Imperial College London

Road User Charging: what does existing evidence tell us?

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Outline

- What is Road User Charging?
- Some historical context
- More recent developments and policy options
- Existing evidence

A note on terminology

- Other terms used (often more or less interchangeably)

- Road pricing
- Congestion charging
- Value pricing
- Urban road charging

- I will refer to mainly as Road User Charging

What is Road User Charging?

Not just London Congestion Charge.

A range of methods

- Charges can be levied upon entering a specified area at toll points (such as motorway tolls)
- for crossing into an area (known as cordon charging)
- for any use within a specified area (known as area charging)

- There are lots of options for implementation, e.g. charging can vary by
  - time of day
  - by vehicle class (such as Ultra Low Emission Zone in London)
  - by assessment of emission standards

- All schemes aim to make motorists pay more directly for road use
- Any revenue raised can be used many ways, although some argue that needs to be used to improve other travel options
- Different schemes have different objectives but tend to be around 1) controlling traffic levels / congestion
  2) improvements to the environment (broadly conceived)

Some historical context

- 1962 -Reuben Jacob Smeed was commissioned by the British government to examine the technical feasibility of implementing road user charging (reported 1964)

- Three main impacts from road use:
  - Wear and tear on roads
  - Congestion
  - Social risks (including accidents, noise and fumes)

The road user should pay the costs that he/she imposes upon others

Road pricing : the economic and technical possibilities (1964)

- Convened panel to assess *how* various forms of taxes could be levied, but not whether total amounts paid by motorists should vary. BUT did assume that total amounts motorists paid would be similar

After preliminary study of various proposals for implementing such a change the panel have concluded that practical pricing methods could probably be devised. Some of the information necessary for an accurate estimate of the likely effects is not available, but it is tentatively estimated that the measurable net gain to the community from the higher speeds consequent on the reduction and reallocation of traffic would be about £100-£150 million per year under present conditions. This figure takes no account of the non-measureable benefits such as reduction of noise, fumes and frustration.

In considering road pricing as a means of regulating traffic congestion the panel have made the point that pricing by itself cannot produce a 'cure' for congestion. The proposal to charge for use of congested roads should not be regarded as an alternative to new and better roads; it is rather a means of obtaining better value from the roads that already exist and from those that are yet to be built.

Most important requirements:

(1) Charges should be closely related to the amount of use made of the roads.*

(2) It should be possible to vary prices to some extent for different roads (or areas), at different times of day, week or year, and for different classes of vehicle.

(3) Prices should be stable and readily ascertainable by road users before they embark upon a journey.

(4) Payment in advance should be possible, although credit facilities may also be permissible under certain conditions.

(5) The incidence of the system upon individual road users should be accepted as fair.

(6) The method should be simple for road users to understand.

(7) Any equipment used should possess a high degree of reliability.

(8) It should be reasonably free from the possibility of fraud and evasion, both deliberate and unintentional.

(9) It should be capable of being applied, if necessary, to the whole country and to a vehicle population expected to rise to over 30 million.

Smeed report was not acted on

Reported that PM Sir Alec Douglas-Home suggested the government *"take a vow that if we are re-elected we will never again set up a study like this one“*

Not taken up again for some time

Serious interest in Labour Government

- Road Pricing Feasibility Study (2004) examined how new national system of charging could better utilise road network.

- Concluded:
  - national road pricing is becoming feasible
  - national road pricing could meet the Government's objectives
  - the implementation of road pricing requires the promotion of a greater degree of public consensus

Eddington Transport Study (2006)

- Eddington was the outgoing Chief Exec of BA and was asked to advise on long term impacts of transport strategy on UK productivity and growth

- “road pricing is an economic no-brainer”
- Government should “use road pricing as the most appropriate way to tackle congestion: introduce widespread, congestion-targeted road pricing to deliver the potential benefits cost-effectively; setting out the key decisions needed to unlock the vast potential of road pricing”

Plan was for all vehicles to have a satellite receiver and varying costs on all roads from 2p per mile to £1.34

1.8 million people signed an online petition against the scheme, and referenda rejected schemes in Edinburgh and Manchester

