

Response to peer review of Ferry externality Report—prepared for IPART

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Sapere Research Group is one of the largest expert consulting firms in Australasia and a leader in provision of independent economic, forensic accounting and public policy services. Sapere provides independent expert testimony, strategic advisory services, data analytics and other advice to Australasia's private sector corporate clients, major law firms, government agencies, and regulatory bodies.

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Table of Contents

1	Background	1
2	Accident externality	1
2.1	Problem definition.....	1
2.2	Multiple-vehicle accidents	2
2.3	Single-vehicle accidents	4
2.4	Victims who are not car occupants.....	5
2.5	Traffic density vs accident incidence and severity	6
3	Effect of congestion	11
4	Pollution externality.....	12
5	Marginal cost of funds and optimal ferry subsidy	13
5.1	Value of marginal excess burden of taxation	13
5.2	Fare optimisation logic	15
6	Consistency with IPART's approach?	15
7	Do conclusions follow from the analysis and data?.....	16

1 Background

At IPART's request, Dr Mark Harrison and Professor Henry Ergas conducted a peer review of a Sapere report entitled, "*External benefits of Sydney Ferry services – final report to IPART, 23 August 2012.*" I received a copy of this peer review on 12 June 2013. The purpose of this brief note is to respond to several points of criticism of the Sapere methodology that were raised by the peer reviewers. The section headings follow those of the peer review report.

In their introduction, the peer reviewers describe the methodology used in the Sapere report accepting, as I read it, the reasonableness of the approach in general. Nevertheless, specific points of criticism were noted concerning the treatment of traffic accident externalities, the effect of congestion, pollution, marginal cost of government funds and optimal ferry subsidies. The points that Harrison and Ergas considered to be in error were said to make little difference to the conclusions.

2 Accident externality

Sapere's treatment of accident externalities attracted the strongest and most detailed criticism. While the peer reviewers make some valid points, especially concerning the under-compensation of accident victims who are not themselves automobile occupants, it is my view that much of the criticism is misdirected.

2.1 Problem definition

One could think of three distinct stages of decision making that are relevant to accidents: (1) government decides what type of road system to build;¹ (2) car occupants each decide whether to travel by car or some other mode, given the road configuration, mix of cars on the road, and a broad statistical understanding of the likely driving behaviour of other motorists; (3) car driver decides how to drive, given the road configuration and decisions of all car occupants to be there or not.

In order to estimate optimal public transport fares and subsidies for the present Sydney road network, it is decision (2) that is relevant because public transport fare

¹ One could perhaps add one more decision stage: traveller decides what type of car to buy. This decision, relevant to the SUV effect mentioned by the peer reviewers, is similar to the government road construction decision in that it establishes the broad framework within which other, more frequently taken decisions operate.

policy is largely directed at influencing modal choice. It is the external implications of a traveller's mode choice that must be evaluated. These externalities are different from the impacts on others of decision (3)—that is to say, whether to drive cautiously or recklessly. They are also different from the external consequences through accident of decision (1). Different types of decisions have different external consequences.

The Harrison and Ergas critique is partly predicated on the notion that the externalities of interest are the consequences for others of decisions (1) car purchase decision—SUV effect and (3) how to drive once the driver is already behind the wheel. However, the relevant question concerns the decision taken by the driver to get behind the wheel in the first place, the decision taken by the adult passengers to be driven, and the decision by the parent or guardian of a child to have that child driven.

2.2 Multiple-vehicle accidents

The peer reviewers begin their discussion by noting that in multi-car collisions, provided that all drivers and vehicles are identical, if the accident rate per kilometre driven is constant, then the extra accident cost imposed by a decision to join the traffic or drive an extra kilometre is internalised (p.4). For convenience of reference, let us refer to this statement as the "*complete internalisation theorem*." I agree with that statement, but I would generalise it in the following ways:

- The internalisation does not apply solely to the driver of a vehicle. It also applies to all car occupants—each of which has made a decision to travel in that car on that day.
- The requirement that all drivers and vehicles be identical is not necessary for analysis of the mode choice decision.
- The restriction of the conclusion to multi-car collisions is also unnecessary, as long as there are no injuries to non-car occupants.

