IPART
New South Wales

Independent Pricing and Regulatory Tribunal

Socially optimal consumption and prices

Final Report - Information Paper 4

Transport — Information Paper
May 2016

The Tribunal members for this review are:

Dr Peter J Boxall AO, Chairman

Ms Catherine Jones

Mr Ed Willett

Inquiries regarding this document should be directed to a staff member:

Brett Everett	(02) 9290 8423
Mike Smart	(02) 9113 7728
Jessica Robinson	(02) 9290 8405
Cato Jorgensen	(02) 9113 7724

Independent Pricing and Regulatory Tribunal of New South Wales
PO Box K35, Haymarket Post Shop NSW 1240
Level 15, 2-24 Rawson Place, Sydney NSW 2000

T (02) 9290 8400 F (02) 9290 2061

www.ipart.nsw.gov.au

What are socially optimal fares?

The optimal price for any good or service is equal to the marginal social cost of consumption

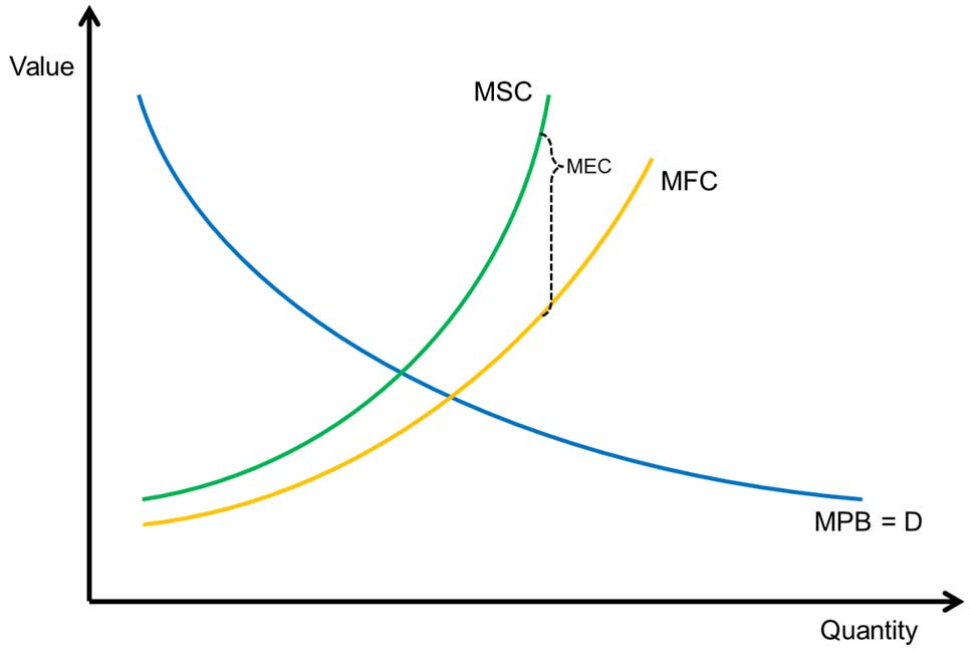
Whenever a good or service is consumed, there is a cost to society. The full social cost of consuming a good or service is the sum of:

- the direct financial costs of consumption (including the cost of production and delivery of the good or service, such as costs of material and labour), and
- any external costs to society that arise as a result of the consumption, such as environmental and health impacts and costs of road congestion.

When we compare the cost of a given level of consumption with that of a marginally different level of consumption (eg, one more unit consumed or 100 more units consumed), we refer to the cost difference as the "marginal cost". The marginal social cost (MSC) of one additional unit consumed is therefore the additional cost to society that results from the production, delivery and consumption of that additional unit of good or service.

Because resources are limited, on average, the cost of consumption tends to increase with each additional unit consumed. This is because the least costly sources for the good or service tend to be used first, before moving on to the next cheapest and so on. As resources deplete and competition for the remaining resources increase, both the direct financial costs and the external social costs tend to increase. This gives rise to an increasing MSC curve as shown in green in Figure 1.