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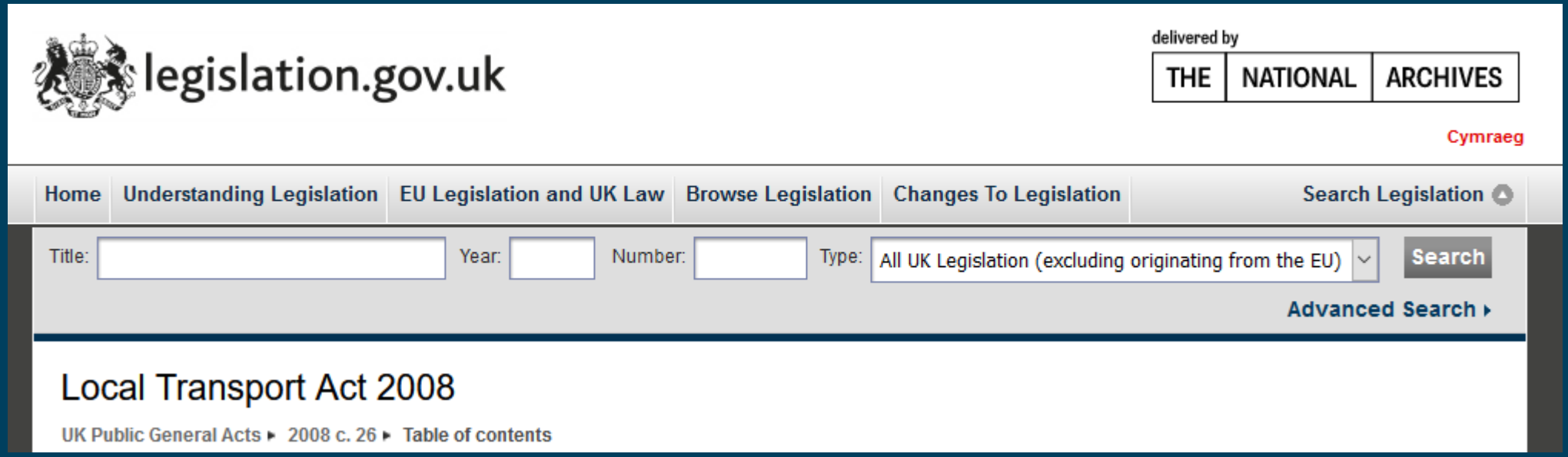
Blair rebuffs 1.8m who signed road petition

By David Millward and George Jones

21 February 2007 • 00:02 am

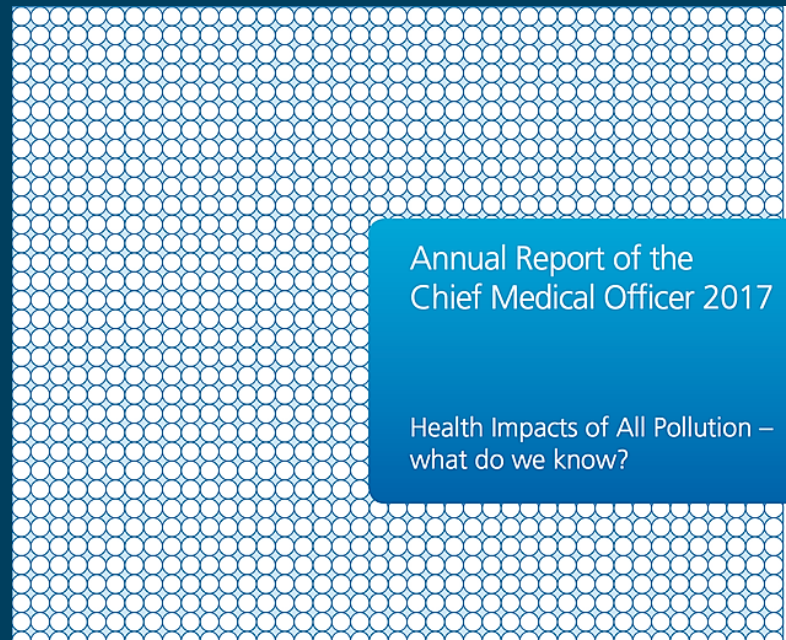
- Govt limped on with policy but never really recovered, although did remove the requirement for local charging authorities in England to obtain the approval of the Secretary of State for their schemes



More recent developments and policy options

More recent developments and policy options

- I think a lot of factors now suggest that appetite for Road User Charging schemes is rising



Financial pressures

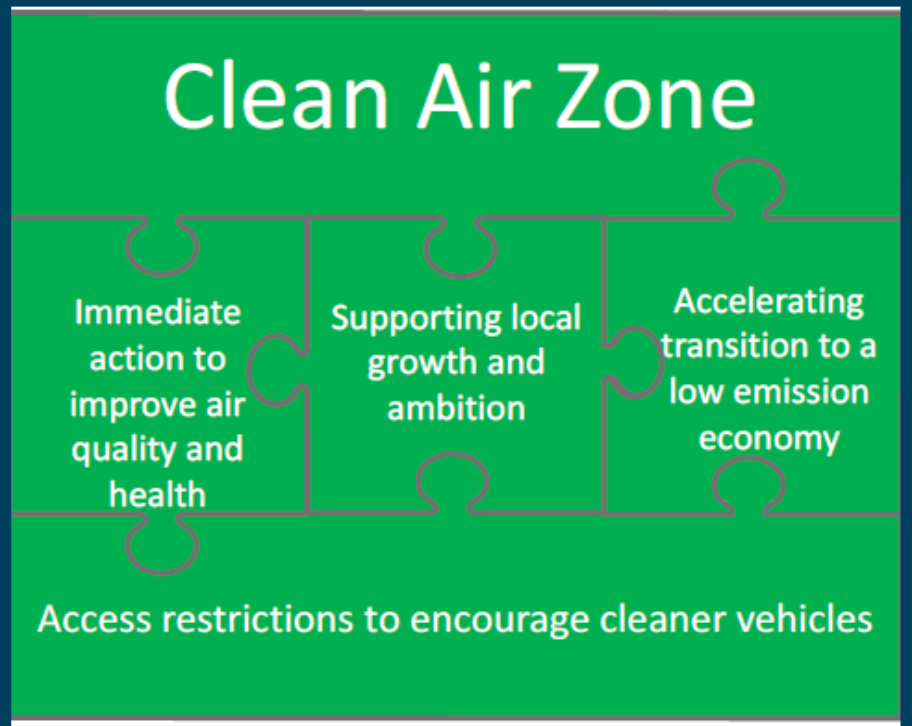
Additionally, also some concerns over the financial sustainability of our current transport system