The relevant question is whether the decision of the marginal car occupant to be in a car or travel further one day increases, decreases or leaves unaffected the average accident cost per vehicle kilometre travelled of the inframarginal car occupants.

If this average cost per kilometre is unaffected, then the marginal accident cost imposed by the marginal motorist on occupants of other cars is zero because their probability-weighted accident cost is the same whether the marginal motorist drives or not. This conclusion is unaffected by the adequacy of insurance coverage for victims or the responsiveness of insurance premia to the amount a given person drives each year.

The peer reviewers make the following points in support of their view that the conditions for the complete internalisation theorem do not hold in practice:

1. A significant class of accidents involve a victim who is not a car occupant.
2. Single vehicle accidents may involve externalities if passengers are killed or injured, if the car damages an object, or if the accident resulted from evading another driver.
3. Drivers and vehicles are heterogeneous.
4. Harrison and Ergas speculate that accident rates per kilometre may increase with traffic density.
5. Tort and insurance arrangements in NSW mean that drivers face an underestimated marginal social cost per kilometre driven.
6. The inadequacy of compensation arrangements for accident victims results in an external cost from accidents.
7. The peer reviewers offer a plausibility argument in favour of their hypothesis that accident rates increase with traffic density.

In brief, my response to each of those points is as follows:

1. On reflection, I agree with Harrison and Ergas that accidents in which the victim is a non-car occupant (such as a pedestrian or pedal cyclist) impose costs that are completely external. I had previously overlooked this externality, but now agree that it should be brought to account. See s3.4 below for more detailed discussion.
2. I disagree that injuries (even death) to a car passenger is external to that passenger's decision to travel in the car on that day (see s3.3 below). Damage to property through single vehicle accidents (or even multiple-vehicle accidents) is nearly fully compensated through insurance, and so is mostly internalised. The point about accidents resulting from the need for evasive action confuses decisions of type (3) (how to drive) with the relevant type (2) decision (modal choice.)
3. I disagree that the heterogeneity of drivers and vehicles is relevant to the mode choice decision. The SUV effect that is mentioned in the peer review confuses a decision of type (1) with the relevant type (2) decision.
4. Empirical accident and traffic density data for the Sydney metropolitan region strongly rebuts the peer reviewers' contention that accident rates increase with traffic density in the relevant spatial setting. This analysis is presented in s3.5 below.
5. I agree that accident insurance arrangements do not fully expose motorists to the marginal social cost of their driving decisions. As noted elsewhere, this imperfection in insurance is irrelevant to the external status of the cost of injuries suffered by car occupants, and it has only minor bearing on property

damage through accidents, but it is relevant to the estimation of the marginal external cost of injury to non-car occupants.

6. Relatedly, I agree that compensation arrangements are imperfect. I disagree that this is relevant to the external status of cost of injuries suffered by car occupants or of property damage. Again, it is relevant to injury to non-car occupants.
7. The peer reviewer's heuristic arguments are contradicted by the empirical data for Sydney metropolitan roads presented in s3.5. These arguments are also flawed from a theoretical standpoint. No matter how many cars there are on the road, it is still only possible to run into the one in front, the one behind, or the one on each side. People certainly do drive more slowly when traffic density is high, and this certainly does impose additional travel time. However, this is the congestion externality, not the accident externality. To include it under the accident heading as well would be to double count.