Figure 1 Marginal costs and benefits



At the same time, different people value goods and services differently. The marginal private benefit (MPB) refers to the highest value any of society's consumers places on each additional unit of consumption. This is the highest price that any consumer would be willing to pay for the next unit. At any price, only those that would value the good or service at that price or higher would be willing to buy the good or service. The lower the price, the more consumers would be willing to buy the good or service, down to the last person that would only value the good or service at exactly the asking price. This MPB of each additional unit consumed by society is represented by the blue curve in Figure 1, which therefore also depicts society's total demand.

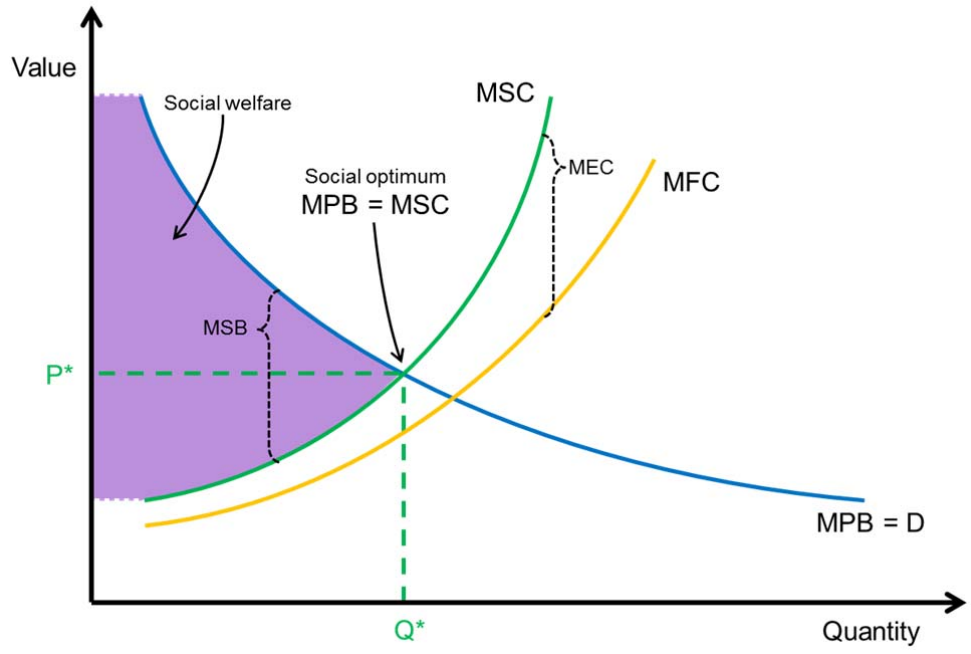
The gold curve in Figure 1 represents the marginal financial costs (MFC) of the good or service consumed (ie, the direct cost of production and delivery), and the vertical gap between the green and the gold curves represents the marginal external costs (MEC). MEC is the additional cost that is borne by anyone in society other than the consumer of the good or service, such as the costs of environmental impacts and road congestion.

The socially optimal level of consumption of any good or service occurs where the benefit to the user of the last unit consumed (ie, the MPB) is no more and no less than the total cost borne by society when that unit is consumed (ie, the MSC). This is shown in Figure 2 where the MPB and MSC curves intersect, at the socially optimal quantity of consumption, Q*. At this point, if more of the good or service was consumed, the benefit enjoyed by the consumers would be smaller

than the cost to society of the additional consumption, resulting in a loss of overall welfare to society. On the other hand, at quantities below Q*, each additional unit consumed would generate private benefits greater that the social cost of that consumption, so social welfare could be increased by consuming more. The increase in social welfare for each additional unit consumed would be equal to the gap between the MPB curve and the MSC curve. This amount represents the marginal social benefit (MSB) of consumption.

Total welfare to society is therefore maximised when consumption is at Q*. The value of the social welfare enjoyed when consumption is at Q* is represented in Figure 2 as the purple area between the MPB curve and the MSC. This welfare-maximising level of consumption represents what economists refer to as the *allocatively efficient* level of consumption, where goods and services are allocated first to those consumers whose consumption would generate the largest social net benefit (ie, the largest MSB).