- Two of the major income streams are
  - Vehicle excise duty (a.k.a car tax) which is being eaten into by electric cars
  - And fuel duty, which is at risk from rising fuel efficiency, electric cars and politicians pledging not to raise it (stable since 2011-12)
- And despite concerns over “peak car” DfT still forecasting more driving in future

Clean Air Zones

In 2017 DEFRA set out guidance for Local Authorities when considering whether and how to implement Clean Air Zones

Clean Air Zones are not a pre-specified intervention but they involve commitments to targeted and coordinated action



Clean Air Zones

- Divided into charging and non-charging
- Charging schemes categorised as Category A – D with increasing restrictions

Charging Clean Air Zones

Category	Vehicles included
Class A	Buses, coaches, taxis and private hire vehicles.
Class B	All of the above in Class A – plus HGVs.
Class C	All of the above in Class B – plus large vans, minibuses, and small vans / light commercial vehicles.
Class D	All of the above in Class C – plus cars, motorcyles and mopeds.

Some local examples (1)

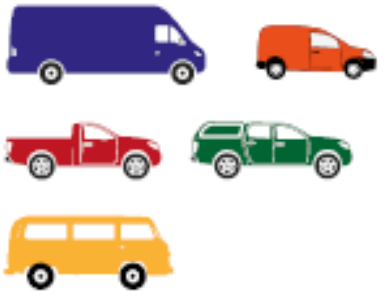
- Newcastle consulted on implementing a charging clean air zone

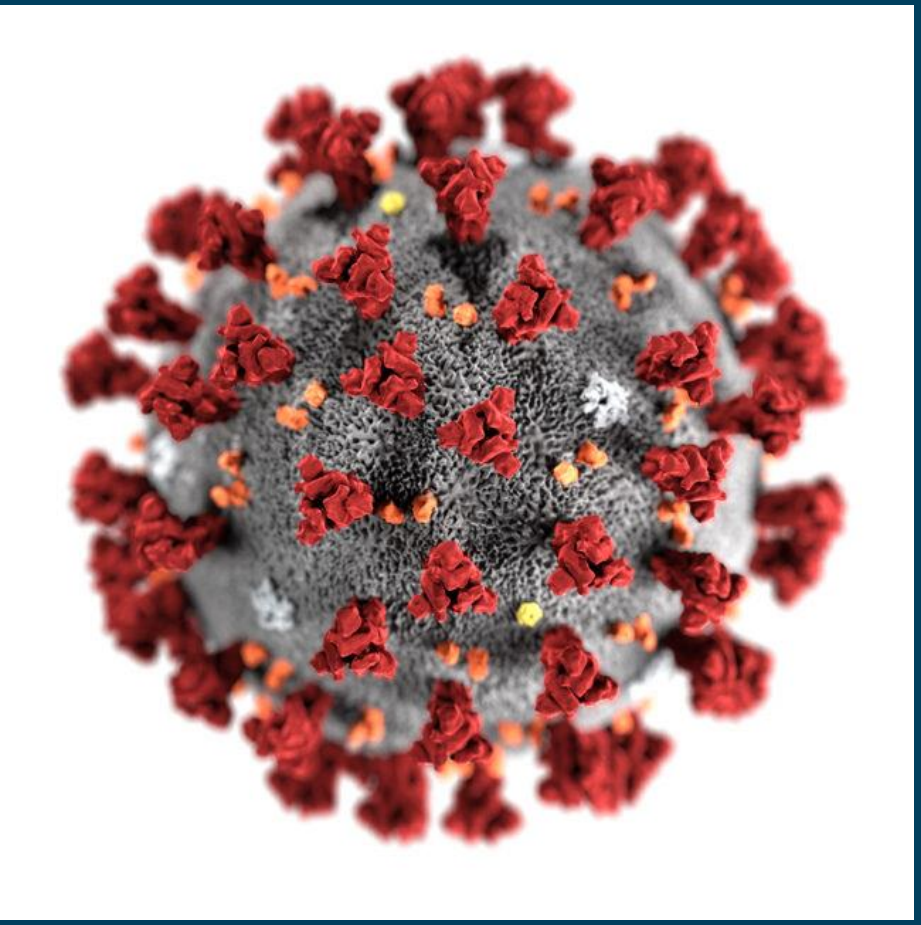
- Previous consultation in May did result in scaling back proposals to only include Category A. From over 50,000 responses their headline conclusion was