2.3 Single-vehicle accidents

Assuming that driver, passengers and parents of child passengers are rational and well-informed about accident risks, each of these decision makers will factor into their modal choice an element of the cost of travelling by car that corresponds to the probability-weighted cost of being the victim of a traffic accident. In this way, every decision that results in a person occupying a car will fully internalise the traffic accident cost to themselves.² This conclusion applies even when insurance does not adequately compensate the car occupants for loss, as long as they are aware of that beforehand.³

² I assume that the parent or guardian of a child who is injured in an accident would likely suffer as greatly as (and in terms of pain and suffering, perhaps more greatly) than the child. There is evidence to support the claim that parents put a higher Willingness to Pay ("WTP") to avoid injury/death to their children than themselves. For example, Andersson, H & Lindberg, G, 2008 *"Among other things, we find that WTP for a child is higher than private WTP..."* and that *"However, our results indicate that they are not purely selfish, but are prepared to pay for the safety of children, relatives and friends."* Andersson, H & Lindberg, G, 2008, *'Benevolence and the value of road safety'*, Swedish National Road & Transport Research, Working Papers, Revised June 4, 2008 http://swopec.hhs.se/vtiwps/abs/vtiwps2007_004.htm

³ One may object that people are not perfectly rational or knowledgeable and that they may underestimate the risks. They may equally well overestimate the risks. All that is needed for this conclusion to hold on average is that the expectations of car occupants (or their parents) are rational.

Given this line of reasoning, I believe Harrison and Ergas are incorrect to include an external cost for injuries to passengers in a single-vehicle accident. That cost is external to the driver's behavioural decisions once behind the wheel, but it is internal to each passenger's decision to be in the car in the first place.⁴

2.4 Victims who are not car occupants

The remaining type of accident cost that must be considered is injury or loss suffered by a person who is not a car occupant at the time of the accident. This type of cost is clearly external to the car occupants' modal decision (because the sufferers are not car occupants), so the cost should be estimated using the method applied to emissions, as illustrated schematically in Figure 5.2 of the Sapere report. There are two factors that tend to internalise these costs, but I do accept that the internalisation is incomplete.

Both factors relate to insurance. The first factor is that car drivers are required in NSW to hold third party injury insurance (CTP green slip). While it is not compulsory, many drivers also carry third party property damage insurance. As I understand it, an at-fault driver who damages third party property is liable for that damage, whether insured or not. As Harrison and Ergas point out, the CTP premium is not responsive to the distance each driver drives over the year so, in any given year, the driver's average driving cost reflects a part of this accident cost, but the marginal driving cost is lower than this average cost. Even here, though, the marginal internal accident cost faced by the driver is not zero. Accident history is taken into account in determining CTP premia, and accident history is likely to correlate reasonably well with the likelihood of being involved in future accidents causing harm. In short, the driver faces a non-zero marginal cost of insurance that partly internalises the risk-weighted cost to non-car occupants of accidents that the driver might cause.

Third party property insurance premia are not regulated by the State, and it is reasonable to suppose that, to the extent that victims of property damage are fully compensated for their loss, drivers face the correct marginal cost. If this were not so, then it would be the insurance companies, rather than the accident victims, who would suffer the external cost. Given the bargaining power of insurance companies, that seems unlikely.

The second factor is that victims are not completely compensated for injury and loss. Court awards for pain and suffering are determined arbitrarily. Lump sum payouts to accident victims for economic loss are calculated by applying a 5% discount rate to the

⁴ In the case of children, the parent makes the decision on behalf of the passenger and internalises this risk.

expected stream of future medical costs (s127, Motor Accidents Compensation Act 1999 (NSW)). It seems likely that this figure significantly overstates the relevant real discount rate, implying that lump sum payouts are systematically below the true present value of costs.⁵

Concerning property damage, while the at-fault driver is technically liable for the full loss, the sufferer will in practice be inadequately compensated. Some uninsured at-fault drivers are unable to pay the full amount. Even when the driver is insured, the process of obtaining payment through litigation will consume part of the compensation funds.

2.5 Traffic density vs accident incidence and severity

The above discussion of multiple-vehicle accidents highlighted the importance of knowing whether the accident cost/km driven is higher in denser traffic. This question can be assessed empirically for the Sydney metropolitan road network by comparing traffic density with the incidence of car accidents and of fatal car accidents at different times of day on weekdays.

