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Effective Speeds: Car Costs are Slowing Us Down

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Introduction

Formula One racing teams spend hundreds of millions of dollars each year so that their drivers can travel at very high speeds for a very short time. If these teams want to be competitive, they have no choice but to devote huge amounts of time and money to their cars. But is this strategy a sensible one when applied to everyday transport? Is it worth investing hundreds of hours per year to pay for a mode of transport that might save only half of that in travel time? We can help answer this question by considering the concept of 'effective speed', where speed is calculated on the basis of the total amount of time consumed by a particular mode of transport. Applying this concept of 'effective speed' provides some surprising results in the comparison of cars, bicycles and public transport.

The Claimed Advantages of Cars

Cars have dominated transport planning in many western cities for the last fifty years or more. Cars appear (to many people) to provide an unbeatable combination of independence, low cost and high speed. Yet there is a growing awareness that these supposed advantages of the car are somewhat illusory.

The average Los Angeles motorists spends 93 hours each year in rush-hour traffic (Shrank and Lomax, 2004). That's nearly four days going nowhere. Even when cars are not stuck in traffic jams, they do not provide us with 'independence'. "Simply to keep oneself mobile in a car requires large vehicle manufacture, service and repair industries, the road building industry, an international oil industry and, of course, an external source of energy" (Ker and Tranter, 2004, 108). While supporters of cars claim that they provide the independence to travel when and where they choose, this freedom is paradoxical: car drivers are entirely dependent on costly infrastructure, goods and services provided by a multitude of others.

Cars are more expensive than we believe they are. Many car drivers base their estimates of the costs of driving on the amount they pay for fuel 'at the pump'. Yet fuel accounts for only about 20% of direct car operating costs in Australia (NRMA, 2004). Motorists tend to ignore (or underestimate) the other direct costs that they themselves pay to keep their car running (RACV, 2004), and very few drivers consider the external costs of car ownership (the costs that are not paid directly by them, but which are borne by society). A study by the RAC (Royal Automobile Club) in the UK found that drivers grossly undervalue the costs of motoring, estimating their expenditure at a level of less than 40% of the real average cost calculated by the RAC. The RAC calculations did not include a range of costs that are paid by drivers, including costs of car accessories, costs of infringement fines, and the time spent putting fuel in the car. Nor did the RAC estimate the external costs (e.g. health costs) of car ownership, many of which are not covered by the fees, taxes and insurance levies paid by motorists. Those motorists who are aware of the money they devote to cars are likely to consider reducing their dependency on the car if given suitable alternatives and support.

Perhaps the most pervasive belief about cars is that they give us the advantage of high speed. The promise of high speed is used to sell motor vehicles throughout the world. In Australia, many car companies use speed (or the suggestion of speed), along with clear links to motorsport, to sell their high performance cars (and the rest of their models as well). Honda uses Formula One sounds and cars in its advertisements. Mitsubishi has used rally racing to help sell its Magnas. Ford and Holden have used success in V8 Supercar motor racing events to sell their Falcons and Commodores. Even Daihatsu has used car racing footage in its advertisements for its tiny Sirion. Many car manufacturers have at least one high performance car in their model range, and this car can help sell the other models. It is "not just a specific model. A fast powerful car puts a halo over other models in the line-up, and helps sell them, even if they have nothing in common with the hot rod" – "automakers are selling speed because they know that speed sells" (Healey, 2004).

Despite the advertising hype, average driving speeds (trip speeds) are remarkably low in most cities, particularly in inner city areas where traffic speeds are not much higher than walking speeds (even in Australian cities) (Kerr, 2004; Hinchliffe, 2004). Even assuming that we could achieve high trip speeds by car in cities, the key questions addressed in this paper are:

1. **Can high speed transport be achieved without a loss of time in other areas of human life?**

2. **Can a high 'effective speed' be achieved for mass urban transport based on private motor vehicles?**

To answer these questions, we need to consider the concept of 'effective speed' (also referred to as "social speed") (Kifer, 2002; Whitelegg, 1993a; Whitelegg, 1993b).