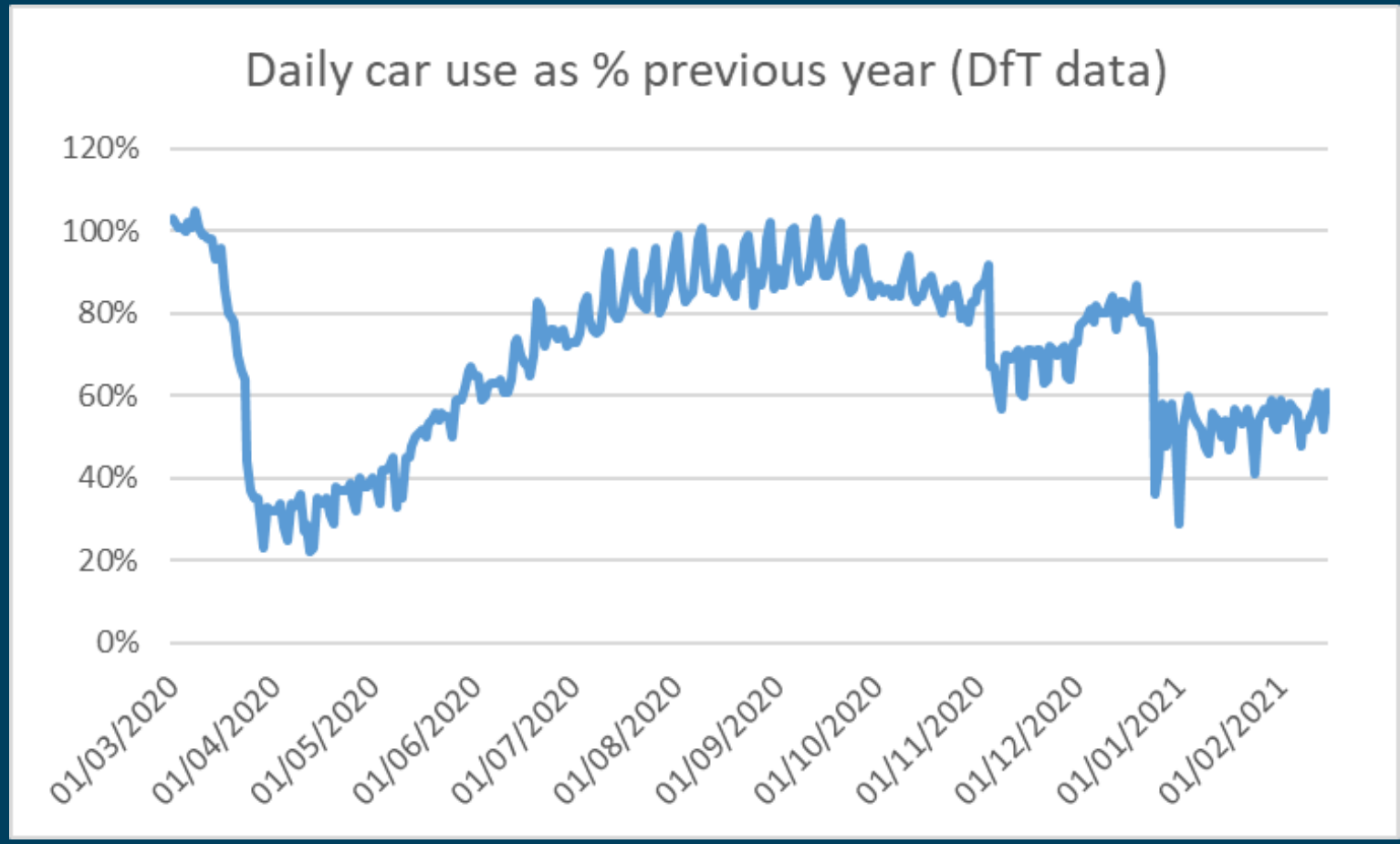
Public willing to take action on air pollution – but support is needed

Some local examples (2)

- Bath planned to charge higher emission vehicles for driving in the city centre
- Strong public feeling against charging private cars but going ahead with charging higher emission buses, coaches, taxis, private hire vehicles and HGVs
- To charge all of the time

Vehicle category	Type of vehicle	Euro standard	Daily charge
M3	• Buses • Coaches 	Pre euro 6/VI diesel	£100
N2, N3	• HGVs under 12 tonnes (N2) • HGVs over 12 tonnes (N3) 	Pre euro 6/VI diesel	£100
M1	• Taxi • Private hire vehicles 	Pre euro 6 diesel Pre euro 4 petrol	£9
M2	• Minibuses • Minibus taxis/ PHVs 	Pre euro 6 diesel Pre euro 4 petrol	£9
N1	• Vans • LGVs • Pick-ups • Dual purpose 4 x 4s (N1) • Campervans (N1) 	Pre euro 6 diesel Pre euro 4 petrol	£9
N1/ PHGV	• Motorhomes classed N1 or PHGV • Horse transporters N1 or PHGV 	Pre euro 6/VI diesel Pre euro 4/IV petrol	£9




