% between 2008–2009 and 2017–2018 [31] (p. 140). In an attempt to mitigate this trend, private hire vehicles, which had always been exempt from paying the Congestion Charge when driving in the Charging Zone during charging hours, are no longer so. In April 2019, the exemption was removed, except for private hire vehicles that are designated as wheelchair-accessible [32].

Whilst speeds and travel times in central London are close to pre-charging levels, the reduction in private car traffic due to the Congestion Charge suggests that speeds and travel times would be worse without the Congestion Charging Scheme [30] (p.12).

It should be noted that prior to the implementation of the London Congestion Charging Scheme, there were a number of public consultations, the results of which were used to modify the details of the proposal, especially in the area of exemptions and discounts, and this helped increase public acceptability [33,34].

It should also be noted that Transport for London substantially improved the number of buses, bus routes and bus capacity in the year *before* the London Congestion Charging Scheme went live [33], making public transport an attractive alternative to the private car.

### 2.2.3. The Workplace Parking Levy in Nottingham

As of 2020, Nottingham is the only city in the UK to have implemented a WPL, and they did so in April 2012 as part of their 2011 Local Transport Plan. The rationale behind WPLs in Nottingham is to reduce congestion, use the revenues to improve public transport [35,36], and encourage modal shift to public transport, active travel, or car sharing schemes [36]. To some extent, a WPL can close “a loophole”, as currently, local authorities do not have any authority when it comes to private non-residential parking spaces, and the Transport Act 2000 [13] gives them the option to have some [37] (p. 260).

Nottingham was experiencing high levels of morning and evening peak congestion in 2011, costing the city £160 million (€184 million, US\$257 million, at 2011 prices and exchange rates) per year [36]. The WPL works by employers being legally obliged to apply for a WPL license, if the terms apply to them, stating how many premises they have within the Nottingham City Council administrative boundary, and how many workplace parking spaces they have [38]. The annual current cost to employers is, for the year 1st April 2019 to 31st March 2020, £415 (€491, US\$546, at December 2019 exchange rates) per space, a cost which has risen with inflation since the WPL was introduced [39]. The money raised by the WPL is earmarked to the transport sector, and has been used to fund two new tram lines, improve Nottingham Railway Station, and enhance the LinkBus services.

It should be noted that before the implementation of the WPL in Nottingham, there was a Public Consultation and, although not legally required, there was a Public Examination, to encourage public participation in the consultation exercise [40]. The results of these were taken into account and used to modify the details of the proposal, especially in the area of exemptions, including one for

small businesses that provide less than 11 workplace parking spaces [38]. This helped increase the scheme acceptability.

#### 2.2.4. Workplace Parking Levies in Australia

There are three WPL schemes, all located in Australia, that hold similarities to the one in Nottingham. The Australian schemes operate in Sydney, Perth and Melbourne. Table 1 summarizes the characteristics of the three schemes, and the Nottingham scheme as well, for comparison purposes. Hypothecation is a key factor, with only the revenue from the Melbourne Congestion Levy not solely used for transport improvements.

The revenues generated in the Australian cities are quite different from those generated in Nottingham, as it can be seen in Table 1. The reason for this difference in revenues collected is likely to be the difference in area and population size (and therefore in the number of parking spaces liable for the charge). Nottingham has an area of 75 km<sup>2</sup>, whereas Sydney has an area of 12,368 km<sup>2</sup>, Perth has an area of 6418 km<sup>2</sup> and Melbourne has an area of 9,990 km<sup>2</sup>. For the year 2017–2018, Nottingham had a population of circa 331,100 [41], in contrast with Sydney, which had a population of 5.23 million, Perth, which had a population of 2.06 million, and Melbourne, which had a population of 4.96 million [42]. The charge levels are also higher in Sydney, Perth and Melbourne than in Nottingham.



**Table 1.** A comparison of Workplace Parking Levies in Sydney, Perth and Melbourne, Australia, and Nottingham, UK.

Location	Area	Year Introduced	Annual Charge per Place (2019–2020)	Liable for Charge	Exemptions	Objectives	Annual Revenues (2017–2018)	Use of Revenues
Sydney Parking Space Levy (PSL).	Central Business District (CBD) and five outlying business areas.	1992	Category 1 <sup>1</sup> : A\$2490 (£1297, €1537, US\$1705) <sup>3</sup> Category 2 <sup>2</sup> : A\$880 (£458, €543, US\$603) <sup>3</sup> .	Off-street, private non-residential parking, occupied or non-occupied. Does not apply to public car parks.	Disabled spaces, loading bays, public service bays. Businesses with fewer than 6 spaces. Spaces incidental to primary business activity. Retail, and hospitality parking in outlying area.	Discourage car use and fund infrastructure to encourage public transport use.	A\$110 million (£64.2 million, €72.8 million, US\$85.1 million) <sup>4</sup> .	Hypothecated for public transport. Infrastructure: Bus/Rail/Ferry, Park and Ride. Light rail. Electronic passenger information system.
Perth–Parking License Fee.	CBD.	1999	Long Stay — A\$1124.90 (£586, €694, US\$770) <sup>3</sup> Short Stay & On-Street: A\$1038.90 (£541, €641, US\$711) <sup>3</sup> .	All non-residential parking bays in use.	Disabled spaces, loading bays, public service bays. Businesses with fewer than 6 spaces. Spaces incidental to primary business activity.	Fund Central Area Transit (CAT) bus system and encourage modal shift to reduce congestion.	A\$21.2 million (£12.4 million, €14 million, US\$16.4 million) <sup>4</sup> .	Hypothecated for transport CAT bus system and expansion of Free Transit Zone.
Melbourne Congestion Levy.	CBD.	2006	Category 1 (Central, including docklands): A\$1440 (£750, €889, US\$986) <sup>3</sup> Category 2: A\$1020 (£531, €629, US\$699) <sup>3</sup> .	All public and private long stay non-residential car parking spaces in use.	Business visitors, emergency vehicles. Council and charities. Shift workers. Spaces incidental to primary business activity.	Reduce congestion by encouraging commuters to use public transport. Create more parking for shoppers and visitors.	A\$103.2 million (£60.2 million, €68.3 million, US\$79.8 million) <sup>4</sup> .	Not hypothecated—some revenue is used for public transport improvements.
Nottingham Workplace Parking Levy.	City of Nottingham.	2012	£415 (£470, US\$550) <sup>3</sup> .	Occupied, private non-residential off-street workplace parking.	Customers. Emergency Services. Disabled spaces. Loading spaces. Employers with fewer than 11 spaces. NHS or NHS contractors delivering frontline services.	Reduce congestion and encourage modal shift to more sustainable modes. To fund transport infrastructure.	£9.2 million (£10.4 million, US\$12.2 million) <sup>4</sup> .	Hypothecated for transport: Light rail expansion, LinkBus services and redevelopment of Nottingham railway station.

<sup>1</sup> Includes districts of Sydney CBD and North Sydney/Milsons Point. <sup>2</sup> Includes districts of Bondi Junction, Chatswood, Parramatta, St Leonards. <sup>3</sup> Values converted at December 2019 exchange rates. <sup>4</sup> Values converted at 2017/2018 exchange rates. Source: Dale et al. [43], Transport for New South Wales [44], City of Perth [45], Australian Department of Transport [46], State Revenue Office Victoria [47,48], Nottingham City Council [39,49].

### 2.2.5. Reflections on WPLs

With only four examples of WPLs in place across the world, and only one of them in the UK, research is limited, and only a few studies exist to show their effectiveness [35,43,50–52]. Overall, the literature suggests that the effectiveness of WPLs in reducing congestion is mixed. Whilst the scheme in Sydney has had little or no impact on car use [51], traffic declined in Perth and the use of public transport grew 67% in the decade after implementation [35]. However, Perth still suffers from congestion, although this may be because of its growing economy and large population increase, and without the WPL, traffic congestion would probably be worse [35]. In Nottingham, in the first year of operation of the WPL, the reduction in congestion was minimal [35] but the reduction was statistically significant in the years that followed [43].