Effective Speed

High speed transport was one of the major attractions of cars when they first appeared as a means of urban transport. Cars provided the means for a privileged group of people to travel at higher speeds than the rest of the population, which was restricted to walking, cycling or trains. However, when cars became available to the general public, the time advantages of cars faded, along with the rise of traffic congestion. Even when the car appears to provide a speed advantage over other modes of transport, this advantage is questionable when the total time devoted to the car is considered. The 'effective speed' of the car is limited by the time investment needed to keep cars mobile.

Effective speed can be calculated using the formula:

"Speed = distance divided by time", where

- distance is the total kilometres traveled, and
- time is the total time devoted to the mode of transport (including the time spent at work to earn the money to pay all the costs created by the particular mode of transport).

In the calculation of car speed, the time required for car travel is rarely adequately considered. Most drivers consider only the time spent in the car while it is moving (and perhaps while it is idling) when estimating their average speed. They ignore the considerably larger amounts of time that must be devoted to their cars. As well as the time a driver must spend sitting in a car, he or she must spend time earning the money to make the car travel possible. During this time, the driver is effectively going nowhere; hence their speed for this time is zero. When this time is taken into account, along with other time devoted to the car, it is apparent that the car does not save us as much time as we think it saves us.

There has been little development of the concept of effective speed (or social speed) in the literature. The concept can be traced back to 1854, and various writers since this time have shown an awareness of the ideas behind 'effective speed'. Some have made some estimates of effective speeds in specific contexts.

The first person to bring attention to the idea behind the 'effective speed' argument was probably Henry David Thoreau in his book *Walden,* published 150 years ago in 1854. In *Walden*, Thoreau argues that "the swiftest traveller is he that goes afoot". He compares his own speed, as a pedestrian, with the speed of another traveller who takes the train to a nearby town:

> "I start now on foot, and get there before the night. You will in the meanwhile have earned your fare, and arrive there some time tomorrow, or possibly this evening, if you are lucky enough to get a job in season. Instead of going to Fitchburg, you will be working here the greater part of the day. And so, if the railroad reached around the world, I think that I should keep ahead of you" (Thoreau, 1960, 47).

Thoreau was aware that there was no 'effective' speed advantage in train travel in the 19^{th} century, at least for people who were not very wealthy. In 1974, Ivan Illich wrote his thought-provoking book *Energy and Equity*, in which he brought Thoreau's arguments into the 20^{th} century. Illich explained:

> "the typical American male devotes more than 1,600 hours a year to his car. He sits in it while it goes and while it stands idling. He parks it and searches for it. He earns the money to put down on it and to meet the monthly installments. He works to pay for petrol, tolls, insurance, taxes and tickets. He spends four of his sixteen waking hours on the road or gathering his resources for it. And this time does not take into account the time consumed by other activities dictated by transport: time spent in hospitals, traffic courts and garages, time spent watching automobile commercials or attending consumer education meetings to improve the quality of the next buy. The model American puts in 1,600 hours to get 7,500 miles: less than five miles per hour" (Illich, 1974, 18-19).

In 1990 the German sociologist D. Seifried (Whitelegg, 1993a; Whitelegg, 1993b) used the phrase "social speed" to describe the average speed of a vehicle after hidden time costs are considered. Seifried considered the time spent at work to earn the money to pay for the car and its running costs, as well as the external costs of the car. Such external costs include environmental and social costs (e.g. accident costs). Seifried's calculations indicated that when all costs are considered, the "social speed" of a bicycle can be faster than a car.