Figure 2 Welfare maximising consumption



If the price per unit was the same for every consumer, ensuring the welfare maximising level of consumption (Q*) would require a per unit price of P*, as shown in Figure 2.[1] For each unit consumed above Q*, the private benefit of consumption would be less than P*, and consumers would therefore rather choose to not consume these units. On the other hand, the private benefit of each unit consumed below Q* would be higher than P*, and therefore consumers would be willing to pay at least P* to be able to consume these units.

Public transport services create large external benefits and should be subsidised

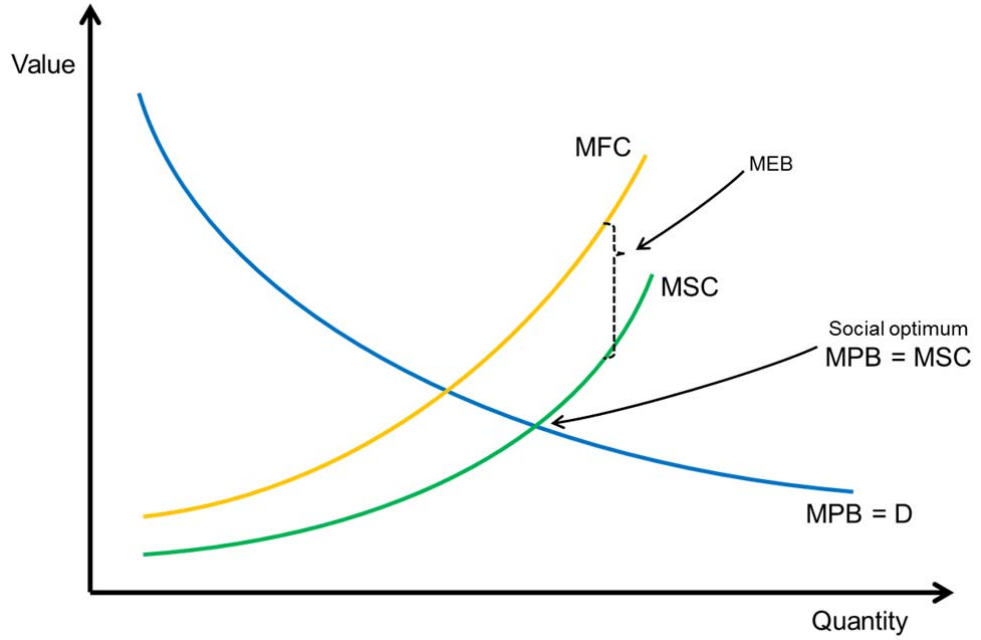
In an ideal world, all goods and services would be priced at their MSC. As explained above, this would result in the socially optimal level of consumption of all goods and services, and would therefore maximise welfare. Road users currently do not pay the full cost that their road use imposes on society as a whole, including the economic and social costs of road congestion. Motorists pay fixed costs related to motor vehicle ownership such as registration, and charges related to use such as the fuel excise and various tolls. However, most of these charges do not provide price signals that encourage drivers to modify their patterns of road travel to allow scarce road space to be allocated to those whose use generates the greatest benefit. One of the primary benefits of public transport use arises as a consequence of road user charges (eg, fuel excise, tolls and parking levies) being well below the MSC of road use. This results in over-use of private road transport, causing excess congestion and other external social costs.

In the absence of socially optimal pricing for road use, the second-best approach to minimising the excess social cost associated with road use is to lower public transport fares and encourage more people to use public transport instead of private road transport.

1 There are other pricing strategies that could be used to achieve this optimal consumption level, but for simplicity we will limit our discussion here to uniform pricing.