The potential negative impacts of a WPL include increased off peak traffic congestion [37] and displaced parking caused by commuters choosing to park in surrounding residential spaces to avoid the levy [15], something that became evident in Nottingham. Having said that, the problem in Nottingham has been well-managed. The WPL there funds two traffic management officers, who are in charge of dealing with displaced parking and where necessary, developing traffic management schemes to address problems in local areas. The most problematic examples emerged in residential areas where school employees decided to park outside the school itself [53]. As many residential streets in Cardiff have on-street parking, which, in some instances is controlled by the local authority through resident permits, displaced parking would need to be an important consideration, and certainly one that would need to be managed.

Hypothecation of revenues to improve public transport and active transport infrastructure is a key factor in the effectiveness of WPLs. However, other options to encourage a modal shift include the promotion of car sharing schemes, which would allow commuters to reduce the cost of fuel and parking by either carrying passengers, or becoming a passenger in someone else's vehicle [54]. These schemes can, however, involve a large amount of organization, and have disadvantages to those involved, such as less flexibility on commutes [54]. There is some evidence, however, of a shift to car share schemes in organizations that implement their own park charging schemes [55], and it is therefore an important consideration when researching the potential effects of a WPL in Cardiff.

## 3. Data and Methods

The overall aim of the present study was to understand the perceptions of both employers and employees regarding a WPL in Cardiff by consulting them directly. This was done through 17 semi-structured interviews with employers and a web-based survey, which was completed by 272 employees. The number of interviews conducted and survey responses received allowed us to achieve data saturation and information redundancy [56]. The sample, detailed below, was relatively large and varied, and the results, which provide important insights, may therefore be generalizable to the whole of Cardiff. The interviews and the survey were conducted over June to November 2017, and June to August 2019.

### 3.1. Sample

We used purposive sampling to ensure that participating organizations were relevant to the research. All participants had to be located within Cardiff, and companies had to have a total of six or more workplace parking places that were either free or subsidized in order to be considered as potential participants.

We contacted a total of 78 employers from different sectors located across different areas in Cardiff, and 17 agreed to take part in the study, exceeding the twelve interviews suggested as a “good rule of thumb” when conducting qualitative research [56,57].

The participating organizations took different approaches to the employee survey. Whilst 13 organizations sent the survey to their employees, 4 did not. We were able to contact employees in



one of these organizations, and send them the link to the survey, but this was through convenience sampling (people we knew), and snowball sampling (as we asked them to forward the survey to colleagues). Although snowballing has the potential problem of referral bias, it was only used in one organization, which minimized any potential bias in the results.

The total number of people working in Cardiff in 2018 was approximately 255,700 [58]. The total number of survey responses we received was 272, which would be a representative sample, assuming (a) a confidence level of 90% and a margin of error of 5%; (b) a representative sample frame, composed of the employees that could be reached at the 13 organizations that agreed to send the link to the survey to their staff, and the 1 organization whose employees we approached directly; and (c) no self-selection bias, which, strictly speaking, is not possible to guarantee, as those who responded to the survey may have been particularly concerned about congestion or commuting problems.

Having said the above, in qualitative research, it is content and depth rather than sample size what matters, and the 17 interviews and 272 responses were enough to reach data saturation and information redundancy [56], as already highlighted above.

The 17 participating organizations span a range of sectors, including financial services, consultancy, estate agency, social enterprise, retail, hospitality and leisure, education, and broadcasting. The number of employees per organization and parking spaces they offer also span a wide range, from 35 to 5000 employees, and from 7 to 1,700 parking spaces. These organizations are located across different areas in Cardiff, including the city centre, Cardiff Bay, and areas between the A4161 and the A48 and beyond the A48. The distance from Cardiff Castle, a central landmark, to each of these organizations varies from 400 metres to 8.6 kilometres, thus providing a varied sample location-wise.

### 3.2. Interviews

To understand employers' perceptions on WPLs in Cardiff, we conducted semi-structured interviews. These interviews took place with the employer from each organization sampled, and provided qualitative data. Semi-structured interviews were based on outline questions, which were used as a guide, but being semi-structured, there was also flexibility, and interviewees were able to expand on the points they deemed to be significant. Using this method also meant that the same questions were asked to each organization, ensuring cross-case comparability. Burchell et al. [15] used semi-structured interviews for the same reasons in their research on the early effects of the WPL in Nottingham soon after it was implemented. The outline of our interview questions is included in Appendix A. The interviewees were introduced to the concept of WPLs first, along with the fundamental issue of hypothecation of revenues to improve local transport initiatives, including public transport, walking and cycling. Following full transcription, a thematic coding approach was employed using NVivo software, in order to identify and extract key themes. The transcripts were imported to NVivo, which assisted in data organization and analysis by highlighting themes in the interviews.

The interviewees did not respond on behalf of their organizations, nor were their responses given in an official capacity. All interviewees requested anonymity, and therefore we do not identify the responses to each organization. They held posts such as HR Manager or similar leadership positions. We were only allowed to interview one person per organization.

### 3.3. Survey

To understand employees' perceptions across Cardiff, a survey was used. A survey was cheaper and quicker to administer, so it allowed a larger sample as it did not require the same interaction as interviewing individual employees. We used a Likert-type scale, which is a widely used approach to scaling responses in survey research. Before the survey was sent to potential respondents, it was trialed on colleagues, allowing for feedback on ease of completion, time taken, and clarity of questions. The survey was then adjusted according to this feedback before it went live. The full survey, which was administered via SurveyMonkey, is included in Appendix B.

## 4. Results and Discussion

The interviews we conducted and the survey responses shed light on a number of fronts, which allowed us to understand if a WPL would be an acceptable policy in Cardiff and whether the perception was that it would have potential to reduce traffic congestion. In this section, we discuss a number of themes analyzing the views from both interviewees and survey respondents.

### 4.1. What Are the Most Serious Transport Problems in Cardiff According to Employers and Employees?

Most of the employers and employees who took part in the study ranked traffic congestion in Cardiff as either a very serious or serious problem, although many employers pointed out that it is a peak time issue, rather than an all-day one. One recurrent theme was the insufficient infrastructure to support the number of cars now on the roads. One interviewee, for example, mentioned how traffic congestion was a problem in the mornings, saying:

“... congestion really is an issue, particularly at peak times...” (Participant 5)

Several employers also mentioned that the city does not have the road infrastructure to handle the amount of traffic there is within the city. One interviewee said:

“I have noticed the considerable amount of traffic in Cardiff. And most of it is because the roads that are here aren’t meant to take that many cars.” (Participant 3)

Employees were asked in the survey how they would rate the seriousness of certain traffic related issues in Cardiff. Figure 2 shows the percentage of respondents who ranked the issues as either serious or very serious. Clearly, traffic congestion in Cardiff was ranked as the most serious issue in Cardiff, even by many employees who do not drive to work or only do so sometimes. This view was also held by most employers, with one of them saying:

“With buses you still get the congestion and it takes twice as long because it stops everywhere.” (Participant 1)

These results are in line with the results from the Cardiff Transport Survey [7] (p. 21), which showed that 64.1% of all respondents would like to see a reduction in congestion.

In addition to traffic congestion, access and quality of public transport were identified as serious or very serious by 53% and 50.6% of survey respondents, respectively. Of the 38 employees who provided qualitative answers regarding additional serious transport issues, 13 described various issues regarding public transport in Cardiff, including “lack of integration” and “limited public transport infrastructure”.