Daily car use as % previous year (DfT data)
120%
100%
80%
60%
40%
20%
0%
01/03/2020
01/04/2020
01/05/2020
01/06/2020
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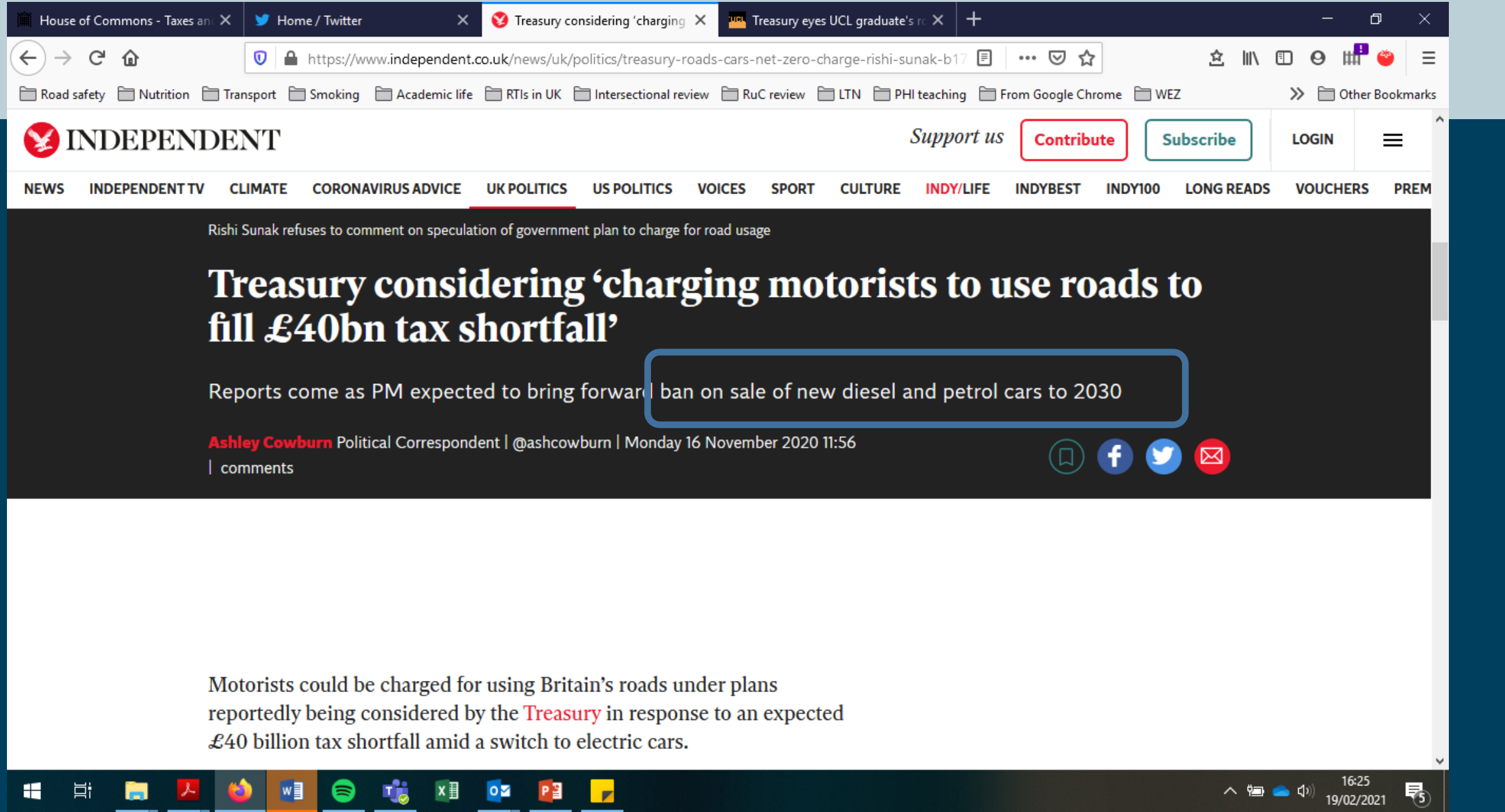
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https://www.independent.co.uk/news/uk/politics/treasury-roads-cars-net-zero-charge-rishi-sunak-b17
Road safety
Nutrition
Transport
Smoking
Academic life
RTIs in UK
Intersectional review
RuC review
LTN
PHI teaching
From Google Chrome
WEZ
Other Bookmarks
INDEPENDENT
Support us
Contribute
Subscribe
LOGIN
NEWS
INDEPENDENT TV
CLIMATE
CORONAVIRUS ADVICE
UK POLITICS
US POLITICS
VOICES
SPORT
CULTURE
INDY/LIFE
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VOUCHERS
PREM
Rishi Sunak refuses to comment on speculation of government plan to charge for road usage
Treasury considering 'charging motorists to use roads to fill £40bn tax shortfall'
Reports come as PM expected to bring forwar ban on sale of new diesel and petrol cars to 2030
Ashley Cowburn Political Correspondent | @ashcowburn | Monday 16 November 2020 11:56
| comments
Motorists could be charged for using Britain's roads under plans reportedly being considered by the Treasury in response to an expected £40 billion tax shortfall amid a switch to electric cars.
16:25
19/02/2021