Kifer (2002) conducted an assessment of the multitude of costs associated with running a car in the United States, including the direct costs used in the calculation of "vehicle operating costs" by motoring organisations, as well as various hidden or indirect costs of cars. When only the direct costs to the motorist are considered, the "net effective speed" of US motorists was estimated to be a mere 9.7 mph (assuming a trip speed of 25 mph as the probable US average for cars). (These 'direct costs' did not include parking costs, tolls, fines or vehicle accessories.) When the highest estimates of external costs were included in the calculations, the "net effective speed" fell to a mere 5.8 mph (Kifer, 2002). He makes the point that "in **all** of these cases, the speed of the automobile is no greater than that of a bicycle. The slowest speed is not much above my 4.5 mph walking speed" (Kifer, 2002). Kifer's estimates of external costs were based on two detailed studies of the direct and external costs of cars, the first by the Conservation Law Foundation and the second by the International Center for Technology Assessment (Burrington, 1994; International Center for Technology Assessment, 1997). The second of these studies calculated that if US motorists had to pay the full costs of driving their cars, gasoline costs would increase from $1 per gallon to between $5.60 and $15.40 per gallon! The reason for the wide variation is the difficulty of defining or measuring external costs, particularly when some of these costs may not be felt in the current generation.

Todd Litman (Victoria Transport Policy Institute) estimates that the average Canadian motorist devotes nearly 20% of their household budget to their cars, equating to approximately 1.5 hours per day. “Combining this with the amount of time spent driving represents an overall speed of about 15 miles per hour (24 km/h) per working day” (Victoria Transport Policy Institute, 2003).

Effective Speeds in Australia

As far as I am aware, no studies have been conducted that estimate the effective speeds of various modes of transport (including different makes and model of car) in Australia. This section of the paper outlines the calculation of effective speeds for single occupant car driving, bus travel and cycling in one Australian city – Canberra. Canberra was chosen because, of all Australian cities, it is likely to have the highest trip speeds by car, as well as having few disincentives to use the car. There are no tolls on Canberra roads, little traffic congestion and minimal car parking costs (compared with larger Australian cities). None of the speed advantages of rail and light rail are present in Canberra. Thus Canberra is likely to provide a case study showing cars at their best and public transport at less than its best in terms of ‘effective speed’. In other Australian cities, effective speeds are likely to be lower for cars and higher for public transport.

To estimate the ‘effective speed’ of any mode of transport, we need to do three things.

- First, we need to estimate the average in-vehicle (or per trip) speed. For a car driver, this can be calculated by dividing the total distance travelled by the total time spent in the car (from the time you open the car door to the time you get out of the car).

- Second, we need to estimate the time devoted to that mode in terms of activities that are undertaken as a consequence of making trips by that mode or of owning and operating a particular vehicle. These include putting fuel in the car, checking oil and tyre pressures and walking to and from the car when it is parked.

- Third, we need to calculate the time that a person must spend at work to earn the money to pay for a particular mode of transport. For car drivers, the cost of operating a car has been partly calculated by the NRMA as average vehicle operating costs (NRMA, 2004). However, the NRMA calculations do not cover the full range of costs associated with cars.

Estimating trip speeds

While there is information available on average speeds on particular roads (Richardson, 2003), such studies do not provide all the data needed to calculate average trip speeds. For car drivers, to calculate average trip speed requires consideration of the time spent getting into and out of the car, putting on seat belts, opening and closing garage doors, driving around car parks, and reversing out of private garages or driveways. There appears to be little available evidence that can reliably indicate average in-vehicle speeds over the course of a driver’s weekly or monthly driving behaviours. This is an area that should be researched more fully.

Data on peak hour speeds on major routes in Australia’s capital cities shows some major roads with peak hour speeds down to 18 km/h (Brisbane’s Moggill Road) (Hinchliffe, 2004). The Roads and Traffic Authority’s estimate of peak-hour average speed on major roads in Sydney is 35 km/h (Kerr, 2004). “On the seven major routes to and from the Sydney CBD, average speeds in 2002-2003 were 34 km/h for the AM peak and 41km/h for the PM peak” (RTA, 2003, 6). For

Melbourne, according to traffic monitoring carried out by VicRoads, the average traffic speeds on Melbourne's freeways and arterial roads was 41.4 km/h in 2001/2 (VicRoads, 2003). However, this did not include minor roads: the lowest level of arterial road considered was classified as "Undivided Arterials with Trams" (which had average speeds of 22.3 km/h). Minor roads have average recorded speeds of as low as 3 km/h (inner-city Sydney) (Kerr, 2004) and 6.3 and 6.4 km/h (St Paul's Terrace and Hale St Brisbane) (Hinchliffe, 2004).