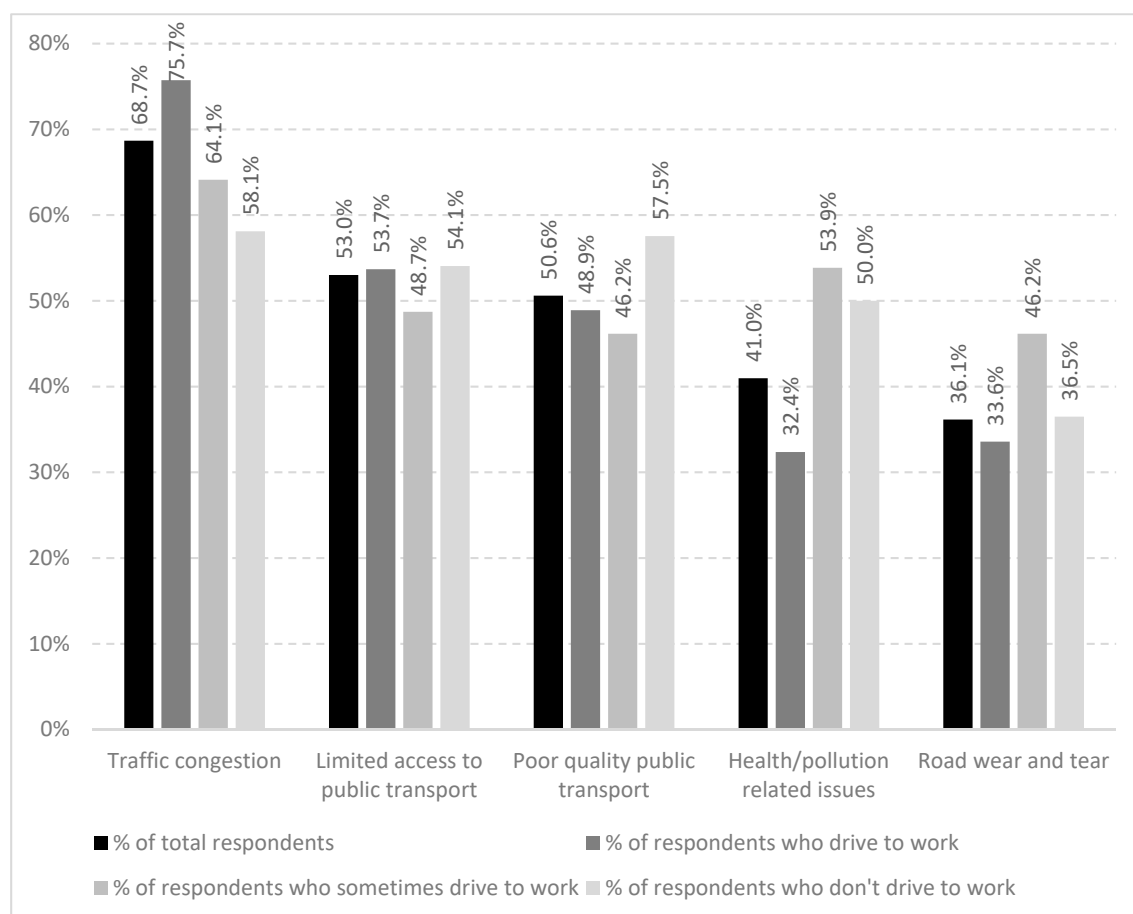
These concerns were echoed by the employers we interviewed:

“I think if people are faced with a charge, it does deter them. Take London, for example, with the Congestion Charge. The difference is, London has a comprehensive public transport network. Cardiff currently does not.” (Participant 5)

This is a particularly important point. Public transport in London was improved before the Congestion Charge was introduced in 2003. Transport for London conducted extensive modeling prior to the charge and estimated that about 20,000 people would switch from car travel to public transport during the morning peak period. This additional public transport capacity was put in place prior to the charge implementation [33]. Introducing a WPL in Cardiff without first extending capacity and coverage, along with reliability of public transport, would not be viable. A realistic alternative needs to be in place in order for car commuters to switch modes.

A common theme throughout the survey responses and the interviews was that public transport in Cardiff is not considered to be a viable alternative to the car. The system is not integrated or comprehensive and can be unreliable. The South Wales Metro, a proposed, integrated network of

heavy rail, light rail and bus routes in South East Wales, was mentioned in 75% of the interviews we conducted. Many interviewees stated that once these transport improvements are implemented in Cardiff, then modal shift away from the private car will be feasible.



**Figure 2.** Percentage of respondents who ranked issues as serious/very serious. Source: Survey responses.

#### 4.2. Do Employers Think That Employees Would Reduce Car Use If There Were a Workplace Parking Levy in Place?

Most employers thought that a WPL would not reduce car use, and would only impose additional costs. They also thought that a WPL would only raise costs marginally, or otherwise it would produce a public backlash. Since costs would not increase too much, the impact on car use and congestion would be negligible.

A number of interviewees also highlighted opposition to additional travel costs as a means to reduce congestion, with one employer stating:

“I don’t think levying people is always the right way to go about things. People need to be educated to make the right choices. You can implement a levy or other policies to help reduce congestion but unless people are educated on the change and the reasons behind it, they will not alter their behavior.” (Participant 13)

Many employers also thought that previous experience of reducing workplace parking has been controversial and that, due to the location of some workplaces in Cardiff, employees feel entitled to free workplace parking. Whilst they could not say if their organization would reduce parking spaces if a WPL were implemented, their experience of limiting parking in the workplace in the past has shown that it does not necessarily reduce car use, as employees can use on-street parking or nearby car parks.

This theme was key and became evident when coding the interviews. This is in line with findings by Burchell et al. [15], who highlight the problem of displaced parking.

In addition, 2 of the 17 organizations that took part in the study, have a parking fee system in place where employees pay around £2 for parking per day, respectively. One of these organizations stated that the parking fee had not discouraged car use. The other organization stated that the car park is operating at capacity, and there is a waiting list of 700 employees who are willing to pay the fee for a parking space. The interviewee suggested the reason behind this was that because they are located in the city centre, the cost of their parking is significantly cheaper than the cost of surrounding public parking, and therefore this fee does not discourage car use. The interviewee also felt that, due to their location, if a WPL were implemented and employees were charged more to use the workplace car park, the charge would still remain cheaper than public parking, and therefore would have no effect on car use. The results therefore show that employers in Cardiff do not feel that employee car use would be reduced with a WPL. This differs from the expectation that charging employees a fee to use the workplace car park, and limiting the amount of parking available would reduce the number of employees driving to work [35,36]. The organizations that currently charge employees about £2 (€2.37, US\$2.63, at December 2019 exchange rates) per day for parking have not seen this discourage car use. For comparison purposes, the WPL in Nottingham is £415 per year (€491, US\$546, at December 2019 exchange rates), or around £1.60 (€1.9, US\$2.1, at December 2019 exchange rates) per day [39] and there is evidence that it has reduced congestion [43].

In addition, 2 of the 17 organizations that took part in the study, have a parking fee system in place where employees pay around £2 for parking per day, respectively. One of these organizations stated that the parking fee had not discouraged car use. The other organization stated that the car park is operating at capacity, and there is a waiting list of 700 employees who are willing to pay the fee for a parking space. The interviewee suggested the reason behind this was that because they are located in the city centre, the cost of their parking is significantly cheaper than the cost of surrounding public parking, and therefore this fee does not discourage car use. The interviewee also felt that, due to their location, if a WPL were implemented and employees were charged more to use the workplace car park, the charge would still remain cheaper than public parking, and therefore would have no effect on car use. The results therefore show that employers in Cardiff do not feel that employee car use would be reduced with a WPL. This differs from the expectation that charging employees a fee to use the workplace car park, and limiting the amount of parking available would reduce the number of employees driving to work [35,36]. The organizations that currently charge employees about £2 (€2.37, US\$2.63, at December 2019 exchange rates) per day for parking have not seen this discourage car use. For comparison purposes, the WPL in Nottingham is £415 per year (€491, US\$546, at December 2019 exchange rates), or around £1.60 (€1.9, US\$2.1, at December 2019 exchange rates) per day [39] and there is evidence that it has reduced congestion [43].

