

# Urban Congestion and the Boom

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## Introduction

Demand-based economic policies, such as congestion tolls and market-based curb-side parking charges, should be used as tools for addressing congestion in Australia's large cities. These policies are important because Australia is a highly urbanised society possessing a handful of high population, low-density state capital cities, where most citizens live and where traffic congestion is a growing problem. Poor urban policies will detract from the quality of lives of most Australian citizens. Moreover, the transport sector in the cities is a significant part of the total Australian economy so congestion will impact adversely on our national productivity.

The resource-driven economic boom that Australia looks like enjoying for the foreseeable future should double Australian incomes in the next 20 years. Over this period, increasingly affluent city populations will grow by 4 million to 20 million and vehicle traffic flows will grow by 40 per cent, with urban freight increasing by more than 70 per cent. The benefits of the present boom will be more keenly enjoyed in the cities if citizens can travel using efficiently-utilised urban infrastructure. A failure to adopt sensible policies towards urban congestion will inevitably mean increasing congestion costs even as other aspects of our prosperity increase and our cities grow.

Moreover, congestion costs will become increasingly hard to reverse using conventional road supply measures as land supply constraints increasingly come to bite. Without effective pricing, congestion costs will treble over the next 20 years and travel in major cities will become subject to generalised not just local congestion. Gains in living standards will be less than they could be with efficient and convenient travel in the cities.

The benefits of the current boom should spill into the provision of efficiently-designed roads and urban infrastructure. But, for the most part, these supply-driven infrastructure investments are not considered here. The reason is that supply issues have been overemphasised in the past relative to demand-oriented pricing policies as a means of addressing congestion. Demand-based pricing measures are considered that will increase the efficiency with which we can use *whatever* stock of physical infrastructure we have.

To be specific, this paper discusses ways of ensuring that journeys taken within large cities are efficient. The 'urban sprawl' debate is also addressed since, if there is no serious attempt to price congestion, sprawl will continue to grow exacerbating current

congestion problems in our city peripheries. A popular approach to such sprawl problems is to set binding city boundaries which increase land values and encourage more intensive development. Such policies are shown to be less effective than congestion pricing in addressing urban congestion issues. We must bite the bullet and price journeys in cities so they reflect the full social costs of taking them.

### **Traffic Congestion**

Traffic congestion is a miserable wasteful use of valuable time that also reduces national productivity. While it is often considered to be an inevitable curse of modern life congestion is a well-understood resource misallocation concern that can be effectively addressed at low cost. Increased urban populations, affluence-driven increased vehicle ownership and increased intensity of use of existing vehicle stocks, mean that traffic congestion is an increasing problem. While free flow traffic speeds are increasing as urban transport surfaces and signalling technologies improve, this is counterbalanced by much slower travel under widely-prevalent congested conditions. The deadweight losses that accurately measure the costs of congestion, I estimated with Andrew Hawkins were around \$700 million in Melbourne in 2005.

In the past congestion issues have been addressed by supply-side measures such as building more roads and upgrading the public transport system. Civil engineers have forecasted transport demands when journeys by car are heavily underpriced or subject to no direct charges at all. The forecasts will not be inaccurate on this account but they will lead to plans that accommodate too many low-valued vehicle journeys and levels of public transport provision that are distorted both by the underpriced road travel and the low density urban sprawl that is a consequence of underpriced congestion.

The difficulty here is not private vehicle travel but underpriced travel. Indeed congestion *per se* is not the problem. We all voluntarily accept congestion as an acceptable cost of modern living that is counterbalanced by improved urban lifestyles and agglomeration economies. The problem is specifically *inefficient* congestion – congestion that we must put up with even though a change in policy could make us all better off. Inefficient congestion arises because congestion is underpriced.

That underpriced congestion generates economic inefficiencies has been recognised for 50 years by economists, following William Vickrey's suggestions for pricing urban auto travel in downtown Washington. But the impact of these theories on public policy has been disappointingly low. For the most part it has taken the form of a single policy recommendation for 'first best' efficient pricing at social marginal cost of *all* private travel externalities (congestion, parking, noise, accident, pollution) by levying charges on *all* roads on the assumption that *all* public transport is marginal cost priced. Then urban transport planning is greatly simplified. Urban trips on the basis of these correct pricing signals are efficient – journeys are only undertaken when the private benefit from the journey exceeds all social costs. Indeed, in this case even the dynamic issues of expanding road networks are simplified. Road expansion decisions can even be mechanically determined given forecast net returns by looking at payoffs from existing roads – as in a private business, if roads display constant returns to scale and are turning a profit, they should be expanded.