Table 1a summarises the number of fatal crashes in the Sydney metropolitan area for 2011 by time of day and day of week. Table 1b summarises the number of crashes in the Sydney metropolitan area for 2011 by time of day and day of week. The data for these tables was provided by the NSW Centre for Road Safety, Policy and Regulation, Transport for NSW.

⁵ According to an October 1991 Reserve Bank of Australia Bulletin (<http://www.rba.gov.au/publications/bulletin/1991/oct/pdf/bu-1091-2.pdf>), since 1900, the average bond rate deflated by the CPI averaged about 1.5%, and actuaries usually assume a real rate of return on a diversified portfolio of about 4 per cent (comprising rates of 1 to 2 per cent for fixed-interest securities and higher rates for riskier assets such as equities and property).

Time	Day of week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0:01 - 1:59	2	1	1	1	0	0	2	7
2:00 - 3:59	0	0	1	0	0	1	2	4
4:00 - 5:59	0	0	1	0	1	0	0	2
6:00 - 7:59	0	0	0	3	3	3	0	9
8:00 - 9:59	0	0	1	1	0	0	2	4
10:00 - 11:59	3	0	1	1	0	0	1	6
12:00 - 13:59	1	2	2	0	0	2	3	10
14:00 - 15:59	2	2	0	2	1	3	1	11
16:00 - 17:59	2	1	1	0	5	4	0	13
18:00 - 19:59	0	0	0	0	1	1	0	2
20:00 - 21:59	0	0	0	2	0	0	0	2
22:00 - Midnight	1	1	0	1	0	0	1	4
Unknown	0	0	0	0	0	0	0	0
CRASHES:								
TOTAL	11	7	8	11	11	14	12	74

Time	Day of week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0:01 - 1:59	162	58	67	52	76	78	155	648
2:00 - 3:59	128	38	28	29	44	44	107	418
4:00 - 5:59	95	88	76	83	80	75	90	587
6:00 - 7:59	105	351	366	357	375	366	140	2060
8:00 - 9:59	183	479	485	496	527	471	310	2951
10:00 - 11:59	297	314	341	309	362	364	481	2468
12:00 - 13:59	360	378	337	303	359	401	522	2660
14:00 - 15:59	365	439	468	494	509	587	427	3289
16:00 - 17:59	316	534	587	630	635	625	447	3774
18:00 - 19:59	233	330	437	485	428	548	386	2847
20:00 - 21:59	177	195	228	233	260	258	257	1608
22:00 - Midnight	147	151	173	163	170	255	236	1295
Unknown	0	0	0	0	0	0	0	0
CRASHES:								
TOTAL	2,568	3,355	3,593	3,634	3,825	4,072	3,558	24,605

Source: NSW Centre for Road Safety, Policy and Regulation, Transport for NSW.

Table 2 presents vehicle kilometres travelled on an average weekday in the Sydney metropolitan area by time of day for 2011/12.