#### 4.2.1. Location of Workplaces

When discussing the impact a WPL could have on their organization, the location of the workplace within Cardiff was mentioned by employers as a factor that should be taken into consideration. For example, some interviewees highlighted that organizations may no longer benefit from locating in areas outside the city centre, where the cheaper location costs could be heightened by the WPL, which they may have to absorb themselves to ensure employees are able to get there, as public transport accessibility tends to be lower. Interestingly, though, it was not possible to establish a clear association between location of the workplace and employers' perception of the WPL's potential effectiveness in reducing car use and encouraging modal shift, especially towards public transport. On the one hand, there is evidence from the Cardiff Bus Network Study that accessibility to bus services is highest in central Cardiff and declines towards the edges of the city, which have significantly lower accessibility [59] (p. 14). On the other hand, some employers located in outer areas felt that the WPL would encourage modal shift and except for one employer, all the employers based in relatively

central areas, stated that a WPL would not encourage modal shift due to existing parking habits and insufficient public transport.

#### 4.3. Do Employers Think That Traffic Congestion Would Be Reduced If a WPL Were Implemented?

Most of the employers we interviewed believe employees are attached to their cars, and a WPL levy would simply end up being paid by the organizations, absorbing it to remain attractive employers, leaving the employee with no additional cost. They also feel that public transport in Cardiff is not good enough to support a modal shift, and so driving will remain the most convenient option for commuters.

One interviewee stated:

“... but you have some [commuters] that, no matter what, will not get out of their car. You might convince them to go from single occupancy to dual occupancy or triple, but they won't give up their car.” (Participant 4)

Another interviewee felt that, although they currently promoted sustainable travel options, if their organization began to charge for parking then it would act as a barrier for employees to get to work:

“... the way that the organization policy works is that they wouldn't want people to find barriers to travel to the workplace, and that would be co-workers, so we've always had free parking lots ... ” (Participant 3)

If the organization were to absorb the levy, rather than pass it on to employees, then it would not act as a means for discouraging car use. In addition, most interviewees highlighted that traveling by car is perceived as the most convenient option in Cardiff, especially for workplaces which are not in the city centre. One interviewee stated that policies to encourage sustainable travel should be about “increasing the ease” for people to use public transport and active travel, rather than focusing on discouraging car use, as they felt that commuting by car in Cardiff is currently the easiest, and in most cases, quickest, option. Further to this, all interviewees were told that a WPL in Cardiff would lead to increased investment in public transport and active transport infrastructure; however, one felt that for a WPL to work effectively, the improvements to public transport would have to come first to encourage people to change mode, whilst another also thought that the current public transport infrastructure would not provide a good enough alternative to commuters, and said it needed “step changes” if more people were expected to use it.

Although there were reservations, two employees thought a WPL would reduce congestion, but would not be without negative impacts. Firstly, displaced parking was mentioned as a concern by one interviewee, who felt that it was already a problem and would only worsen should a WPL be implemented. Another concern that was also mentioned was the cost to the employee, with one interviewee saying that for it to be effective, the WPL would have to be set at a high level, to make the cost significant, and thus push a modal shift.

The overall perception as to whether a WPL would reduce congestion was therefore mixed. It became apparent that the cost to the employee was the most significant factor, and one which could vary from workplace to workplace, depending on how the organization chose to administer the levy. Over time, some organizations in Nottingham began to implement parking management schemes that involved charging employees for parking, whilst others chose to reduce the number of parking spaces they provided in order to reduce their fee, and there is clear evidence that congestion has decreased [43]. Of course, it is not possible to know exactly how organizations in Cardiff would react to a WPL. However, the results of the present study indicate that employers think the different responses organizations could have would impact the effectiveness of a WPL. Employers also felt that for a WPL to be effective, public transport in Cardiff would have to be significantly improved, and become a suitable alternative to driving.

#### 4.4. Do Employees Think They Would Change Mode If a WPL Were Implemented?

From the employees who responded to the survey and stated that they usually or at least sometimes drive to work, 57.2% also stated that bus or train are modes of transport that are available to them for that journey. A smaller percentage also stated that cycling (25.8%) and walking (13.4%) to work would be feasible. We then asked these respondents how they would travel if a WPL were implemented in Cardiff. Table 2 summarizes their responses, with the key numbers shown in bold font. As it can be seen from the table, 32.4% of those who have a bus or train available would consider switching to public transport, 23.1% of those who could walk to work would consider doing so, and 32% of those who could cycle to work would consider this option. Whilst these results show potential for a slight modal shift, the majority of respondents stated that they would continue to drive despite other means of transport being available to them, in contrast with findings by Dale et al. [35], who argue that a WPL will ultimately influence employees' choice of commute mode.

**Table 2.** Travel options that driving respondents would consider to travel to work if a WPL were implemented (based on the commute mode options available to them).

Option That Would Be Considered (% of Respondents)	Driving Respondents Who Could Get a Bus or Train to Work	Driving Respondents Who Could Walk to Work	Driving Respondents Who Could Cycle to Work
Continue to Drive and Use Workplace Car Park	62.2	30.8	36
Continue to Drive and Use Nearby Residential Parking	45.9	42.3	34
Continue to Drive but Use A Public Car Park	14.4	11.5	6
Use Public Transport	<b>32.4</b>	34.6	34
Walk	6.3	<b>23.1</b>	10
Cycle	15.3	23.1	<b>32</b>
Get Involved with A Car Share Scheme	17.1	7.7	12
Don't Know	29.7	7.7	8

Source: Survey responses.

#### 4.5. Would a Car Share Scheme Be Supported by Employers and Employees If a WPL Were Implemented?

Only 1 out of the 17 organizations had an official car share scheme, with only 12% of employees registered in it. However, other interviewees mentioned that they do have some employees who currently car share on a casual basis.

The majority of employers we interviewed felt that there were too many barriers involved in setting up a car share scheme. The two key barriers mentioned were the administration costs for the organization, with one employer calling them an “administrative nightmare”, and the lack of flexibility in working patterns for those car sharing. One interviewee, for example, explained:

“It is to do with geography and now with flexible working. People may not be working at the same time or even on the same days. It may have worked in the past but not anymore.”  
(Participant 15)

To add to this, one interviewee mentioned that car share can work out on the way into work if those car sharing start at the same time, but it is much more difficult for car share to work on the way back, as everyone car sharing would need to finish work at the same time in order to travel home together, and their perception of car share schemes was that they limited freedom, and came with added dilemmas such as deciding whose car to use, and whose turn it would be to pay for fuel.

From the 194 survey respondents who drive, or sometimes drive, to work, 9.8% said that they would consider joining a car share scheme if a WPL were implemented. This differs from the results reported by Rye and Ison [55], who found that organizations that charged for parking saw a shift to car share schemes. When our respondents were asked what factors would encourage them to join a car share scheme, 52.1%, said that no factor would encourage them, although 47.9% stated they would



potentially join to save money on parking or on fuel. Table 3 summarizes the responses to the question of what factors would encourage drivers to join a car share scheme.

**Table 3.** Factors that would encourage respondents to join a car share scheme.

Factors/Reasons	% of Driving Respondents
I am involved in one already	4.6
I would join to save money on parking	20.1
I would join to save money on fuel	27.8
I would join if my employer set it up for me	17
None	52.1

Source: Survey responses.