But, as mentioned, this very comprehensive policy proposal has had little policy impact overall. Apart from Singapore, which has stronger central government than is practicable in Australia, this policy advocacy has seldom been pursued. Indeed, authors such as Richard Arnott, claim that ‘first-best’ congestion economics has generally *failed* to contribute usefully to policy debates. Why? This question has direct policy relevance, as well as academic interest, since it points to the factors that we need to account for if we are to satisfactorily introduce road pricing.

In what follows I discuss issues that the ‘first-best’ efficient pricing prescription fails to address. These modify the way we must think about pricing roads. Accounting for them helps provide a package of demand management policies that can be successfully used to manage congestion.

### **Distribution issues**

The efficiency gains from congestion pricing – the gains in consumption values that we on average enjoy - are real but often rather hidden. The distributional impacts on those who seem to lose from such pricing are however painfully obvious. Without monetary compensations, those prevented from using roads because of pricing (the ‘tolled off’) are worse-off with pricing *as are* those who continue to use at toll-inclusive costs (‘the ‘tolled-on’). Compensations here are feasible using the income generated by pricing but this connection is difficult to sell politically. Congestion tolls are experienced as a direct hit on the hip pocket whereas possible tax relief from compensations may be less keenly felt because it is hidden within a mix of other taxes and charges.

For pricing to be politically feasible governments must demonstrate that tolls are not a tax grab and that *all* groups can be advantaged with efficient pricing. Economists know that with appropriate compensations that this is feasible but this needs to be spelt out to those affected. Tolling charges can be explicitly linked to tax savings elsewhere or to ear-marked infrastructure improvements, such as improved public transport, that benefit transport consumers.

The net benefit of a revenue-neutral switch to congestion pricing roads in the cities stems from the ‘double dividend’ green tax advantages of such charges. Congestion charges yield a revenue dividend by targeting a social ‘bad’, congestion, rather than other taxes which target work effort or savings. Congestion charges can also reduce reliance on socially dubious gambling taxes that depend on revenue streams that generate community harm and which are widely despised in the community. Finally, congestion charges can displace reliance on stamp duty charges on housing which diminish labour market mobility and lower the efficiency of labour markets.

In thinking about introducing congestion taxes it is important to focus on promoting their distributional acceptability. This is a major policy design concern not a detail that can be swept under the carpet.

Other aspects of improving policy acceptability include providing alternative travel opportunities to those ‘tolled off’ roads because they are unwilling to pay tolls. This can mean providing options to travel under congested conditions as an alternative to travelling on low congestion tollways. It can also mean ensuring that public

transportation reforms provide substitute public services although, again, these do need to be provided at efficient prices.

Finally, on distributional issues, Donald Shoup has argued that market-determined curbside parking policies gain greater local political support if revenues are returned directly and specifically to those local communities impacted by the charges. This helps obviate their immediate cost impacts on local users and helps ensure their local political acceptability.

### **Second-best issues**

Comprehensive pricing of *all* the roads in an Australian city is probably infeasible at present. Tolls are more likely to be applied only either to major motorways or to CBD areas using cordon pricing schemes. These partial or piecemeal pricing policies will inevitably direct traffic flows from priced onto unpriced roads where the resulting congestion will reduce the gains from the piecemeal pricing reform. These ‘second-best’ constraints modify desired pricing and road expansion plans.

The economics of ‘second best’ suggest that if there are constraints such as prohibitively high transactions costs of pricing on the efficient pricing of all road resources, so that only piecemeal policy reform is feasible, that attempts to price the resources that can be priced at social marginal cost may not improve economic efficiency. To make this clear consider, for example, the situation where a major road can be priced but where transactions costs of monitoring traffic flows prevents pricing roads carrying lower traffic volumes that run near to it. Then pricing the major road at marginal cost may divert traffic onto these substitute roads – a phenomenon referred to as ‘rat-running’. This may even lead to a worse overall congestion problem than when the major road was unpriced. Similarly a cordon pricing scheme around a city’s CBD may create severe congestion problems on its boundary that undoes the advantages of pricing within the cordon.

