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Agenda
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Hard shoulder: using behavioural nudges to reduce congestion

Road congestion is expensive and inconvenient, but measures to alleviate it can be politically unpopular. Behavioural economics can help by proposing congestion mitigation policies that nudge individuals towards socially optimal travel decisions. How does the framing of information and incentives affect travel decisions, and when are interventions most likely to influence long-term behaviour? We look at how policymakers can use nudges to reduce urban congestion

By 2050, if the current trend towards 'urbanisation' continues, the share of Europe's population living in urban areas is expected to increase from 73% to 82%.[1] Towns and cities exist and grow because of the social interactions and economic benefits that are generated when people live and work in proximity to one another. The density of urban centres improves the productivity of those living there, but it can also generate road congestion—a reduction in driving speeds caused by excess demand for road capacity. Indeed, the annual cost of congestion to European economies is expected to increase by more than 40% by 2030.[2]

Policy measures that alleviate road congestion save people time and improve air quality, and can facilitate the increased proximity and productivity that enhance economic wellbeing. They can achieve this by changing when and where people travel or how much road space they use. However, the policies that are proven to be most effective at reducing congestion—those that put a price on driving or parking in congested areas—are often expensive and politically unpopular. Indeed, residents of both Edinburgh and Manchester in the UK overwhelmingly rejected council plans for zonal congestion charges following referendums.[3]

An alternative is to implement congestion mitigation policies that nudge individuals towards socially optimal travel decisions without restricting their options or changing financial incentives. Such nudges may be cheaper and less controversial than traditional anti-congestion policies and could, in certain circumstances, be just as effective.

What are nudges?

In traditional economics, individuals are considered to be 'rational agents' who maximise their utility and minimise their costs. In the case of transport, such costs include time and discomfort, as well as money. In this framework, the solution to congestion—the result of excess demand for scarce road capacity—would be to adjust the cost of using the road network in a given area at a particular time. This would encourage people to change their travel choices by travelling at different times, using public transport instead of cars, or not travelling at all.

However, a growing body of evidence from behavioural economics suggests that this simplified model of decision-making obscures important limitations. In reality, individuals have limited cognitive resources, which leads them to take shortcuts that often result in systematic and predictable deviations from rationality. Indeed, studies show that people regularly make seemingly irrational travel decisions and are strongly influenced by how and when options are presented to them.[4]

An understanding of these deviations can help policymakers to identify a policy toolkit for reducing congestion that does not entail building infrastructure or introducing a charging regime. This article sets out how this toolkit can be applied to ease congestion in European cities, by looking at the framing of information and incentives, and the timing of interventions.

Framing

Providing individuals with information to help them make transport choices is an important public service. By

making data on parking, maintenance and road accidents available to the public in real time, local authorities and private organisations enable individuals to make informed travel decisions. However, insights from behavioural economics suggest that the way in which this information is presented to individuals can be just as important as what it contains.

Loss-aversion

One important finding from behavioural economics is 'loss-aversion'—the idea that consumers value potential losses more than potential gains of similar magnitude.[5] This suggests that how travel choices are presented makes a difference, even if the alternatives themselves are unchanged. For example, an individual may be more likely to change their behaviour if they are informed that using their car for a journey will cost them ten minutes compared with taking the bus, than if they are told that taking the bus will save them ten minutes.

A related finding, 'hedonistic framing', also concerns how choices are presented. This is the idea that individuals are more responsive if costs (or benefits) are articulated individually, rather than lumped together. In the context of congestion, a commuter may be more likely to change their behaviour if they are told that using a car for a journey would be five minutes slower on the way to work and ten minutes slower on the way home, than if they were told it would be 15 minutes slower per day.

Simplicity

The language used to explain the costs and benefits of travel choices also matters. If an incentive structure or explanation is too complex, individuals may not absorb all the relevant information. For example, Thaler and Sunstein (2008) suggest that displaying fuel efficiency in terms of litres of fuel saved per 100 miles of driving (rather than as an increase in the number of miles per litre of fuel) helps individuals to conceptualise the efficiency of different vehicles and the cost of alternative travel choices.[6]

Default bias

Behavioural economics finds that an individual is more likely to choose an option if it is presented to them as a default. Numerous studies show that individuals making choices about organ donation or pension contributions systematically change their behaviour if the default option is adjusted.[7] Defaults matter for a number of reasons. In some cases, people believe that the default position conveys information about the 'normal' or generally accepted practice. In other cases, the default option may be the easiest to adopt, making it more likely to be accepted than the alternatives.

A similar approach in congestion policy might involve requiring journey-planning tools to propose public transport as the default option, and requiring users to actively opt out if they would prefer to travel by car.