#### 4.6. Would a WPL Be Supported by Employers and Employees in Cardiff?

Employers and employees seem to hold different views, probably influenced by what a WPL would entail for them, were it to be implemented. Employers felt less supportive overall, whereas employees tended to show some degree of support for the idea.

Unsurprisingly, most interviewees expressed concerns regarding the additional administration work and cost to organizations. With the exception of one interviewee who felt that the additional administration would not pose a problem for their organization, explaining that their organization had already set the WPL up in Nottingham and would therefore have the experience to do it again in Cardiff, most employers seemed to oppose the idea. One interviewee, for example, said:

“You would have to work out who would that sit with, whose responsibility would it be, how would you police that levy, would you expect employees to pay one lump sum, what would happen if they leave ... ” (Participant 1)

Another interviewee, whose organization currently charges employees for parking, spoke about how such a scheme can cause a big cost for organizations. He explained that, on top of paying the levy, in order for organizations to enforce the policy, they would have to purchase equipment and signage, as well as having staff to monitor it. The interviewee raised this as a reason why organizations would not support the policy, stating that to be able to enforce and police a car park it would have to generate funds, and as the organization would not receive any revenue, they would have to pay an additional cost for no benefit.

Another problem cited by employers was the potential “impacts on competitiveness” that a WPL could have. In line with the idea that “most commuters ... feel employer-paid parking is a basic right” [18] (p. 17), one employer mentioned that free workplace parking is important to attract the best staff:

“If you don’t have a parking space available, it makes a big difference and we are in a market where we have to be attracting the best staff. So that is an issue. We need to be competitive in the job market.” (Participant 8)

A different but closely related theme that emerged was that both employers and employees felt that additional funds are needed towards public transport, road transport infrastructure, and active travel routes in Cardiff. Table 4 shows the percentage of survey respondents that felt various traffic measures in Cardiff definitely, and probably, need additional funding.

**Table 4.** Percentage of respondents that felt various traffic measures in Cardiff definitely, and probably need additional funding.

Traffic Measure	%Definitely	%Probably	Total
Improved maintenance of existing roads	26.8	29.0	55.9
Lower public transport fares	28.3	36.0	64.3
Improvements to active travel routes	48.5	29.8	78.3
Improvements to the frequency and reliability of public transport	44.9	32.7	77.6
Extended traffic calming measures	5.5	12.5	18.0

Source: Survey responses.

Furthermore, the employers we interviewed also felt that road transport infrastructure and active travel routes in Cardiff need additional funds, as does public transport. One interviewee, who felt that trains in particular need additional funding, talked about how the current improvements being implemented have resulted in fares rising to cover the cost, discouraging use. Another interviewee pointed out that public transport had to be improved before any pricing mechanisms to discourage car use were implemented.

In general, the employers we interviewed seemed reluctant to accept a WPL, and were convinced that employees would reject the idea if they had to pay. In line with this, as discussed below, more than half of the employees who completed the survey would consider WPLs an acceptable policy, provided there were realistic alternative modes of transport available to them, and/or they did not have to bear the full cost themselves.

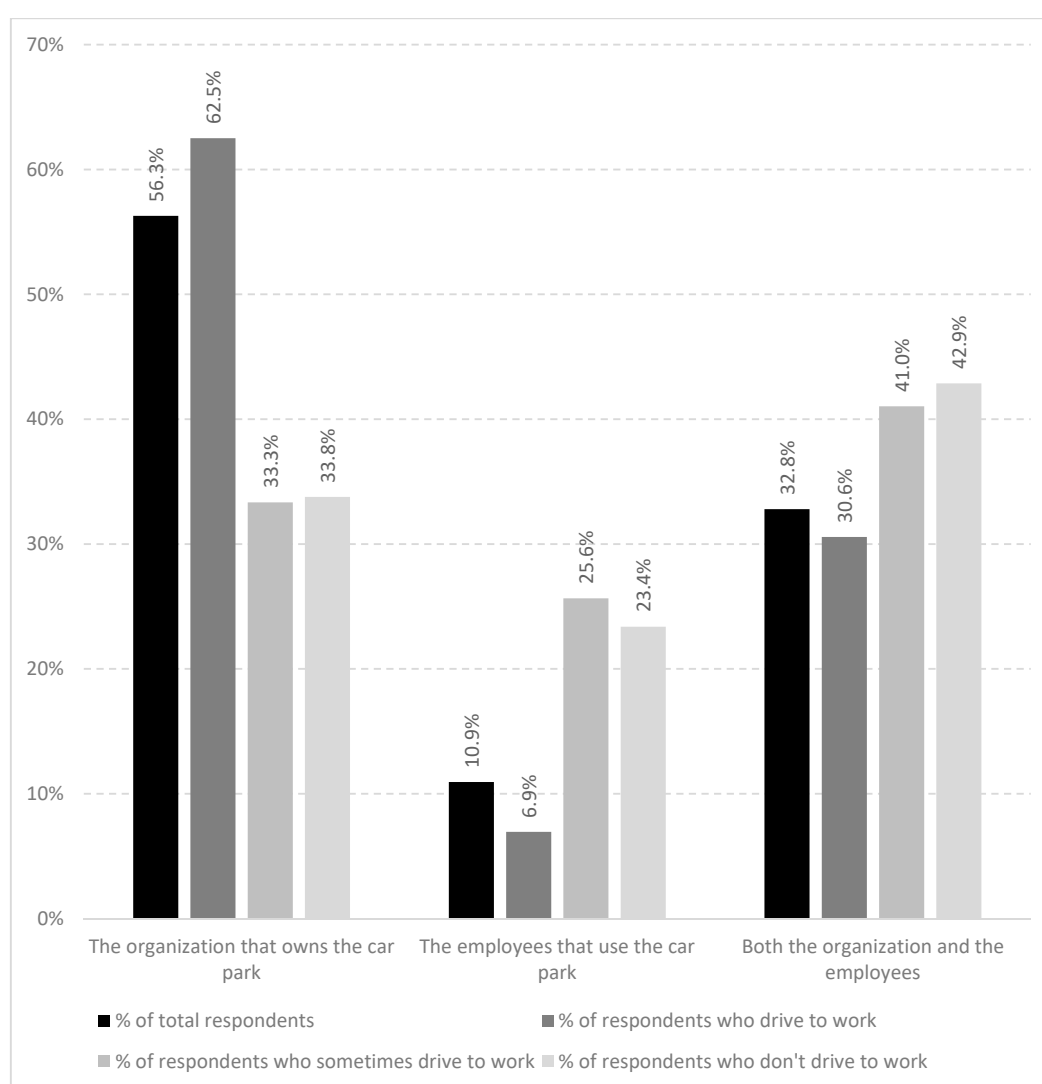
The question of who would pay for the WPL is, in itself, a very interesting one. Figure 3 summarizes the views of those employees who responded to the survey. As it can be seen on the figure, 56.3% of all the employees who responded to the survey felt that the WPL should be paid by the organization that owns the car park. Unsurprisingly, when only those who always drive to work are considered, the figure goes up to 62.5%. The figure also shows that 42.9% of respondents who do not drive to work thought that both the organizations and the employees should share the additional cost of a WPL.

In addition to the above, survey respondents were asked to rank various transport policies by how acceptable they thought they were, with a particular focus on Cardiff. The results in Table 5 show the percentage of respondents who felt that policies were totally acceptable, or fairly acceptable. As it can be seen in the table, 57.3% of respondents felt that introducing a WPL would be totally/fairly acceptable, in contrast with only 23% who felt road user charging would be totally/fairly acceptable, as would have been expected. Other traffic measures listed in the survey were perceived as totally/fairly acceptable by a larger percentage of respondents, with improvements to public transport being ranked as totally/fairly acceptable by 97.2% of respondents, and promotion of active travel, by 90.8% of respondents. This is perhaps because they are measures which would not involve additional cost, or provide an inconvenience to respondents if implemented.

