

# Congestion pricing: why and how

Congestion pricing is looking increasingly likely as a tool to both reduce over-crowding of roads and provide a revenue source for governments. In NSW, the 2003 Parry Inquiry recommendations, accepted by the government, were to consider implementing electronic road pricing for congestion within 5 to 10 years. The Henry tax review, currently being considered by the Australian Government, is also expected to support congestion pricing. Congestion pricing has been implemented in various ways in other countries, such as the UK and Singapore.

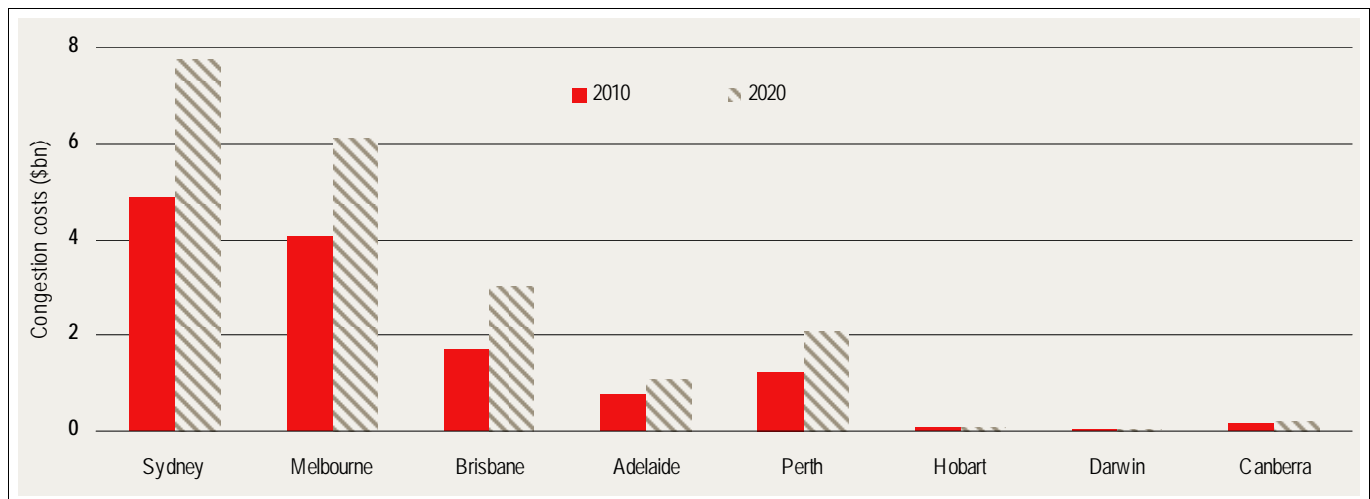
In theory congestion prices would change depending on the impact of each person's journey on other road users. This has many positives, replacing taxes that distort incentives with one that improves them.

In practice, congestion pricing will be more limited, in order to manage the costs of implementation. The nature of its application and the range of other policies used to support it will determine the extent to which congestion pricing achieves its theoretically available benefits.

Congestion pricing has broader implications for public transport, new infrastructure and other government taxes. These would have to be considered as part of its introduction.

This note addresses the why and how of congestion pricing and the implications that introducing congestion pricing would have for public transport and for other government taxes.

## 1 Congestion costs across Australia's major cities



Data source: Bureau of Transport and Regional Economics 2007, Working Paper 71.

### *Congestion costs are large and rising*

Anyone living in a major city understands that congestion is a significant cost. Often, the same journey can take more than three times as long if undertaken during times of high use of the roads versus times of lower use. For a half hour journey on the weekend, this could mean a one and a half hour journey come Monday morning.

The Bureau of Transport and Regional Economics has valued the costs that this delay has. The main part of this is time costs, but it also includes greater fuel use and greater pollution. In total, the avoidable costs of congestion for Australia's capital cities in 2010 are predicted to be greater than \$12 billion, rising to more than \$20 billion by

2020. Sydney has the highest congestion costs of the major cities.

These costs are part of the impetus to develop solutions, such as congestion pricing that would provide better signals to people about the costs of their travel.