Norms

Behavioural economics has found that nudges work best when they harness or reinforce existing social norms—i.e. the values, behaviours or expectations that implicitly guide the behaviour of a community.[8]

For example, informing an individual that their peers are making socially conscious choices can reinforce his/her underlying motivations. Evidence suggests that comparing a consumer with their neighbours in this way is effective in encouraging them to make socially optimal decisions such as filing their tax returns on time[9] or reducing energy consumption.[10] For example, the 'Most of us wear seatbelts' campaign in Montana, USA publicised the fact that 85% of car users wore seatbelts, thereby enforcing an existing social norm and driving a significant increase in seatbelt use.[11]

In the context of congestion reduction, transport authorities could inform individuals of the proportion of their neighbours who use car pools or cycle to work. Similarly, social norms against pollution could be leveraged to reduce car use by comparing the amount of carbon that an individual emits with a local benchmark or 'carbon budget'.[12]

Even when norms are weak, nudges can be applied to embed socially positive attitudes or behaviours. For example, individuals who commute at off-peak times or use public transport could be given a platform to communicate their socially conscious travel choices to their peers, generating a 'badge effect'.

Taking this a step further, Stanford University offers commuters who arrive at its notoriously congested campus in off-peak times a chance to win cash prizes in a daily lottery.[13] (This intervention takes advantage of yet another cognitive shortcut, optimism bias, which states that people overestimate the probability of positive events such as winning a random prize.[14])

Framing information in these ways could encourage individuals to make socially beneficial travel choices and help reduce congestion in a way that is both cheaper and less interventionist than direct anti-congestion policies.

Timing

In addition to how information about travel choices is presented, behavioural economics suggests that it is important *when* the information is presented. One of the main reasons for this is a cognitive shortcut known as status quo bias—a preference for the current state of

affairs over alternatives. This means that, for a commuter to change their departure time or use public transport, the benefits of the change would have to outweigh the costs by a margin that accounts for the psychological costs of changing.

When individuals first encounter a new journey, they must consciously evaluate alternative modes, departure times, parking options, etc. However, once a conscious choice has been made, subsequent travel decisions for subsequent journeys are likely to be made by reflex or habit. A key corollary of this finding is that transport policy interventions should focus on influencing behaviour at the point at which habits are formed, not once they are already entrenched.

Status quo bias

For example, new home-owners or tenants could be provided with information on their local cycling infrastructure or bus routes, or given discounted car club vouchers when they move in. Similar information could be provided by companies to individuals starting new jobs. Such well-timed interventions could shape an individual's travel choices at the time when long-term decisions or purchases are made.

A similar approach is relevant on a day-to-day basis. While familiar journeys may be subject to status quo bias, unfamiliar journeys present an opportunity to shape habits. For example, journey-planning tools could provide a business-person travelling to an unfamiliar location with a detailed public transport travel plan, including help finding terminals and transferring between modes. Citymapper, one such journey-planning tool, already provides many of these services. For example, it can advise individuals on which S-Bahn compartment is best for their transfer in Berlin, and send them push-notifications when they are approaching their stop.[15]

Similarly, a journey planner could proactively prompt a regular commuter before they leave for work if there is an accident or elevated congestion on their route, and suggest a different route or a public transport alternative. Indeed, the UK government has recently announced £4m of funding for technological innovations that give motorists advanced notice of congestion or parking availability.[16] As congestion occurs in time as well as space, journey-planning tools could also suggest alternative departure times to commuters—for example, by advising that leaving 'x' minutes earlier will reduce their commuting time by 'y' minutes.

Experimentation

Even if travel habits are entrenched, individuals can be encouraged to re-evaluate their choices. One of the simplifying assumptions that planners and economists make is that travellers have sufficient information to make optimal route choices. However, there is evidence that people, especially those making irregular journeys, often have incomplete information about their options, either because the information is costly to obtain or because they persist with an existing route out of habit.

A good example in the context of travel choices comes from Larcom, Rauch and Willems (2017), who demonstrated that, when London underground commuters were forced to experiment with alternative routes, many changed their behaviour.[17] The paper compared the route choices made by London commuters before and after the Tube strikes of 5–6 February 2014. The authors found that more than 5% of commuters changed their route permanently once normal service resumed. They suggest that incomplete information, including a stylised underground map and substantial variation in the speed of different underground lines, led consumers to make suboptimal choices, despite many having access to journey-planning tools.[18]

This implies two things: that individuals may not engage with all of their transport alternatives; and that some individuals can be encouraged to make better choices if they are pushed to experiment. This insight is particularly relevant if those choices improve both social and private welfare, such as switching from driving to using public transport, or from a more congested route to a less congested one.