In addition to the benefits from avoided road use, there is a range of other important external benefits associated with public transport use. More information on external benefits of public transport is provided in Information Paper 8. Overall, the external benefits from public transport tend to outweigh the external costs, on average generating net benefits for each additional public transport journey. This can be represented as shown in Figure 3, where the green MSC curve is positioned *below* the MFC curve. The difference between MFC and the MSC curves represent the marginal (net) external benefits (MEB) of each additional public transport journey.[2]

Figure 3 External benefits of public transport



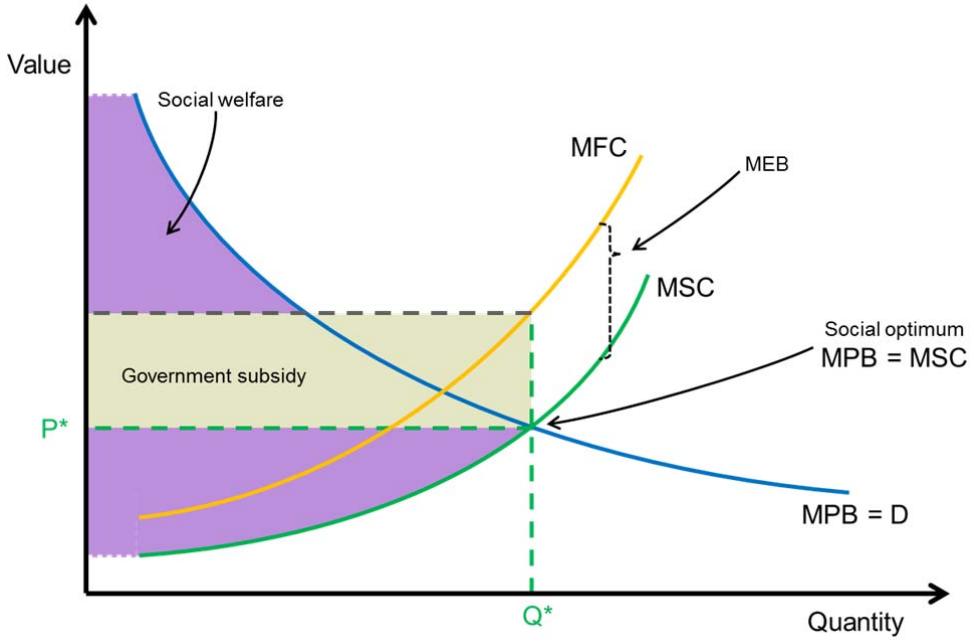
[2] The benefits from shifting use away from private road travel to public transport would be more accurately depicted by showing how, as a result of public transport subsidy and lower public transport fares:

a. demand for private road travel would shift inward away from above socially optimal level of consumption, and
b. demand for public transport would shift outward towards the socially optimal level of consumption.

However, for simplicity, we have instead depicted the average net benefit per public transport journey as shifting the marginal social cost curve below the financial cost curve.

As explained above, the allocatively efficient level of public transport use would be where the MPB is equal to the MSC, shown in Figure 3 where the green MSC curve intersects with the blue MPB curve. But since the social cost of public transport is *less* than the financial cost, a government subsidy is necessary to allow fares to be set at the socially optimal level. Instead of fares recovering the full marginal financial costs of public transport journeys, it is better for society to cover the remaining costs through taxes. This is shown in Figure 4, where the socially optimal quantity and price is again at Q* and P* respectively, and the light shaded box represents the required subsidy for the allocatively efficient outcome.[3] The purple shaded area between the MSC and MPB curves shows the total social welfare from the optimal level of consumption of public transport services.

Figure 4 Optimal subsidy of public transport



In the case of public transport, P* represents the socially optimal fare level, and the purpose of the first step in our approach is to identify P* for:

- each mode
- the medium run and the long run
- weekday peak and off-peak periods, and
- short distance and long distance journeys.

[3] For simplicity, we assume that the MSC curve incorporates the marginal excess burden of taxation associated with the required subsidy at each level of consumption. See Information Paper 8 for more on the marginal excess burden of taxation.

This set of socially optimal fares represents the fares that would best address our first two assessment criteria – encouraging efficient use and promoting efficient delivery of public transport. (See Chapter 1 in the Final Report for the full set of assessment criteria.)