### *Congestion pricing – the theory*

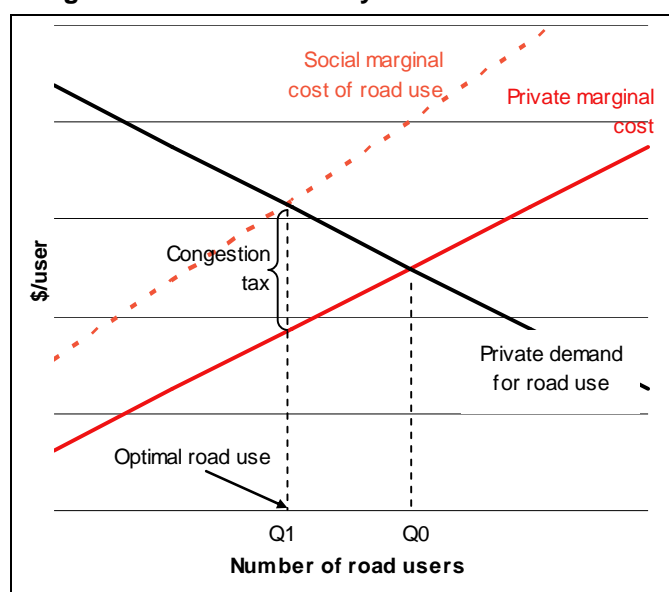
The idea behind congestion pricing comes from the standard economic theory of efficiency and externalities. People make socially efficient decisions if they consider all the social costs and benefits in making the decision. For example, in the absence of any government policy, a high rise development might be put in front of your house blocking its view. The developer would not

consider the negative impacts that this would have in terms of the value you placed on the property. The costs and benefits not considered by people in making their decisions are known as externalities.

The use of a road can impose costs on other users, as each additional motorist slows the speed of other users. This effect typically rises with more users, so 1000 additional users might slow journey times by 10 minutes but the next thousand additional users would slow traffic by an additional 20 minutes. This can be pictured as in the chart below. Private costs of road use are below social costs of road use and the gap between these rises with more users.

In the absence of a congestion tax, road use is  $Q_0$ , at which the private benefits are lower than the social costs, hence an inefficient outcome. An optimal congestion tax would move road use to  $Q_1$ .

### Congestion as an externality



Source: The CIE.

In the theory of congestion pricing, it is worth recognising that the chart above applies to a particular road at a particular moment in time. Congestion costs will be different for each road and even for a single road could be constantly changing depending on the demand for use of the road at a particular time.

For each road and each time period, the optimal congestion tax is the marginal external cost (marginal social cost less marginal private cost) at the point where the marginal social cost is equal to the marginal social benefits, known as a Pigou tax (shown in the chart). This is a difficult figure to

measure, even for externalities that are relatively constant through time, and even more difficult for congestion. This suggests that careful analysis of congestion pricing schemes is required to ensure that they improve on the current arrangements.

### Advantages of congestion pricing

In general, revenue generating efforts by government, such as taxation, distorts people's decisions away from an optimal decision. For example, payroll tax can encourage companies to stay small or tariffs can encourage people to buy high cost local products over low cost overseas alternatives.

In some cases, this is not true, where the social optimum differs from the private optimum. The social costs of smoking borne by the public health system are one justification of the high taxes on cigarettes. The environmental impacts of greenhouse gas emissions are the basis of a carbon tax.

These taxes are efficient in that government revenue does not come at the cost of distorting people's decisions away from the best outcome. Congestion pricing is one of these taxes and could be a highly effective means of generating revenue while improving economic and social outcomes.

Introducing congestion pricing could also remove a large number of second best solutions to congestion problems, discussed below.

Note that congestion pricing if done properly will not remove congestion, but will ensure congestion costs are factored into people's decisions.

### Australian approaches to addressing congestion

Governments around Australia have attempted to address congestion issues. This has typically been through a range of different measures, which can partially address congestion issues but are also aimed at other objectives such as funding infrastructure and improving environmental outcomes. Measures that impact on road use and hence indirectly on congestion include:

- fuel excise — motorists pay taxes on their fuel that reduces the incentive to drive and indirectly reduces congestion;
- road tolls — some roads are tolled, typically to recover the costs of infrastructure rather than as a congestion price. The Sydney Harbour Bridge

has limited time of day pricing, justified on the basis of congestion. However, many roads are not tolled leading to greater distortions than having no tolls at all;

- public transport subsidies and priority – subsidies to public transport are often directly linked to their impacts on reducing congestion, such as in NSW, and operate to favour public transport use over car use;
- priority for cars with passengers – priority lanes for cars with more than one person provide an incentive for car pooling through shorter journey times and hence reduce the demand for road use; and
- car parking levies – government levies on car parking spaces in centres reduce demand for travel on often congested roads.