**Pricing Major Roads Alone.** Piecemeal pricing of major roads alone will direct traffic towards unpriced roads where resulting congestion reduces the gains from pricing. Therefore charges on priced roads should be ‘adjusted’ lower than they would be with comprehensive pricing to reduce these traffic spill-overs. Traffic diversions can be further reduced by ‘traffic calming’ – by reducing travel speeds along unpriced roads with street architecture, restrictions on turning and so on, so that travel along them is inconvenient for the longer journeys seeking to ‘rat run’ around a tolled road. Tolls should be set low enough so that the relative expense of traffic diverting to travel down unpriced roads is too high to make it worthwhile compared to the cost of paying the toll.

In a city like Melbourne there can be selective pricing of all major radial arterials and ring roads with traffic calming used to minimise ‘rat-running’ onto substitute roads. Details of such a proposal are set out in a recent paper by Andrew Hawkins and myself.

Road tolls should be set at *adjusted* social marginal cost - adjusted downwards to optimise traffic flow spill-overs onto unpriced roads. Tolls should not be set at average costs to recover project costs. While cost-recovery provides distributive

justice by charging in accord with ‘user pays’ principles, prices will be too high to ensure efficiency. To be specific pricing at average cost has two disadvantages. First, as mentioned it means prices will be too high excessively discouraging traffic, particularly when traffic can move onto untolled roads. Second, with average cost pricing, tolls will not depend on current congestion, a prerequisite for smoothing peak traffic flows. One objective of congestion pricing is to encourage motorists to switch from travelling during peak periods of high congestion to off-peak times where congestion is lower. This is ideally achieved by pricing travel less during less congested periods. Zero charges should be levied if traffic is operating under free flow conditions,

Thus while the role of the private sector in constructing and designing toll-roads is not seriously disputed by anyone, the requirement that tolls be set at short-run marginal cost means that private sector should not *manage* such operations because it may be that efficiently-operated tollways need to operate at a loss. Where poorly-designed contracts have already been set on a cost-recovery-plus-margin basis, as they have on most of Australia’s toll roads, they should be ethically renegotiated to make certain that motorists are paying *only* adjusted short-run marginal cost.

Second-best constraints that limit pricing to a subset of a city’s roads diminish the gains from efficient pricing but do not provide a convincing case against pricing high traffic volume roads. They simply provide a case for adjusting downwards the tolls that should be levied. The extent to which tolls need to be adjusted depends on the extent to which traffic diversions can be limited onto un-priced roads by using traffic calming and other measures.

The approach of pricing major roads alone can be viewed as an interim step on the path towards comprehensive electronic pricing of all road use based on GPS or other technologies. It introduces citizens to the notion of pricing and makes the final transition to more comprehensive pricing less abrupt and more acceptable.

**Pricing Within a CBD Cordon.** Cordon pricing means that charges are levied on travel within certain highly congested areas of a city, generally an area including the city’s CBD. *Periphery cordons* levy tolls on motorists *entering* the cordon and make sense for cities such as Melbourne and probably Sydney where sound parking policies are in place. *Area cordons* which levy charges that depend on the time spent within the cordon are less relevant in Australia than in other world cities, such as London, where congestion problems are more directly related to the duration of a car’s stay within the cordon.

Periphery cordons create ‘boundary problems’ on the cordon periphery since motorists have incentives to park in this periphery and to either walk or take other means of public transport into the CBD. They may also have incentives to divert journeys around the periphery in taking cross town journeys leading to increased intensity of traffic on the boundary. These problems become less important the broader is the scope of the periphery. The parking problem will also be reduced by effective market-oriented curb-side and off-street parking policies in the boundary area. Parking policies are discussed below. Given market-based parking policies, a broad enough cordon should encourage ‘park and ride’ policies that involve less car travel even from areas distant to the cordon. Indeed, if a CBD worker, who lives in a

city's periphery, understands they will face hefty charges for entering the CBD or for parking on its boundaries, their incentives will be to drive their car to a convenient radial public transport link close to their departure point rather than to attempt to achieve most of a city-directed journey by car. Cordon pricing seeks to induce these types of incentives.

A significant advantage of cordon pricing is that spill-over costs are smaller with it than with the selective pricing of major tollways because the substitution options involving private travel by a vehicle are less. But clearly these options are complements not substitutes in addressing overall congestion.