Table 2. VKT by time of day for an average weekday

VKT by trip arrival time hour in Sydney SD, average weekday

Source: 2011/12 HTS 3-years-pooled dataset using unlinked trips, BTS, TfNSW

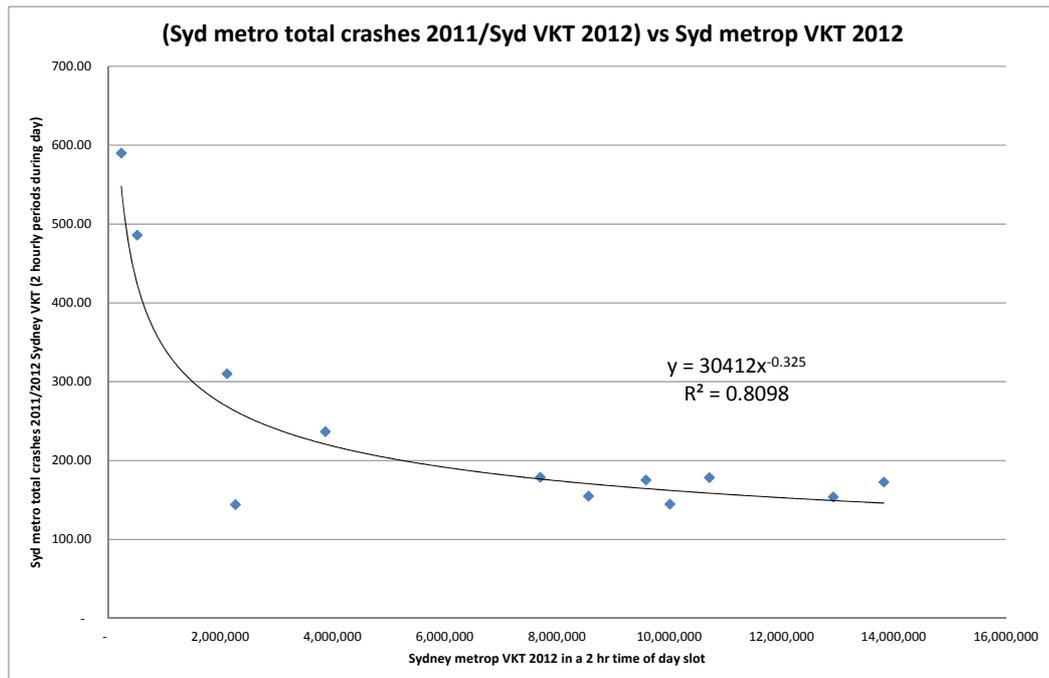
Trip Arrival Time Hour	Total VKT
arrive 00:01 - 01:00	353,788
arrive 01:01 - 02:00	167,054
arrive 02:01 - 03:00	117,743
arrive 03:01 - 04:00	117,969
arrive 04:01 - 05:00	507,732
arrive 05:01 - 06:00	1,764,440
arrive 06:01 - 07:00	3,957,929
arrive 07:01 - 08:00	6,056,996
arrive 08:01 - 09:00	7,595,101
arrive 09:01 - 10:00	5,327,933
arrive 10:01 - 11:00	4,512,860
arrive 11:01 - 12:00	4,050,403
arrive 12:01 - 13:00	3,950,308
arrive 13:01 - 14:00	3,750,226
arrive 14:01 - 15:00	4,862,975
arrive 15:01 - 16:00	5,853,987
arrive 16:01 - 17:00	6,817,631
arrive 17:01 - 18:00	7,005,527
arrive 18:01 - 19:00	5,953,940
arrive 19:01 - 20:00	3,631,281
arrive 20:01 - 21:00	2,012,494
arrive 21:01 - 22:00	1,859,203
arrive 22:01 - 23:00	1,351,725
arrive 23:01 - 24:00	768,219
	82,347,465

Source: Bureau of Transport Statistics, Transport for NSW.

Figure 1 plots the ratio of annual crashes on Monday, Tuesday, Wednesday, or Thursday to average weekday VKT against VKT. There is one point per two-hour time

of day. The former value is proportional to the accident rate per kilometre travelled. The latter value is proportional to traffic density.

Figure 1. Crashes per kilometre travelled versus traffic density



Source: author’s calculations, *Transport for NSW*.

As figure 1 clearly indicates, this empirical evidence lends no support to the peer reviewer’s speculation that Sydney accident rates increase with traffic density. If anything, a decreasing trend is suggested. The appearance of a decreasing trend is influenced by the high accident rates that occur late at night (lowest VTK points), possibly reflecting other factors (fatigue or alcohol).

The same conclusion applies for accident severity, which can be proxied by the incidence of fatal crashes. Figure 2 presents the fatality rate per kilometre driven as a function of traffic density.