Given the range of speeds listed above, it is unlikely that any major Australian city would have an average in-car speed of more than 40 km/h. None of the speeds quoted above include speeds in car parks, petrol stations, driveways, laneways and culs-de-sac, most of which feature in the normal driving patterns of city drivers.

A study by Sinclair Knight Merz (2003) estimated speeds in Canberra as: 50km/h for car, 30km/h for bus, 55 km/h for motorcycle and 45 km/h for taxi. No reference or methodology is given for these estimates. Given my own record keeping (see below) I suspect that each of these is an overestimate of average trip speeds in Canberra.

In an attempt to provide some indication of an average in-vehicle speed for a Canberra driver, I decided to keep a record of all my car trips around Canberra for a four-week period. During this time, the highest average in-vehicle speed I was able to achieve on any single car trip was 65.8 km/h for a trip that included a large section of a 100 km/h road. Many of my car trips had speeds lower than 30 km/h. While this may seem surprising, it becomes understandable when it is considered that local streets in Canberra (and many other Australian cities) have a 50km/h limit and that driving in urban areas involves frequent slowing and stopping (for corners, traffic lights and intersections).

Over the four-week period, my driving within Canberra gave me an overall average in-vehicle speed of 41.4 km/h. This in-vehicle speed can only be seen as a very rough approximation of an average in-vehicle speed within Canberra. To conduct such a study would require a large-scale study with a carefully developed methodology. Because of the lack of any reliable data on in-vehicle speeds, the calculations for this paper are made for a variety of average in-car speeds. The lowest of these speeds is higher than the average for my own driving in Canberra.

In this paper, the calculations of effective speeds are based on the following estimates of trip speeds in Canberra:

- Car – 45 km/h, 55 km/h and 90 km/h
- Bus – 25 km/h and 35 km/h
- Cycle – 20 km/h

The cycling speed assumes the cyclist is a regular commuter and hence is very fit. The bus speed of 25 km/h is based not on in-vehicle speed, but on the speed over an equivalent road distance that would be possible by car. Hence, the various detours on bus routes are taken out of the estimation of bus speed. ACTION Bus executives in Canberra estimate average Canberra bus speeds at 32 km/h (Barb Barrett, 2004, pers comm.).

Other time devoted to the transport

Car ownership and use necessitate a range of activities. Some of these activities have been included in Table 1, which depicts some of the calculations for "effective speeds". Not only must the car driver spend time 'in' the car, but anyone who drives a car must also devote time to getting to and from the car when it is parked. Most car owners devote time to cleaning their car, and time is needed to put fuel in cars. Getting a car serviced also involves a time cost: even if the owner employs specialists to do the servicing, the car has to be delivered to the service agent and picked up again. There are several other time costs that have not been included in the calculations (e.g. time spent paying insurance and registration bills and time spent purchasing cars).

Transport Monetary Costs
The effective speed calculations were based on NRMA car operating cost survey results, in which NRMA's motoring experts examined nearly 500 models of motor vehicle (NRMA, 2004). Operating cost calculations were based on:

- the average price for fuel in Sydney during May 2004 (e.g. unleaded at 99.2 cents per litre)
- depreciation
- registration
- interest on loans (as opportunity cost)
- insurance (for a driver 29-59 years of age with maximum no claim bonus)
- servicing and repairs.

The costs were based on an average mileage of 15,000 km for vehicles owned for a 5 year period. (Average costs for the entire vehicle fleet are likely to be lower than the averages for these cars.)

Note that these NRMA operating costs do not include a range of other costs that add to the cost of driving and are paid by individual drivers. Parking costs and fines for driving infringement (e.g. speeding) were not considered. Costs of any car accessories (e.g. car polish, seat covers, tow bars, baby capsules, child seats, windscreen covers) were not included. Some of these extra costs have been estimated in this paper, and added to the calculation of total costs of the car. (The external costs of motoring are not considered at all in the NRMA calculations.)