**Table 5.** Transport policies considered totally acceptable and fairly acceptable by respondents.

Traffic Policy	% Totally Acceptable	% Fairly Acceptable	Total%
Road user charging	6.9	16.1	23.0
Levy on workplace parking spaces	13.7	43.6	57.3
Introduction of high occupancy vehicle lanes	14.7	30.2	44.9
Improvements to public transport	74.3	22.9	97.2
Encouragement of car share schemes	30.5	37.8	68.3
Promotion of active travel	62.7	28.1	90.8

Source: Survey responses.



**Figure 3.** Who respondents think should pay any additional fee applied to workplace parking. Source: Survey responses.

## 5. Conclusions and Policy Recommendations

We used semi-structured interviews and a survey to explore the perceptions of a sample of 17 employers and 272 employees in Cardiff regarding a WPL, to gain an understanding of whether it would be an acceptable policy to reduce traffic congestion within the city.

The main finding is that whilst both the employers and employees who participated felt that traffic congestion was a serious problem in Cardiff, they did not think a WPL would be effective in encouraging a modal shift, reducing car use, or reducing congestion in Cardiff. Employers also felt that, should a WPL be implemented, car share schemes would be an unlikely outcome for their organizations as they are perceived as difficult to set up and manage, with little benefit to the employer. This result was supported by the response of the employees, the majority of which would not choose to join a car share scheme if a WPL were implemented. Overall, employers tended to oppose a WPL, with concerns over extra administration work and cost to their organizations, which, they argued, may not be manageable, and all employers thinking that their employees would not be prepared to pay an additional fee for parking. In line with this, the majority of respondents to the employee survey felt it was an acceptable policy to implement, provided employers absorbed the cost of the WPL and public transport and active travel routes were improved first.

Employers also highlighted that if a WPL were implemented, it could have a negative financial impact for commuters for whom other transport modes are not reasonable, and could also act as a barrier for them to get to work. This, subsequently, could lead to organizations absorbing the levy to remain attractive employers, which, in turn, would have a negative financial impact.

Another important finding is that both employers and employees believe that public transport and active travel routes in Cardiff are inadequate, even in central areas. According to the employers and employees that took part in the study, a WPL would not be effective in reducing car use, unless public transport and active travel routes were improved first. The South Wales Metro featured prominently both in the survey and interviewee responses collected, with many believing this will encourage modal shift.

Bearing the results of the present study in mind, it is difficult to recommend the introduction of a WPL to manage congestion in Cardiff unless public transport and active travel routes are improved first. In addition, there are important points which need to be noted. First, as discussed in Section 2, both the proposals for the London Congestion Charging Scheme and the Nottingham Workplace Parking Levy were sent out for public consultation, and the results of the consultation helped modify the details of the schemes, especially in the area of exemptions and discounts, and this increased public acceptability. This could also increase public acceptability of a WPL in Cardiff. Second, although our study participants thought that a WPL would not reduce car use or traffic congestion, the WPL in Nottingham has led to a statistically significant reduction in congestion [43]. This could also be the case in Cardiff, should a WPL be implemented. Third, the employees that participated in the study thought that a WPL was a more acceptable transport policy than congestion charging, and so if Cardiff Council were to choose one of the two, it would be politically easier to push for a WPL.

Future lines of research include (a) a feasibility study with alternative scenarios regarding the level of potential WPLs in Cardiff and their subsequent financial impact on employers and employees under different assumptions of who would pay for the levy; (b) a modeling study of traffic flows and traffic composition in Cardiff during the morning and evening peaks, with and without a WPL, and with and without a reduction in the number of parking places offered by employers. These extensions would provide a picture of the potential socio-economic impacts of a WPL in Cardiff, and would also inform the issue of acceptability further.

**Author Contributions:** Conceptualization: G.S., A.H., O.L., Methodology: G.S., A.H., O.L., Acquisition and analysis of data: G.S., A.H., O.L., Writing: G.S., A.H., O.L., Reviewing and editing: G.S. All authors have read and agreed to the published version of the manuscript.

**Funding:** The authors did not receive any funding for this work.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A. Outline Interview Questions

1. How many employees do you have in Cardiff?
2. How many car parking spaces do you have?
3. Do you consider congestion to be a problem in Cardiff?
  - Do you think it is more of a problem in the morning/evening or it does not differ?
  - Do you think your employees consider congestion to be a problem?
4. Do you think if your employees had to pay for parking they would use other methods of transport?
  - Why not?
5. Do you think a WPL scheme across Cardiff would be an effective way to reduce congestion?
  - Would improvements to public transport, walking and cycling routes encourage your employees to use greener transport modes?

6. Do you think a WPL scheme across Cardiff would be an acceptable policy?
  - Why? Why not? – controversial? Who pays?
7. A WPL could add additional admin tasks (e.g., collecting payments), would this cause any problems?
  - Would you consider such a scheme easy or difficult to manage?
8. Do you currently have a travel plan? Or other incentives such as bicycle hiring or bicycle sharing?
9. Do you currently have a car share scheme set up?
10. Would you be willing to set up a car share scheme with your employees?
  - Would you consider this an easy or difficult task?
  - Do you think your employees would be willing to join?

## Appendix B. Survey Questions

1. Do you drive to work?
  - Yes
  - No
  - Sometimes

Questions 2–8 for respondents who drive or sometimes drive to work

2. How far do you travel to get to work?
  - 0–2 miles
  - 2–5 miles
  - 5–10 miles
  - Over 10 miles
3. Where do you park your car
  - Workplace car park
  - Public car park
  - Nearby residential street
4. What transport options, other than driving, are available and/or reasonable for you to use to travel to work?
  - Walking Cycling
  - Bus
  - Train
  - Park and Ride
  - Taxi
  - Other
  - None
5. How much do you currently pay for parking per day?
  - Nothing
  - Up to £1
  - Up to £5
  - Up to £7.50
  - Over £7.50
  - Don't know
6. If you were required to pay for parking at work, how would you choose to travel to work?
  - Continue to drive and use the workplace car park

Continue to drive but use nearby residential parking

Continue to drive but use a public car park

Use public transport

Walk

Cycle

Get involved with a car share scheme

Don't know

7. If a fee was applied to workplace car parks, who do you think should pay?

The organization that owns the car park

The employees that use the car park

Both the organization and the employees

8. What factors (if any) would encourage you to join a car share scheme?

I am involved in one already

I would join one to save money on parking

I would join to save money on fuel

I would join if it was organized for me by my employer

None

#### Questions 9-11 for respondents who do not drive to work

9. How far do you travel to get to work?

0–2 miles

2–5 miles

5–10 miles

Over 10 miles

10. Which of these transport options are available and/or reasonable for you to use to travel to work?

Walking

Cycling

Bus

Train

Park and Ride

Taxi

Other

None

11. If a fee was applied to workplace car parks, who do you think should pay?

The organization that owns the car park

The employees that use the car park

Both the organization and the employees

#### Questions 12–14 for all respondents

12. How serious would you rate the following traffic related issues in Cardiff?

	Not at All Serious	Not Very Serious	Fairly Serious	Serious	Very Serious
Health/pollution related issues, e.g., asthma					
Traffic congestion					
Limited access to public transport					
Poor quality public transport					
Road wear and tear					
Are there any other traffic related issues you would consider serious in Cardiff?					
.....					