Figure 2. Fatal crashes per kilometre travelled versus traffic density

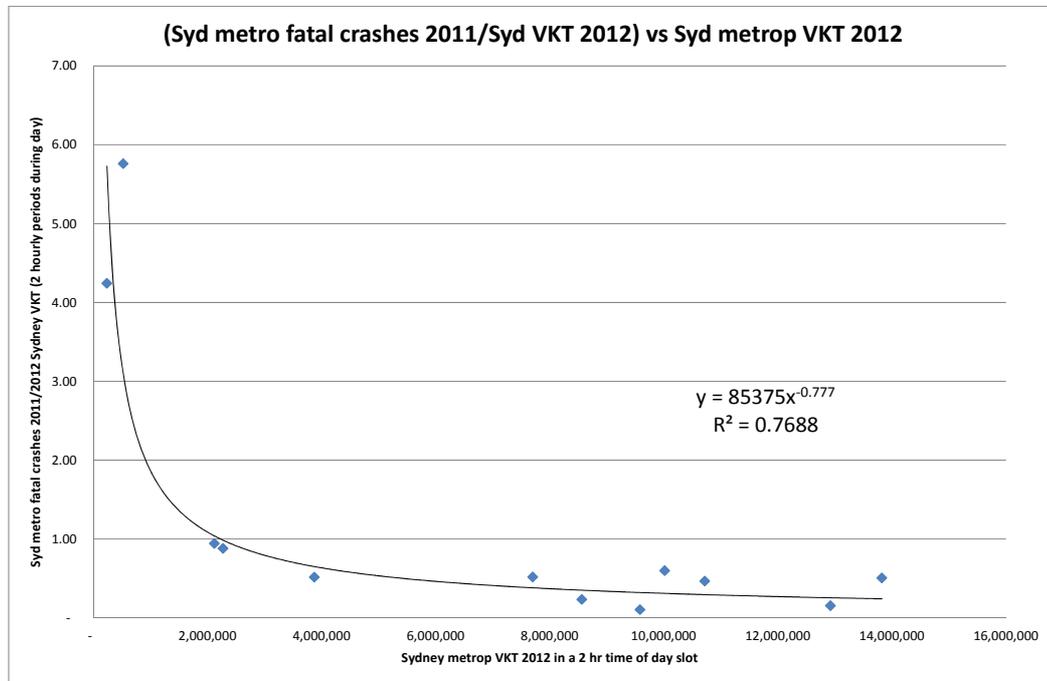


Figure 2 also clearly indicates that fatality rates do not increase with traffic density. If anything, they decrease over low density ranges before flattening out for higher densities. The density range shown in both figures 1 and 2 includes the highest density AM and PM peak periods. In conclusion, neither accident rates nor the severity of accidents increases with traffic density for the Sydney road network.

The article by Edlin and Karaca-Mandic⁶ that is cited by the peer reviewers is a useful reference that suggests (and quantifies for US highways) a positive relationship between traffic density and both accident insurer costs and insurance premiums per vehicle—at the level of individual states, rather than individual roads. Their study does not examine the effect of density on accident cost for the same road. The authors acknowledge that “*without knowledge of the inherent safety of the roadways (roadway-specific effects), these studies could lead to biased estimates of how much traffic density increases accident rates on a given roadway*” (p.934). Clearly that caveat should be borne in mind for a Sydney-centric analysis of accident costs.

⁶ Edlin, A. & Karaca-Mandic, P., 2006, *The accident externality from driving*, Journal of Political Economy 114:931-55.

When differences between the road networks are removed from the analysis, as was done above, the Karaca-Mandic conclusions are invalidated, at least for Sydney traffic.

3 Effect of congestion

The peer reviewers question my assumption that time taken to travel one kilometre (variable $Y = 1/\text{speed}$) is a linear function of the total vehicle kilometres travelled by all cars (variable Q). My formula is $Y = AQ + B$. Citing a 1967 paper by Harberger on a somewhat different topic (transport project evaluation), they state that a more usual assumption is that speed is a linear function of Q . Their formula is $S = F - DQ$. They present some algebra that forms the basis of a hypothetical alternative calculation of congestion costs. They imply that their approach is simpler and state that it is more practical.

At high values of Q (for example, where $Q > F/D$), their formula will give an implausible result: negative speed. My formula performs as expected in the high Q range: speed is reduced asymptotically to zero as congestion worsens. On this basis, my approach appears preferable as a theoretical construct. The claims that it is overly complex or impractical are based on an oversimplification of the alternative they propose.