Also Transport Committee inquiry

- In Dec 2020 launched inquiry on both Zero Emission Vehicles and Road Pricing
- The decision to ban sale of petrol/diesel cars by 2030 leaves “£40 billion black hole”
- “The Government has said that the tax system will need to encourage the uptake of electric vehicles and that revenue from motoring taxes must keep pace with this change…. A new system of road pricing—which can come in different forms—has been proposed as a potential solution, although in the past such schemes have been perceived to lack strong public support.” (Huw Merriman)

Road pricing questions in inquiry

- The case for introducing some form of road pricing and the economic, fiscal, environmental and social impacts of doing so;
- Which particular road pricing or pay-as-you-drive schemes would be most appropriate for the UK context and the practicalities of implementing such schemes;
- The level of public support for road pricing and how the views of the public need to be considered in the development of any road pricing scheme;
- The lessons to be learned from other countries who are seeking to decarbonise road transport and/or utilise forms of road pricing.

Existing evidence

- A wide range of possible impacts of road use charges

- Here will focus on

1) **Travel patterns and behaviour**
2) **Pollution**
3) **Road Traffic Incidents**

Much of the UK evidence from London

Other evidence from international schemes

And some from modelling of potential impacts

1) Travel patterns and behaviours

- TfL evaluations showed immediate reductions in private motorised vehicles (e.g. -36% cars , but increases in busses, walking and cycling (e.g. +66% 2007 vs. 2002)

- Also, evaluations of Low Emission Zone (from 2008) associated with more electric vehicles, changes in fleet composition away from the most polluting vehicles

- Evidence from Greece (Athens) (Papathanasopoulou& Antoniou, 2011):
- -reduction of cars entering the zone
- -change in traffic and speed in and out the zone
- -change in traffic beyond charging hours
- -increase in the use of PT

- -Distance Charge (Austrian road network) -(Steiningeret al., 2007)
- •1.6% reduction of NO2 emissions
- •4.6% increase in public transport use
- •5.1% decrease in distance travelled via private transport

- Cordon Charge (Milan Ecopass scheme) –(Rotariset al., 2010):
- •Change after one year (2008-2009)
- •14.2% reduction of number of vehicles entering the area

Cordon Charge (Stockholm) –(Eliasson et al., 2009):

- •Change after one year (2005-2006)
- •18% -23% reduction of entries number of vehicles entering the area in morning and afternoon peaks

Modal shifts?

- Evidence is more limited on modal shifts

ELSEVIER

Journal of Transport & Health

Volume 2, Issue 4, December 2015, Pages 568-579

Congestion pricing and active transport – evidence from five opportunities for natural experiment.

Vicki Brown [a, b], Marj Moodie [a, b], Rob Carter [a, b]

- Concludes that a lack of convincing “real world” evidence on this but that having this would be hugely beneficial

Overall there is good evidence as would expect of road user charges impacting some travel behaviours

But a wide range of travel impacts including changes to route, changes in time, just not travelling are also possible

This combined with low number of schemes makes generalisation difficult

2) Air pollution

- Much recent interest in air pollution impacts of Ultra Low Emission Zone in London
- TfL monitoring concluded from their roadside nitrogen dioxide (NO2) pollution has reduced by 36 per cent in the zone
- None of the boundary roads have increased NO2 pollution since scheme introduction
- In part this due to fewer (by about 13,500/day) older more polluting vehicles