Although cities like Sydney and Brisbane possess multiple traffic foci which induce greater complexity in designing cordon pricing approaches, the difficulties with these more complex city structures are not insurmountable. Cordon pricing schemes have been successfully introduced in Stockholm and London. Australian policy-makers can learn from these experiences.

### **Parking**

The congestion pricing models used by economists are often too aggregative even when 'second-best' constraints are admitted. On the supply-side planners do not typically focus on aggregative capacity *per se* but instead consider a myriad of supply-related options. On the demand side, parking has until recently been a neglected issue with congestion pricing studies downplaying its role by treating it simply as a fixed fee for taking a trip. Transport economists have emphasised that higher parking charges impact mainly on terminating traffic thereby encouraging greater 'through traffic' which can swamp congestion-reduction effects.

Recently Donald Shoup has focused attention on the role of off- and on-street parking and on the congestion caused by cars 'cruising' for parking. Free or underpriced curbside parking provides analogous incentives to encouraging excess travel as unpriced roads. It also leads to an excessive allocation of space to off-street parking and to excessively disagglomerated CBDs. The correct pricing of parking is a major factor in managing urban traffic congestion. Shoup shows that, in the United States, 99 per cent of all automobile trips involve 'free' parking which is, in fact, anything but free – it has high social cost. The average US parking spot costs more than the average car occupying it. Underpriced curbside parking distorts transportation choices, debases urban designs, damages the economy and degrades the physical and aesthetic environment.

Free curb parking constitutes an urban commons so that, attempting to meet demands for an under-priced good, society devotes too many resources to it. Parking areas occupy an excessive fraction of our urban landscapes and cities and reduce the social and economic agglomeration benefits derived from living in dense urban structures. As a consequence of free parking and free roads, motorists travel too much by car. Shoup shows that a free parking spot is equivalent to a 22 cent per mile subsidy to the average American making his journey to work.

Most significantly a significant fraction of American and Australian urban traffic congestion is associated with cruising for a parking spot. Thus subsidised parking

encourages motorists to do things that cause harm to other people and harm the motorists themselves. Shoup estimates that an average 30 per cent of traffic in a selection of 11 large cities is cruising for a parking spot with the average motorist taking about 8 minutes to find a spot. Moreover, motorists themselves attach high disutility to this activity – in Sydney they will pay 3.5 times their wage to reduce this search time.

Some parking opportunities are precluded entirely by ‘no parking’ zones designed to optimise traffic flows. Where curbside parking is permitted, charges should be set so that markets for parking readily clear. The basic idea is that cruising for parking is socially wasteful so charges need to be set that anyone, anywhere can promptly find a parking spot. Traffic engineers normally recommend that about 15 per cent of parking spots should be kept vacant so that setting variable parking charges during the day so that this vacancy rate is approximately achieved will avoid socially wasteful cruising.

### **Sprawl**

It is difficult for politicians to embrace comprehensive road pricing. The distributional and second-best constraints are difficult to reconcile with concerns in their electorates where, despite sound efficiency and compensation arguments, citizens may resent paying for something they have previously enjoyed without explicit cost. Pricing major arterials and cordon pricing a city’s CBD will relieve congestion if comprehensive pricing is impractical but even this limited pricing is often ruled out political considerations as opposition to the Bracks Government’s move to price the Mitcham-Frankston Road makes clear.

If roads are unpriced then such things as travel to work and driving kids to school are socially underpriced. This means that citizens, who make home and school siting decisions and indeed, work-choice decisions, will pay inadequate attention to commuting costs. The result is excessively disagglomerated cities and excessive urban sprawl.

An alternative approach to promoting a more sensible city structure is to regulate directly the ‘sprawl’ consequences of unpriced congestion by setting definite city boundaries to foster urban consolidation. This will increase land rents and provide incentives to reduce ‘sprawl’ – here defined as car-dependent, low-density urban communities. Increased rents by driving higher densities will foster agglomeration benefits from non-market exchanges and reduce the disutility of taking lengthy congested private car journeys in the suburbs by facilitating provision of effective public transport options.