Over the range of Q that is of interest for the externality study, it probably does not make much difference which of the two assumptions is used. I employed fourteen different scenarios in BTS model runs to estimate the relationship between S (or, equivalently, Y) and Q . A linear relationship (as proposed by Harrison and Ergas) was a good fit to the data for S versus Q . A linear relationship (as proposed by Sapere) was also a good fit to the data for Y versus Q . In both cases, the correlation coefficient for a linear fit to these points was above 99.5%.

Harrison and Ergas also criticise my apparent reliance on only two data points to estimate the parameter A . This criticism is not quite valid. In fact, I used three points (two measured and one deduced—the “no traffic” scenario) to estimate a quadratic coefficient A . Although this is not mentioned in the Sapere report, I validated these estimates of A by performing a more detailed analysis of the fourteen data points from the BTS modelling (this time excluding the “no traffic” scenario). The three-point estimates of A were within 8% of the fourteen point estimates, so I concluded that the extra accuracy did not warrant the extra calculation effort.⁷

⁷ Note that a separate estimate of A had to be made for each of 32 permutations of time period, geographic ring and direction of travel.

If Harrison and Ergas' method were to be used instead of mine, it would still be necessary to estimate their parameters F and D empirically, and the same data challenges would have to be faced. The example they gave on p. 7 of their peer review appears simple only because they did not do this estimation.⁸ Without these parameters, it would not be possible to say what the average speed would be at particular values of Q, so it would not be possible to quantify the congestion externality under their approach.

4 Pollution externality

Harrison and Ergas say that the Sapere estimates of car air pollution costs are too high, citing BTRE working paper 71 (2007) in support. The Sapere report used a unit health cost figure from Watkiss (2002) for diesel passenger cars of \$0.46/litre. I accept that this figure was too high.

Subsequent to the ferry externality work, I adopted an alternative figure of \$0.20/litre of unleaded petrol in the 2012 CityRail externality study.⁹ This leads to an air pollution externality rate of 2 cents per person-km travelled by car. That figure is comparable with the BTRE figure of 2.5 cents per vehicle km for cars. Had this change been applied to the ferry externality report, it would have made the case for ferry subsidies even weaker

On the other side of the ledger, air pollution from ferries, the peer reviewers appear not to accept my assumption that the health costs of ferry air pollution would be as serious as if the ferries had been using urban roads. They refer to atmospheric conditions "on a windy harbour", implying that this would mitigate the health costs. However, Sydney Harbour is enclosed on nearly all sides by dense urban settlement. Given the narrowness of the harbour at most points, this air pollution would not be dispersed out to sea, but would instead affect urban residents.

Pending more specific studies of this effect, my assumption remains reasonable, in my view.

⁸ Their estimate employed guessed values for F and S. A meaningful estimate would need to be based on empirical work.

⁹ The alternative figure is also based on the Watkiss 2002 report, but is relevant to a petrol car of Pre-Euro I vintage using mid-sulphur fuel in Band 1 (inner areas of larger capital cities). The Watkiss figure was indexed by CPI from 2002 to 2012.

5 Marginal cost of funds and optimal ferry subsidy

The peer reviewers observe (p.13) that the Sapere report adopts a 10% value for the marginal excess burden of taxation without discussion. That is true. The reason for this choice is that a 10% value was adopted in all of the previous IPART externality studies for rail and bus. As this value is both highly influential in optimal fare setting and highly controversial, IPART asked me not to open this point for discussion in the ferry report. Changing this value would likely lead to significant changes in fare recommendations based on a somewhat artificial change of inputs. Consistency of approach was felt to be fundamentally important.

5.1 Value of marginal excess burden of taxation

That said, the claim by Harrison and Ergas that 10% is likely to be extremely low given how distorting state taxes are, should not be accepted at face value. Gabbitas and Eldridge¹⁰ presented a range of estimates of marginal excess burden for various state taxes. KPMG Econtech¹¹ also presented estimates. They are summarised in Table 3 below, along with an indication of how financially important each tax is to NSW. The final column uses, as its denominator, the sum of NSW taxation revenue in 2011-12 and GST receipts from the Commonwealth in that year.