## 13. Which of the following traffic measures (if any) do you think need additional funding in Cardiff?

	Definitely	Probably	Maybe	Probably Not	Definitely Not
Improve maintenance of existing roads					
Lower public transport fares					
Improvements to active travel routes (walking and cycling)					
Improvements to the frequency and reliability of public transport					
Extend traffic calming measures (e.g., speed humps, narrowing traffic lanes)					
Are there any other traffic measures you think need additional funding in Cardiff?					
.....					

## 14. Which of the following traffic related policies would you consider acceptable in Cardiff?

	Totally Acceptable	Fairly Acceptable	Neither	Serious	Very Serious
Road user charging (such as the London Congestion Charge)					
Levy on workplace parking spaces (Organizations pay a fee for each parking space they own. The organization may pay the fee, or they may pass part or all of it on to employees. The money generated is used to fund transport improvements)					
Introduction of high occupancy vehicle lanes (traffic lanes which can only be used by vehicles carrying passengers)					
Improvements to public transport					
Encouragement of car share schemes					
Promotion of active travel (walking and cycling)					

## References and Notes

- European Commission. European Urban Mobility: Policy Context. March 2017. Available online: <https://ec.europa.eu/transport/sites/transport/files/2017-sustainable-urban-mobility-policy-context.pdf> (accessed on 20 June 2018).
- Welsh Government. Active Travel Wales Act 2013. Available online: [http://www.legislation.gov.uk/anaw/2013/7/pdfs/anaw\\_20130007\\_en.pdf](http://www.legislation.gov.uk/anaw/2013/7/pdfs/anaw_20130007_en.pdf) (accessed on 21 June 2017).
- Welsh Government. Well-being of Future Generations (Wales) Act 2015. Available online: <http://gov.wales/docs/dsjlg/publications/150623-guide-to-the-fg-act-en.pdf> (accessed on 21 June 2017).
- Cardiff Council. Cardiff Local Transport Plan 2015-2020. Available online: <https://www.cardiff.gov.uk/ENG/resident/Parking-roads-and-travel/transport-projects/Documents/FINALLTP.pdf> (accessed on 21 June 2017).
- Cardiff Council. Cardiff's Transport White Paper: Transport Vision to 2030 - Changing how we move around a growing city. Available online: <https://www.cardiff.gov.uk/ENG/resident/Parking-roads-and-travel/transport-policies-plans/transport-white-paper/Pages/default.aspx> (accessed on 4 February 2020).
- Welsh Government. Powering the Welsh Economy. Available online: <https://monmouthshire.gov.uk/app/uploads/2015/01/5-Cardiff-Capital-Region-Board.pdf> (accessed on 20 June 2018).
- Cardiff, Council. Transport Survey 2017. Available online: <https://www.cardiff.gov.uk/ENG/Your-Council/Have-your-say/Ask%20Cardiff%20Library/Transport%20Survey%202017%20Report.pdf> (accessed on 17 December 2019).
- Kirschner, F.; Lanzendorf, M. Parking management for promoting sustainable transport in urban neighbourhoods. A review of existing policies and challenges from a German perspective. *Transp. Rev.* 2019; 40, 54–75.
- Cardiff Council. City of Cardiff Council Parking Strategy 2016. Available online: <https://www.cardiff.gov.uk/ENG/resident/Parking-roads-and-travel/parking/Parking-Strategy/Documents/Parking%20Strategy%20September%202016.pdf> (accessed on 17 December 2019).

10. Cardiff Council. Cardiff Council Annual Parking and Traffic Enforcement Report 2017/18. Available online: [https://www.patrol-uk.info/annual\\_reports/Cardiff/Cardiff-City-Council-Annual-Parking-Report-2017-18-English.pdf](https://www.patrol-uk.info/annual_reports/Cardiff/Cardiff-City-Council-Annual-Parking-Report-2017-18-English.pdf) (accessed on 17 December 2019).
11. UK Office for National Statistics. Dataset: Annual Survey of Hours and Earnings time series of selected estimates. Available online: <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/ashe1997to2015selectedestimates> (accessed on 17 December 2019).
12. Cardiff Council. Cardiff Local Development Plan 2006–2026. Available online: <https://www.cardiff.gov.uk/ENG/resident/Planning/Local-Development-Plan/Documents/Deposit%20Plan.pdf> (accessed on 21 June 2017).
13. Acts of Parliament. Transport Act 2000. Available online: [www.legislation.gov.uk/ukpga/2000/38/contents](http://www.legislation.gov.uk/ukpga/2000/38/contents) (accessed on 21 June 2017).
14. Cardiff Council. Cardiff's Transport & Clean Air Green Paper Changing how we move around a growing city. Available online: <https://www.cardiff.gov.uk/ENG/resident/Parking-roads-and-travel/transport-and-clean-air-green-paper/Documents/Cardiff%27s%20Transport%20and%20Clean%20Air%20Green%20Paper.pdf> (accessed on 18 December 2019).
15. Burchell, J.; Ison, S.; Enoch, M. The Smeed Report 50 years on: A role for the workplace parking levy? *Transp. Plan. Technol.* **2015**, *38*, 62–77. [CrossRef]
16. Goodwin, P.B. Empirical evidence on induced traffic. *Transportation* **1996**, *23*, 35–54. [CrossRef]
17. Hills, P. What is induced traffic? *Transportation* **1996**, *23*, 5–16. [CrossRef]
18. Shoup, D.C. *Parking Cash-Out, Report Number 532*; American Planning Association: Chicago, IL, USA. Available online: <http://shoup.bol.ucla.edu/ParkingCashOut.pdf> (accessed on 21 June 2017).
19. California Air Resources Board. California's Parking Cash-Out Law. Available online: <https://ww3.arb.ca.gov/planning/tsaq/cashout/cashout.htm> (accessed on 20 June 2018).
20. California Air Resources Board. California's Parking Cash-Out Program An Informational Guide For Employers. Available online: [https://ww3.arb.ca.gov/planning/tsaq/cashout/cashout\\_guide\\_0809.pdf](https://ww3.arb.ca.gov/planning/tsaq/cashout/cashout_guide_0809.pdf) (accessed on 21 June 2017).
21. Enoch, M. UK Parking Cash Out Experience, and Lessons from California. *Traffic Eng. Control.* **2002**, *43*, 184–187.
22. Private Communication with Pfizer Press Office. 2019. [PressofficePGP-UK@pfizer.com](mailto:PressofficePGP-UK@pfizer.com).
23. Private Communication with Vodafone Press Office. 2019. [ukmediarelations@vodafone.com](mailto:ukmediarelations@vodafone.com).
24. Acts of Parliament. Greater London Authority Act 1999. Available online: [www.legislation.gov.uk/ukpga/1999/29/contents](http://www.legislation.gov.uk/ukpga/1999/29/contents) (accessed on 21 June 2017).
25. Acts of the Scottish Parliament. Transport (Scotland) Act 2001. Available online: <http://www.legislation.gov.uk/asp/2001/2/contents> (accessed on 21 June 2017).
26. Acts of the Scottish Parliament. Transport (Scotland) Act 2019. Available online: <http://www.legislation.gov.uk/asp/2019/17/enacted> (accessed on 17 December 2019).
27. Durham County Council. Durham Road User Charge Zone (congestion charge). Available online: <http://www.durham.gov.uk/article/3437/Durham-Road-User-Charge-Zone-congestion-charge-> (accessed on 10 February 2020).
28. Santos, G. Urban Road Pricing in the UK. *Res. Transp. Econ.* **2004**, *9*, 251–282. [CrossRef]
29. London Assembly: Transport Committee. London Stalling: Reducing Traffic Congestion in London. Available online: [https://www.london.gov.uk/sites/default/files/london\\_stalling\\_-\\_reducing\\_traffic\\_congestion\\_in\\_london.pdf](https://www.london.gov.uk/sites/default/files/london_stalling_-_reducing_traffic_congestion_in_london.pdf) (accessed on 17 December 2019).
30. Transport for London. Public and stakeholder consultation on a Variation Order to modify the Congestion Charging scheme Impact Assessment. Available online: [https://consultations.tfl.gov.uk/roads/cc-changes-march-2014/user\\_uploads/cc-impact-assessment.pdf](https://consultations.tfl.gov.uk/roads/cc-changes-march-2014/user_uploads/cc-impact-assessment.pdf) (accessed on 21 June 2017).
31. Transport for London. Travel in London: Report 11. Available online: <http://content.tfl.gov.uk/travel-in-london-report-11.pdf> (accessed on 17 December 2019).
32. Transport for London. PHVs and the Congestion Charge. Available online: <https://tfl.gov.uk/info-for/taxis-and-private-hire/phvs-and-the-congestion-charge> (accessed on 17 December 2019).
33. Santos, G.; Shaffer, B. Preliminary Results of the London Congestion Charging Scheme, Public Works. *Manag. Policy* **2004**, *9*, 164–181.
34. Santos, G. The London Congestion Charging. *Brook.-Whart. Pap. Urban Aff.* **2008**, *2008*, 177–234.