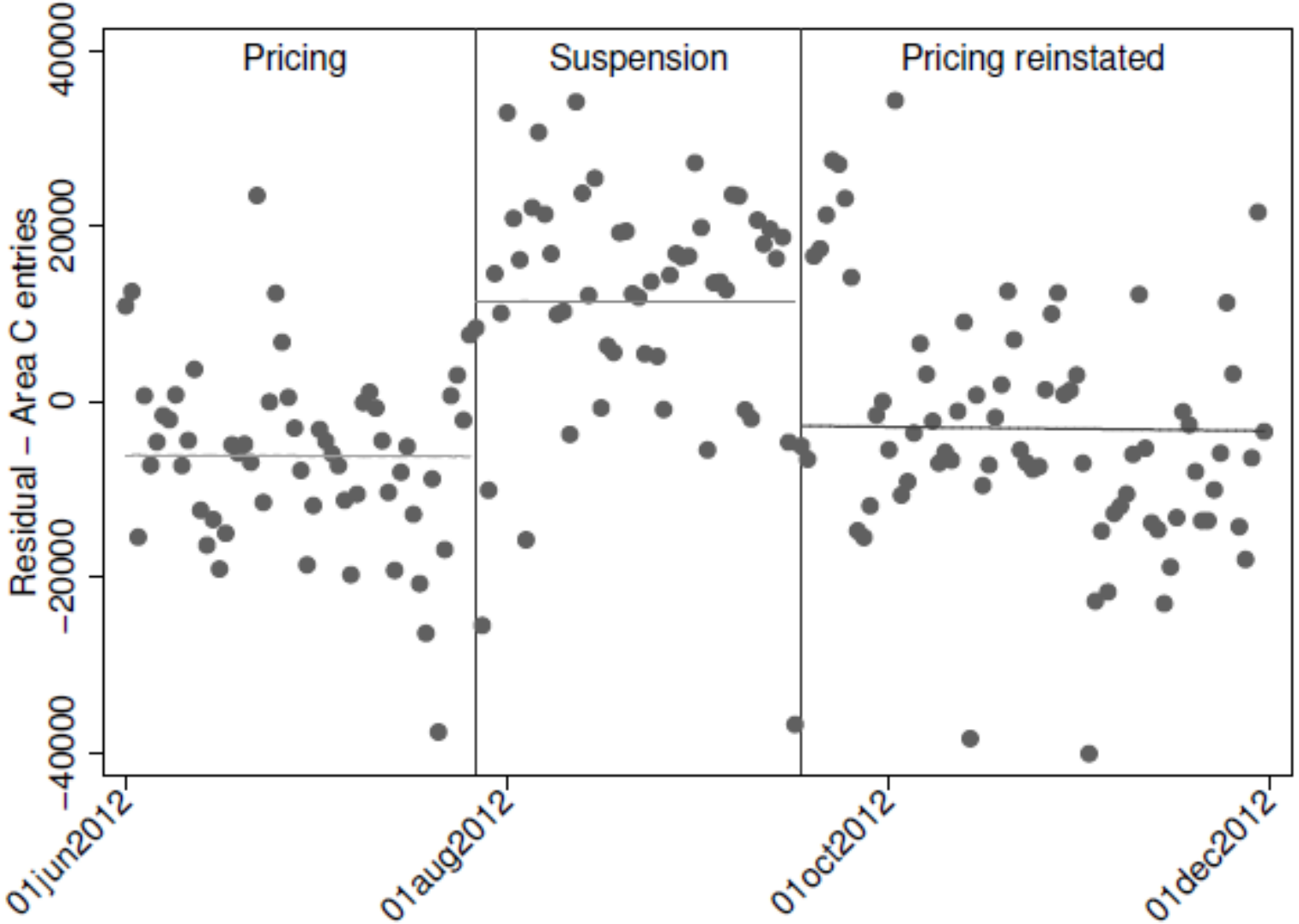
- And this interest replicated initially with 2003 Congestion Charge
- Found to be an increase in buses and taxis, but decrease in cars
- Was an *increase* in speed inside charging zone, which led to reductions in Nox

The percentage change in NO_X and PM_{10} emissions on major roads in the congestion charging zone and on the IRR

	NO_X emissions $\pm 12\%$ (2σ) (see AQEG NO_2, 2004)		PM_{10} emissions	
	IRR	Charging zone	IRR	Charging zone
CCS speed changes	−4.1	−7.9	−4.8	−8.5
CCS vehicle km changes	5.6	−4.1	−3.4	−3.4
CCS overall change	1.5	−12.0	−1.4	−11.9
Additional benefit of improved vehicle technology	−5.7	−3.9	−5.4	−4.0
Total change in emissions	−4.2	−15.9	−6.8	−15.9

Beevers and Carlaw (2005) The impact of congestion charging onvehicle emissions in London Atmospheric Environment 39 (2005) 1–5

Figure 3: Effect of Area C charge suspension on vehicle entries



Matthew Gibson, Maria Carnovale. The effects of road pricing on driver behavior and air pollution. Journal of Urban Economics, Elsevier, 2015, 89, pp.62-73.

3) Road Traffic Incidents

Often overlooked as health burden but in UK, 1,752 deaths on roads in 2019 and additional 25,945 serious injuries