There are many potential applications of this insight. Policymakers might consider making a desirable route choice cheaper or more convenient for a short period of time—for example, by making bike-sharing schemes (such as Vélib' in Paris or OV-fiets in the Netherlands) free for a day. Some people may find that the new route is more efficient than their old one and switch permanently, even after the subsidy lapses.

Understanding status quo bias, and timing interventions so that they have the greatest impact, can therefore be a cheap and effective means of changing travel choices and reducing congestion.

Nudging ahead

Behavioural economics provides a number of insights that can assist policymakers in efficiently reducing congestion. Evidence suggests that interventions based on nudging users can provide credible and cheaper alternatives to traditional price- or supply-side interventions. In particular, carefully framing how information and incentives are presented to individuals, as well as considering when such interventions should occur, can have a significant impact on the travel choices they make. There is scope for policymakers, transport planners and private organisations to give greater thought to how and when such nudges can be used effectively in the transport sector.

Some of the analysis in this article formed part of Oxera's evidence to the UK Parliament Transport Select Committee urban congestion inquiry. See Oxera (2017), 'Andrew Meaney gives evidence to parliamentary inquiry into urban congestion,' http://www.oxera.com/Latest-Thinking/News/January-2017/Andrew-Meaney-gives-evidence-at-parliamentary-inqu.aspx.

[1] United Nations (2014), 'World urbanisation prospects: 2014 revision', https://esa.un.org/unpd/wup/publications/files/wup2014-highlights.Pdf, accessed 7 April 2017; the definition of urban areas is based on national statistics.

[2] Centre for Economics and Business Research (2014), 'The future economic and environmental costs of gridlock in 2030', Report for INRIX, August, https://www.cebr.com/wp-content/uploads/2015/08/INRIX_costs-of-congestion_Cebr-report_v5_FINAL.pdf, accessed 7 April 2017.

[3] BBC (2005), 'Edinburgh rejects congestion plan', 22 February, http://news.bbc.co.uk/1/hi/scotland/4287145.stm, accessed 18 January 2017. BBC (2008), 'Voters reject congestion charge', 12 December, http://news.bbc.co.uk/1/hi/england/manchester/7778110.stm, accessed 18 January 2017.

[4] For example, see Avineri, E. and Prashker, J.N. (2006), 'The Impact of Travel Time Information on Travellers' Learning under Uncertainty', *Transportation*, **33**:4, pp. 393–408.

[5] Kahneman, D. and Tversky, A. (1979), 'Prospect Theory: An Analysis of Decision under Risk', *Econometrica*, **47**:2, pp. 263–91.

[6] Thaler, R. and Sunstein, C. (2008), *Nudge: Improving Decisions about Health, Wealth and Happiness*, Yale University Press, New Haven.

[7] Thaler, R. and Sunstein, C. (2008), *Nudge: Improving Decisions about Health, Wealth and Happiness*, Yale University Press, New Haven.

[8] Elster, J. (1989), 'Social norms and economic theory', *Journal of Economic Perspectives*, **3**:4, pp. 99–117.

[9] The Behavioural Insights Team (2015), 'FAST: Four simple ways to apply behavioural insights', http://38r8om2xjhhl25mw24492dir.wpengine.netdna-cdn.com/wp-content/uploads/2015/07/BIT-Publication-EAST_FA_WEB.pdf, accessed 30 December 2016.

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[11] Linkenbach, J. and Perkins, H. (2003), 'Most of Us Wear Seatbelts: The Process and Outcomes of a 3-Year Statewide Adult Seatbelt Campaign in Montana', The National Conference on the Social Norms Model, Boston, cited in Dolan, P., Hallsworth, M., Halpern, D., King, D. and Vlaev, I. (2010), 'MINDSPACE: Influencing behaviour through public policy', Cabinet Office.

[12] Waygood, E. and Avineri, E. (2011), 'Does "500g of CO2 for a five mile trip" mean anything to the general public? Towards more effective presentation of CO2 information', Transportation Research Board (TRB) 90th Annual Meeting, Washington D.C., USA.

[13] While cash prizes are a form of financial incentive, their primary effect is to draw attention to the socially desirable option and reinforce positive norms.

[14] Zhu, C., Yue, J.S., Mandayam, C.V., Meregu, D., Abadi, H.K. and Prabhakar, B. (2015), 'Reducing road congestion through incentives: a case study', Transportation Research Board 94th Annual Meeting, Washington, D.C., USA.

[15] https://citymapper.com/

[16] UK Government (2017), '£4 million awarded for tech which gives motorists advance notice of congestion and available parking spaces', https://www.gov.uk/government/news/4-million-awarded-for-tech-which-gives-motorists-advance-notice-of-congestion-and-free-parking-spaces, accessed 7 March 2017.

[17] Larcom, S., Rauch, F. and Willems, T. (2017), 'The benefits of forced experimentation: Striking evidence from the London Underground Network', University