¹⁰ Gabbitas, O & Eldridge, D, 1998, *Directions for State Tax Reform – staff research paper*, p. 53, table 4.10

¹¹ KPMG Econtech, 2010, *The Excess Burden of Australian Taxes – Report prepared for the Department of the Treasury*, p. 44, table 5.1

Table 3. Marginal excess burden estimates for selected NSW taxes

Type of tax	Gabbitas and Eldridge	KPMG Econtech	% of 2011-12 NSW revenue (incl GST)
Payroll tax	0-20%	41%	26.3%
Land tax	0-10%	8%	9.2%
Conveyancing duty	10-30%	34%	14.7%
GST revenue from Cwlth	NA	8%	19.4%
Weighted average/total	17%	26%	69.6%

Sources: Gabbitas and Eldridge, see footnote 5. KPMG Econtech, see footnote 6. %of NSW revenue, NSW Budget Statement 2013-14, table 6.5 Taxation Revenue.

The weighted averages of the chosen tax types are above 10%, but two points should be borne in mind. First, Gabbitas and Eldridge give wide ranges for each of their estimates and do not provide estimates for GST, which would be likely to bring the weighted average further down. Second, KPMG Econtech’s estimates were strongly criticised by Ergas and co-author Jonathan Pincus in a recent research paper¹² for being far too high.

¹² Ergas, H & Pincus, J, 2012, *Modelling the Excess Burden of Royalties*, Research Paper No. 2012-03, University of Adelaide, (p. 17).

5.2 Fare optimisation logic

The peer reviewers do not directly criticise the calculation of optimal ferry fares that was presented in the Sapere report, but they say the algebra that is developed in the appendix is overly mathematical. As an alternative, they present a series of three figures that deals with the question of efficient subsidies in the presence of externalities and a non-zero marginal excess burden of taxation.

The choice between these two approaches is probably a matter of taste. I would point out, however, that the peer reviewers' figures concern themselves only with the situation in the market for ferry services. They do not consider the question of equilibrium or welfare in markets for competing transport modes. The entire rationale for public transport subsidy rests on the notion of achieving inter-modal balance, so these other markets should not be overlooked. The mathematical detail in the Sapere appendix is needed to properly account for these other transport modes.

Finally, the peer reviewers say that part of conclusion 8 from the Sapere report (welfare may be improved by a switch away from ferries) seems incorrect, on the basis of their analysis of the ferry modal market by itself. It is a subtle point, perhaps worthy of further discussion and analysis. At any rate, nothing much rides on that point as far as optimal fares and subsidies are concerned.

6 Consistency with IPART's approach?

The peer review found that the Sapere report's methodology was consistent with IPART's approach in other public transport sectors. It was also consistent with a focus on efficiency. However, the peer reviewers note that the Sapere report uses actual costs rather than efficient costs, which is at odds with IPART's usual approach.

In a supplementary report to IPART dated 1 November 2012, I did consider the impact of a more efficient fleet (based on LEK's recommendations) on the pollution externality. This hypothetical fleet would reduce the amount of fuel consumed, hence the emission disbenefit of ferries. However, the effect was small and insufficient to alter the main conclusion that ferry subsidies far exceed the external benefit they provide.

Harrison and Ergas point to the regressive nature of ferry subsidies and query why Sapere did not refer to this fact. The reason was that IPART asked us not to.

7 Do conclusions follow from the analysis and data?

Harrison and Ergas agree with the main conclusion of the Sapere report that the optimal ferry subsidy is close to zero. Even though it is their view that accident costs were understated by Sapere and pollution costs were overstated, it does not affect this conclusion. They note, on p.4 of their peer review, that the aspects of the Sapere report that they believe to be erroneous “*make little difference to the conclusions.*”