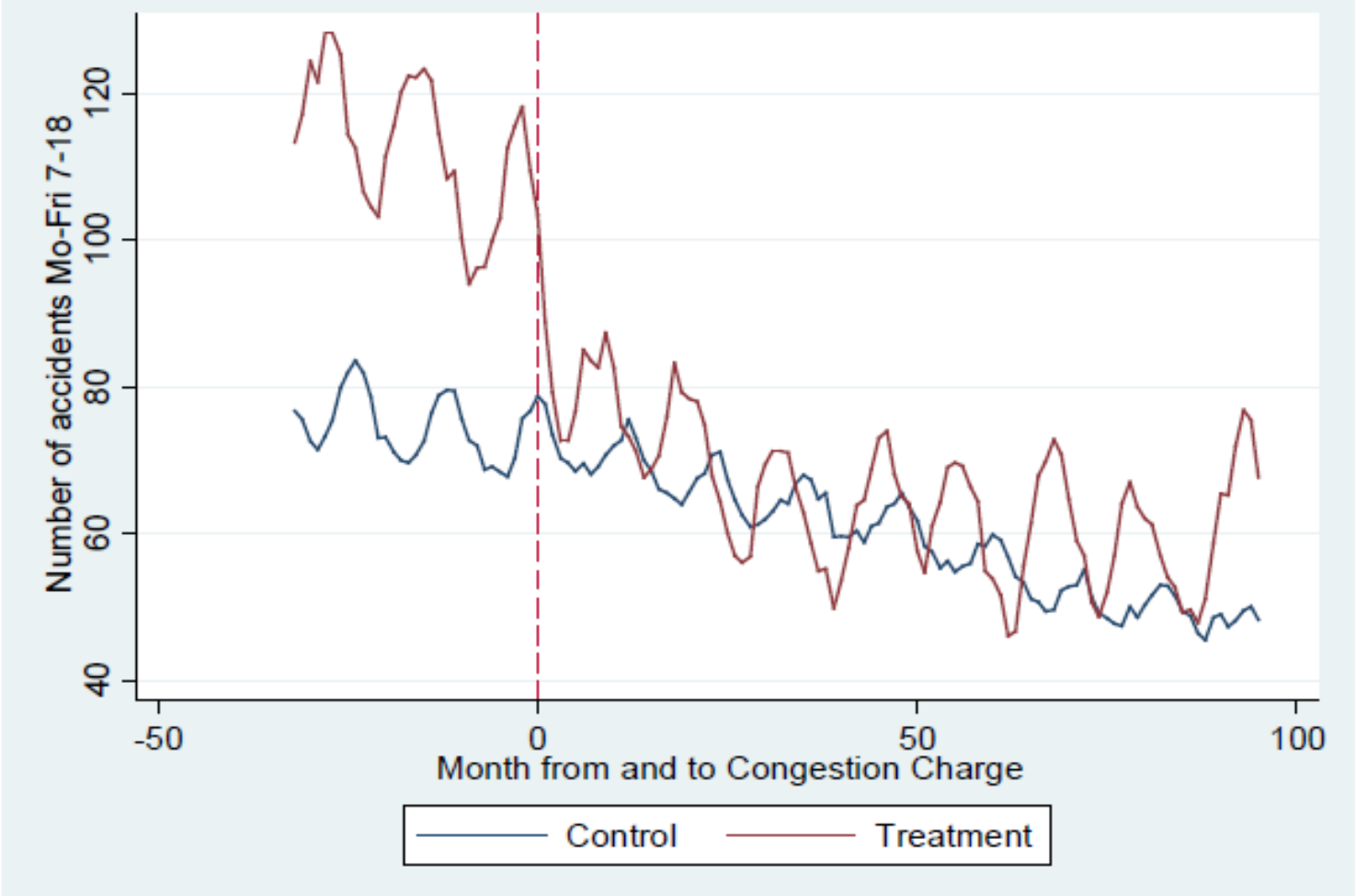
Green et al (2015) used data 2000 – 2010 to examine monthly accidents:

Inside charging zone

Inside charging times

At boundaries of charging zone

Accidents involving charged vehicles in charged times, CCZ vs the 20 largest cities in Great Britain



- Found decline accidents by ~30 per month in charging zone compared with average of 20 other cities in UK
- Also found decrease at the boundaries (2km and 4km) of 18 – 20 per month

A lot of the evaluations presented here try to separate out individual impacts of road user charges

Air pollution changes particularly difficult to disentangle

Important to remember that in common with other transport interventions, also need other supporting aspects including active travel infrastructure, good public transport links and pricing structures

Un(der) explored research questions

- Inequality impacts remain under-considered
- The finances are complicated at all levels. Changes to fuel duty, electric vehicles and other factors also at play
- Will it work everywhere? Perhaps not. But where might it work, and what is required?
- What are mechanisms for any impacts – travel behaviour, changes in cars used etc?

And acceptability

- Acceptability is key, and has derailed national and local schemes in the past

- Some commentators argue that a more transparent system would alleviate this. E.g. RAC Foundation in 2011 argued that is acceptable **if:**
  - Is equitable
  - Is revenue neutral (or money goes into transport)
  - People affected have education but most of all **experience** that it works

In conclusion

- Road User Charging is something we are likely to see an increase of in the UK in the near future
- This is underpinned partly by concerns over the financing of roads and transport, but also increased public pressure around air pollution
- The health impacts will likely depend on the details of policy design
- Evidence suggests potential for positive impacts, but public acceptability remains key

Thank you

Any questions?

Get in touch

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Also thanks to Christopher Millett, Eszter Vamos (Imperial SPRH), Aruna Sivakumar, Francesco Manca (Imperial Dept. Engineering) and James Woodcock, Jenna Panter (CEDAR)

Can read about overall project

- https://sphr.nihr.ac.uk/research/places-communities/transport-case-study-1-road-user-charging-will-local-policy-innovation-improve-population-health-and-reduce-inequalities/

- And our commentary “Road user charging: a policy whose time has finally arrived”. **Laverty AA**, Vamos E, Panter J, Millett C Lancet Planetary Health. 2020. Nov;4(11):e499-e500 https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30244-8/fulltext