It is thus claimed that pursuing compact cities reduces the average costs of providing infrastructure and particularly public transport. The economies of scale required to make this argument work can be thought of as a second-best constraint requiring a planning intervention since, in this situation there is a market failure induced by the implied monopoly power. This claim is particularly contentious with respect to urban travel by public transport. Rail requires *huge* numbers of users to achieve an efficient scale of operation – these scale economies are unlikely to be ever realised in sprawled-out Australian cities. With respect to bus travel there are limited scale



economies so that the argument is irrelevant here anyway – except to emphasise that in a unconcentrated urban setting bus travel is much more cost efficient than rail.

It should be emphasised that, in any event, the case for regulating city size requires a second-best constraint such as the inability to price roads or the existence of economies of scale in public transport. Without such a constraint setting limits on city boundaries will not improve efficiency. For example if land, travel and parking markets work effectively then individual agents will select the type of housing and residential choices that suit them best so there is no need for a public intervention.

However, even with second-best constraints, problems arise with the policy of setting boundaries as a substitute for effective transport pricing. One difficulty lies in the fact that there are various externalities operating in a city. There are centrifugal (moving *from* the centre) externalities and centripetal (moving *towards* the centre) externalities. The dominant centripetal forces are the agglomeration benefits that arise from the non-market exchange of information and informal contracting – *interaction externalities* - that occur in concentrated business areas such as a city's CBD. The centrifugal externalities are the increased transport costs induced by traffic congestion. When interaction externalities cannot be subsidised directly, so that there are insufficient incentives for agglomeration, a second-best policy is to reduce transport costs by reducing congestion charges to encourage interactions. The difficulty in accounting for agglomeration benefits and reaching a balanced judgement about the relative size of effects is that little is known empirically about the size of interaction externalities.

Moreover, as argued by authors, such as Bruegmann and Moran, the case for curtailing sprawl is uneasy because the desire to encourage compact development need not reflect choices made by free agents. In part the desire to live in apartments in compact cities is a desire by planners not the desire of most citizens who prefer free-standing houses with gardens. Planners are sometimes claimed to exhibit a selfish and elitist type of resentment towards the 'nouveau rich' who settle into luxurious so-called MacMansions. If compact cities are provided, even though people prefer stand-alone housing, the consequence will be the high land and therefore house prices that have been seen in Australia over recent decades. Since these high prices reflect a failure to deal directly with congestion by imposing charges, which does provide efficiency in making travel decisions, they necessarily impose avoidable social costs.

This same argument applies to alternative approaches to 'compactify' a city. Corridor development might permit an expanded use of rail or even tolled radial roads along designated corridors but face difficulties if most journeys in a city's periphery are cross-town. Journeys might involve travel to destinations to deposit people or goods cross-town and will often be by car. Then corridor development may still leave high levels of congestion in the periphery. The imperative again is to price congestion.

### **Other Issues**

Traffic planning issues are not only a matter of congestion pricing. Other means of addressing congestion should also be considered. As Richard Arnott and others have suggested, congestion modelling should become more down-to-earth and specific.



Second-best constraints mean that specific urban freight delivery policies, staggered working hour policies, incentives for designing more congestion efficient cars, cars less prone to accidents, efficient road design, encouraging bicycling and the role of land use taxes and controls are all useful policy options in a second-best world.

Different forms of congestion also need to be considered - not only those related to traffic volume (or *link congestion*) but also congestion at intersections and freeway exits (*nodal congestion*), pedestrian-car interactions and gridlock stemming from the physical length of cars.

## Conclusions

Most Australians live in cities where they are subject to increasing traffic congestion and diminishing opportunities to address congestion by increased road supplies. Comprehensive pricing of all roads in our cities is impractical at present so pricing of major roads and CBD areas using cordon pricing schemes makes sense. This means pricing at lower than the social marginal cost that would obtain in an environment where all roads are priced to optimise traffic spill-over effects. It also implies a case for restricting traffic flows onto unpriced roads by using traffic-calming and other policies and for rigorous pricing parking on the boundary of city cordons. Distributional impacts should be addressed by promoting tax-neutral policies with beneficial double-dividend properties.

Parking policies are often assigned a minor role in overall congestion management. This paper argues instead that market-based curb-side pricing is crucial for achieving efficiency.

Attempting to deal with congestion indirectly by imposing constraints on sprawl has various secondary costs. Most notably it will raise land and housing prices. Piecemeal pricing policies will outperform urban planning attempts to drive more compact cities.

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