These instruments can be thought of as second best solutions to addressing congestion. While they reduce demand for road travel, they are typically not matched to when and where congestion costs are occurring. For example, travelling on a toll road at night might have no congestion costs but a user would still pay the toll and fuel excise. This has meant that these instruments have had limited ability to direct people towards less congested roads and less congested times of day.

The overlapping nature of these initiatives has also meant that it is difficult to discern the extent to which the policies are achieving a joint objective of moving road use towards an efficient level.

### *Congestion pricing – in practice*

In practice, congestion pricing will not match theory. This is because it is not administratively feasible to identify the appropriate externality tax at every point in time for every road, although technological improvements have made it possible to get close. A good congestion pricing scheme is about getting as close to the optimal price, with as little administrative cost as possible.

There are many options for congestion pricing. They include fairly limited time of day pricing of major roads to flexible pricing of all roads based on the number of motorists using the road at the time. The major decisions in setting out the congestion pricing scheme include:

- What roads should be subject to congestion prices?

- How much should prices vary across time of day, day of week or other variables?
- How frequently should prices be updated to reflect updated information on externality?
- At what level should prices be set?
- How best to provide information and signals to road and public transport users to inform their choices?

Working through the benefits and costs of each of these options has not been done for Australia's major cities.

There has been some analysis of congestion prices at a fairly aggregated scale based on assessment of the marginal congestion costs, such as by the BTRE. These estimates are typically based on transport modelling. An alternative approach that relies less on transport models is to use natural variation in traffic demand (from days of the week and school holidays for example) and technology such as e-tags to link journey times and road use.

The different approaches will likely need to be piloted in order to fully test their implications, implementation costs and assumptions that underpin the level of congestion prices, such as the value that people place on their time.

Overseas experience provides a guide as to the types of systems that can be implemented. Singapore operates a congestion pricing scheme close to the theoretical scheme. Prices vary by time of day and location and are changed every three months in response to traffic patterns. In London, a much simpler approach was taken aimed at tackling congestion in the CBD. This imposed a fixed toll to enter the CBD zone between 7am and 6pm weekdays.

### *Broader implications of congestion pricing*

Congestion pricing cannot sensibly be introduced without many other changes to government policies. There are three big areas that would be impacted on by congestion pricing – public transport, transport infrastructure and other government taxes.

#### *Public transport*

Public transport is currently subsidised across Australia, in part because more people using it eases congestion. This is a second best solution as public transport subsidies are generally set at an

aggregated level and do not account for the actual patterns of congestion costs. They therefore have limited value as a price signal of the costs of road and public transport use.

If a congestion tax were in place, subsidies to public transport should be reduced. The congestion tax itself would be 'solving the problem' and second best solutions such as public transport subsidies would not be required. Targeted public transport subsidies may still be maintained for particular groups for reasons of equity.

If there were no subsidies to general public transport, there may also be improvements in governance of public transport systems that could be attained. Regulation of full cost recovery government business enterprises has been much more effective than regulation of enterprises that source much of their funding from government.

Note that while public transport prices would go up, this would not necessarily mean that there would be fewer people using them, as costs for using the road network would also have increased. Transport as a whole would be more expensive than would otherwise be the case.

Higher public transport fares could also encourage investment in public transport systems, improve quality of services and potentially allow a greater role for private involvement in areas that could be competitive such as buses.

#### *Transport infrastructure*

New transport infrastructure is sometimes tolled in order to fund the infrastructure. This approach has had variable success, with tolls in some cases discouraging use and reducing the positive impacts that the infrastructure could have on reducing congestion on other road systems. A new road has benefits to those that use it and those that use alternative roads – a toll only captures the part associated from the first group.