The figures used in this paper for car parking costs and for infringement fines are based on ACT Treasury data on revenue from car parking and infringement fines (Sinclair Knight Merz, 2004), averaged for Canberra drivers. The estimates for the cost of bicycles rely on information from several Canberra cyclists and is based on 'high-end' road bicycles. The monetary costs for bus passengers are simple to calculate: their only cost is bus fares. The bus fare was calculated using the cost of Monthly Adult Pre-purchased tickets ($80.50 at September 2004).

Other direct costs associated with car use have not been included in the calculations in this paper. These costs included those costs associated with the private garaging of cars and private driveways.

Time at work needed to pay for each mode of transport
The calculations of effective speed require the consideration of the time spent at work to earn the money needed to pay for all the costs of various modes of transport. The calculations here are based on "Average Full-time Adult Total Earnings" as at February 2004 - $40,100.60 after tax (ABS, 2004). Note that average earnings in Australia are lower than this, as not all employees work full-time, and not all employees are employed for a full year.

To calculate the time at work needed to pay for the costs, the total car costs are divided by the total net income. It is assumed that full time work equates to 38 hours per week for 48 weeks per year.

Table 1 provides data for a sample of cars currently available in Australia. The four cars selected for this paper are:

- an Australian made high-performance car (Holden Monaro) (the most expensive "Sports Car" listed in the NRMA survey, with a weekly operating cost of $265.53).

- an expensive and fuel-hungry large 4WD (Toyota Landcruiser Sahara). (This was the vehicle with the highest operating costs as calculated by the NRMA - $327.19 per week.

There may be other cars that have higher operating costs, but these were not listed in the NRMA tables).

- an Australian made 6 cylinder sedan (Falcon XT). The NRMA operating costs for this car, at $180.76 per week, were below average for the "large car" category. (Large car operating costs ranged from $160 per week for the Camry Altise to $255 per week for the Holden Calais.)

- a small four cylinder hatchback (Hyundai Getz). This car had the cheapest operating costs listed by the NRMA, at $105.84 per week.

Effective speed calculations for these four cars, as well as bus passengers and cyclists are shown in Table 1. The estimated effective speeds for these cars are presented in Figure 1. The calculations are based on an annual distance of 15,000 km. The only car that has a higher effective speed than the bus passenger and the cyclist is the Hyundai Getz. If the Hyundai Getz driver had to pay a moderate cost for parking (say $5 per day during working days), this would reduce the Getz driver's effective speed to 19.9 km/h (lower than the bus passenger at 21.3 km/h).

The Holden Monaro CV8-R V2 is a high performance two-door sports coupe, with a 5.7 litre V8 engine. In outright performance on a race track, this car would clearly be superior to the smaller Hyundai Getz XL 1.3 litre manual hatchback. The Monaro is capable of accelerating to 100 km/h in a time that is about 5 seconds less than the Getz. However, the Monaro Driver must spend an extra few hundred hours to 'buy' this 5 second advantage. The Monaro driver must devote 35% of his or her work time to paying for the car travel (compared to only 15% for the Getz driver). The driver of a Toyota Landcruiser may be faster over rough terrain than the driver of the Getz. But, for the time the average driver needs a 4WD drive, the Getz driver could leave the car behind and walk, and still have a speed advantage over the Landcruiser. (Compared to the Getz driver, the Landcruiser driver must spend an extra 524 hours at work to pay for costs associated with the car, not including any external costs.)

In city driving, an enormously powerful car is unlikely to provide any significant advantage. It may arrive at the next red light a couple of seconds earlier than less powerful cars. Its average in-vehicle speed (trip speed) will only be significantly faster if its driver is willing to break speed limits and ignore red lights. (There may be a time cost for this in terms of the time spent at work earning the money to pay for traffic fines.)

An apparent paradox exists wherein the higher performance cars (those with the highest potential speed on a race track) are the cars with the lowest effective speed.