35. Dale, S.; Frost, M.; Ison, S.; Warren, P. Workplace Parking Levies: The answer to funding large scale local transport improvements in the UK? *Res. Transp. Econ.* **2014**, *48*, 410–421. [CrossRef]
36. Nottingham City Council. Nottingham Local Transport Plan Strategy 2011–2026. Available online: <http://www.nottinghamshire.gov.uk/transport/public-transport/plans-strategies-policies/local-transport-plan> (accessed on 23 August 2017).
37. Bonsall, P.; Milne, D. Urban Road User Charging and Workplace Parking Levies. In *Integrated Futures and Transport Choices*; Preston, J., Hine, J., Eds.; Ashgate: Aldershot, UK, 2003; pp. 259–286.
38. Nottingham City Council. Workplace Parking Levy Employer Handbook. Available online: [https://secure.nottinghamcity.gov.uk/wpl/common/Employer\\_handbook.pdf](https://secure.nottinghamcity.gov.uk/wpl/common/Employer_handbook.pdf) (accessed on 23 August 2017).
39. Nottingham City Council. Workplace Parking Levy. Available online: <https://www.nottinghamcity.gov.uk/wpl> (accessed on 17 December 2019).
40. Nottingham City Council. Workplace Parking Levy Executive Board Report. Available online: <http://committee.nottinghamcity.gov.uk/Data/Executive%20Board/20071218/Agenda/WPLExecBoardReport18Dec2007%20-%2030800.pdf> (accessed on 2 September 2017).
41. UK Office for National Statistics. Labour Market Profile – Nottingham. Available online: <https://www.nomisweb.co.uk/reports/lmp/la/1946157131/report.aspx> (accessed on 3 August 2019).
42. Australian Bureau of Statistics. Regional Population Growth, Australia, 2017–18. Available online: <https://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/3218.0> (accessed on 3 August 2019).
43. Dale, S.; Frost, M.; Ison, S.; Quddus, M.; Warren, P. Evaluating the Impact of a Workplace Parking Levy on Local Traffic Congestion: The Case of Nottingham UK. *Transp. Policy* **2017**, *59*, 153–164. [CrossRef]
44. Transport for New South Wales. Parking Space Levy. Available online: <https://www.transport.nsw.gov.au/programs/parking-space-levy> (accessed on 26 June 2019).
45. City of Perth. Annual Report 2017/18. Available online: <https://perth.azureedge.net/-/media/Project/COP/COP/COP/Documents-and-Forms/Council/Documents/Annual-Reports/City-of-Perth-Annual-Report-17-18.pdf?la=en&modified=20181227073742> (accessed on 26 June 2019).
46. Australian Department of Transport. Licensed Parking in Perth. Available online: [https://www.transport.wa.gov.au/mediaFiles/projects/PROJ\\_P\\_LicensedParkingPerthGuide.pdf](https://www.transport.wa.gov.au/mediaFiles/projects/PROJ_P_LicensedParkingPerthGuide.pdf) (accessed on 26 June 2019).
47. State Revenue Office Victoria. Annual Review 2017/18. Available online: <https://annualreview1718.sro.vic.gov.au/content/financial-statements> (accessed on 26 June 2019).
48. State Revenue Office Victoria. Congestion Levy Current Rates. Available online: <https://www.sro.vic.gov.au/congestion-levy-current-rates> (accessed on 26 June 2019).
49. Nottingham City Council. Statement of Accounts 2017/18. Available online: <https://committee.nottinghamcity.gov.uk/documents/s75489/Appendix%20B%20-%20FINAL%20Statement%20of%20Accounts%202017-2018.pdf> (accessed on 26 June 2019).
50. Hamer, P.; Currie, G.; Young, W. Parking Price Policies: A Review of the Melbourne Congestion Levy. In proceedings of Australasian Transport Research Forum, Adelaide, Australia, 28–30 September 2011. Available online: <https://research.monash.edu/en/publications/parking-price-policies-a-review-of-the-melbourne-congestion-levy> (accessed on 25 July 2019).
51. Enoch, M.; Ison, S. Levying charges on private parking: Lessons from existing practice. *World Transp. Policy Pract.* **2005**, *12*, 5–14.
52. Gerrard, B.; Still, B.; Jopson, A. The impact of road pricing and workplace parking levies on the urban economy: Results from a survey of business attitudes. *Environ. Plan. A* **2001**, *33*, 1985–2002. [CrossRef]
53. Nottingham City Council. Local Authority Parking Enforcement: Written evidence from Nottingham City Council to the UK Parliament (PE 43), Session 2012–13. 2013. Available online: <https://publications.parliament.uk/pa/cm201314/cmselect/cmtran/writev/parking/m43.htm> (accessed on 25 July 2017).
54. Bonsall, P.; Jopson, A.; Pridmore, A.; Ryan, A.; Firmin, P. *Car share and Car Clubs: Potential Impacts*; Institute for Transport Studies, University of Leeds: Leeds, UK, 2002; Available online: [https://www.researchgate.net/publication/237364534\\_Car\\_Share\\_and\\_Car\\_Clubs\\_potential\\_impacts](https://www.researchgate.net/publication/237364534_Car_Share_and_Car_Clubs_potential_impacts) (accessed on 25 July 2017).
55. Rye, T.; Ison, S. Overcoming barriers to the implementation of car parking charges at UK workplaces. *Transp. Policy* **2005**, *12*, 57–64. [CrossRef]
56. Guest, G.; Bunce, A.; Johnson, L. How many interviews are enough? An experiment with data saturation and variability. *Field Methods* **2006**, *18*, 59–82. [CrossRef]
57. Rowley, J. Conducting research interviews. *Manag. Res. Rev.* **2012**, *35*, 260–271. [CrossRef]

58. Welsh Government. StatsWales Commuting patterns by Welsh local authority and measure. Available online: <https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Employment/Commuting/commutingpatterns-by-welshlocalauthority-measure> (accessed on 12 July 2019).
59. Cardiff Council and Cardiff Bus. Transforming the Bus Network: Cardiff Bus Network Study, November. Available online: [https://www.cardiff.gov.uk/ENG/resident/Planning/Local-Development-Plan/Examination/Examination-Documents/Documents/ED026%20Cardiff%20Bus%20Network%20StudyFinal%20RV\\_19%2011%2014.pdf](https://www.cardiff.gov.uk/ENG/resident/Planning/Local-Development-Plan/Examination/Examination-Documents/Documents/ED026%20Cardiff%20Bus%20Network%20StudyFinal%20RV_19%2011%2014.pdf) (accessed on 12 July 2019).



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).