With a congestion pricing scheme in place it might be possible to also fund new infrastructure from the non-users that benefit from the infrastructure. For example, the reduction in the level of congestion could be measured on substitute roads and this component of congestion prices could be directed towards the new infrastructure. This sort of structure better aligns the benefits of the

infrastructure with the payments the private sector could obtain for building it.

Alternatively, congestion pricing schemes would allow much better collection of information about people's willingness to pay for transport infrastructure improvements, which could help inform government decisions.

#### *Government taxes*

Congestion pricing would likely provide a windfall to government from direct revenue and reduced need to subsidise public transport. This could be directed towards improving services or reducing other inefficient government taxes, such as property taxes.<sup>1</sup>

For congestion pricing to gain political support, implementation may have to specify how much other taxes will be reduced by or hypothecate revenue from congestion pricing to a particular area, such as transport infrastructure. This would require estimating revenue impacts of congestion pricing and changes in alternative taxation arrangements.

#### *How to make congestion pricing more effective*

To be most effective, congestion pricing has to change behaviour. Otherwise it is a useful revenue source and little else.

In considering whether it will change behaviour, the many other constraints on transport choices need to be considered, particularly in the short term.

- Lack of substitutes – in some areas there is limited ability to shift to public transport because there is none available or because it is over-crowded and has congestion problems of its own. In the longer term, congestion pricing might encourage new public transport options, although public transport is currently governed centrally and has limited responsiveness to demand.
- Fixed work times or other commitments – many people do not have flexible work hours that could allow them to adjust their work hours or other commitments to minimise congestion prices.

---

<sup>1</sup> CIE 2008, *State business tax reform: seeding the debate*, prepared for the Business Coalition for Tax Reform, November.

- Small cost relative to costs of car use. People choosing to drive to the city face very high charges already, including some tollways, government car parking levies (\$2000 for the CBD) and car parking costs (about \$6000 per year excluding government charges<sup>2</sup>).

The behavioural aspects of choice will also likely be important, with people responding to price signals more if there is better information about the costs and quality of substitutes. This may require innovative approaches to encourage people into public transport and electronic signs detailing current prices and estimated travel times for alternative routes.

Given these constraints and people's behaviour, the short term impacts of congestion pricing may not be large. But in the longer term, congestion pricing offers a good alternative to the ad hoc arrangements that currently exist and could have big benefits if undertaken in conjunction with other policies to increase the flexibility of transport systems.

### *Next steps*

Congestion pricing is, in theory, a good alternative to current arrangements that have reducing congestion as one of their multiple objectives. In practice, the benefits of congestion pricing will depend on how it is implemented and the range of other policies that will go with it.

There are a number of steps required to implement a congestion pricing scheme and ensure that it is the best possible scheme.

- Compare the costs and benefits of alternative congestion pricing schemes:
  - … what are the administrative costs of each option?
  - … how closely does each option address congestion?
  - … how much does each option address substitution to non-priced roads?
  - … how does each option incorporate scope for learning?
  - … who bears the costs and receives the benefits under each option?
  - … what complementary investments and policies will make a congestion pricing scheme most effective in changing behaviour?

- Consider the adjustments necessary to the portfolio of transport policies, such as public transport, registration charges and parking levies in response to a congestion pricing scheme.
- Decide on a framework for linking congestion pricing to funding of new infrastructure that brings in efficient economic signals of the value of new infrastructure.
- Undertake transport and economic modelling to set initial congestion prices.
- Evaluate the broader social implications of changes in road pricing and other transport arrangements.
- Estimate the budgetary impacts of congestion pricing and complementary transport changes.

### *Contact*

Phil Manners, Senior Economist: (02) 9250-0800 or [pmanners@TheCIE.com.au](mailto:pmanners@TheCIE.com.au)

Phil Manners returned to the CIE in October 2008 after completing his MPhil in Economics at the University of Oxford, having been awarded the George Webb Medley prize *proxime accessit*. He worked at the CIE from 2004 to 2006 after previously working at the Reserve Bank of Australia and the Australian Department of Industry, Tourism and Resources. Phil also holds a degree in economics (honours and University Medal) and a science degree (mathematics) from Australian National University.

---

<sup>2</sup> CB Richard Ellis 2009, 'Sydney CBD car parking', Viewpoint, February.