The above calculations have assumed that a Hyundai Getz buyer has an income of $40,100 (after tax). But what if the Getz buyer is an 18 year old earning a respectable income (for that age) of $20,000? This person would pay more for insurance (about $1100 more) than the figure used in the NRMA calculations, and would also have a larger excess to pay in the event of an accident. The effective speed for such a driver, even in the frugal and inexpensive Hyundai Getz would be less than 15 km/h, slower than the cyclist, and much slower than the bus passenger. Such a driver would clearly be doing better on the bus, even before allowing for the external costs. If this person was to catch the bus instead of using the Hyundai, he (or she) would have a spare $6000 to spend on taxi fares home from their favourite nightclub.

What is the effect of a dramatic increase in trip speeds?

One way to increase in-car travel speeds, at least hypothetically, is to build dozens of new freeways to new dormitory suburbs, strung out close to these freeways. Commuters could drive for long distances at high speeds each day (at least till they reached a congested city centre or sub-centre). However, even if it is possible to double the average in-car speed, this will have minimal impact on the effective speed. In contrast, if we can significantly increase in-vehicle public transport speed, the majority of this increase is reflected in an increase in effective speed.

Table 2 shows the effective speeds of the four cars and the bus passenger, when trip speeds are increased by 10 km/h (to 55 km/h for cars, and to 35 km/h for the bus), and then to 90 km/h for the car and 45 km/h for the bus. Figure 2 illustrates the impact on effective speed of a 10 km/h increase in trip speed.

The most important point from these calculations of 'effective speeds' is that even if it is possible to dramatically increase the average in-vehicle speed for car drivers, this will have negligible impact on the effective speed of a car driver. However, the majority of any increase in the in-vehicle speed for public transport (or for a cyclist) will be reflected in an increase in 'effective speed'. For example, if a Monaro driver could increase his or her average in-car speed from 45 to 55 km/h, this would generate an 'effective speed' increase of a mere 0.9 km/h. Alternatively, if the speed for a bus passenger increased from 25 to 35 km/h, this would increase the effective speed of the bus traveller by 6.9 km/h. Even if the Monaro driver could achieve an average trip speed of 90 km/h, the effective speed would only be increased by another 1.9 km/h to 17.4 km/h. This is still slower than the bicycle with a trip speed of just 20 km/h.

The implications of this are profound. If our transport goal is to increase speeds (and I am not arguing that it should be), it is far more effective to spend money on increasing public transport speeds than it is on increasing car speeds. The majority of any increase in trip speed for public transport is reflected in increased 'effective speed'. This is reinforced by the fact that as public transport improves and more people switch to it, it becomes even more effective. The reverse is true for the car. The more cars that use the roads, the more congestion will slow cars and the higher will be the per kilometre running costs.

The above calculations are based on real costs using 2004 data. But what would happen to "effective speeds" if the costs of motoring were to increase, as they are expected to over coming years as a result of the looming oil vulnerability crisis (Robinson, 2002)? If fuel costs were to increase by $2 per litre, and if bus fares were to double, the effective speed of car drivers will fall significantly, while the speed of the bus user will fall only slightly. Using the trip speeds listed in Table 1, the Monaro driver's 'effective speed' (not considering external costs) would fall to 12.4 km/h, while the bus passenger would be travelling at an effective speed of 20.1 km/h (almost exactly the same as the Hyundai driver at 20.2 km/h).

Incorporating External Costs

The calculations outlined so far in this paper are based only on the individualised costs to motorists and public transport users. Mass car use also involves considerable external costs. One of the major external costs of mass car use involves the generation of greenhouse gas emissions. As well as greenhouse gas emissions, external costs include "costs for congestion, crash risk, roads and parking facilities, traffic services and environmental impacts" (Victoria Transport Policy Institute, 2003). These costs are difficult to measure, but are significant. They are not paid by individual drivers, but are shared by all users. Many of these external costs are not borne by today's generation: "their full effects felt only by subsequent generations" (Harris *et al.*, 2004). The magnitude of these costs indicates that "reductions in motor vehicle travel can provide substantial benefits to society" (Victoria Transport Policy Institute, 2003).

The health cost of transport related pollution, including in-car pollution is significant. Researchers are only just beginning to understand the full impact of pollution, and recent research indicates that “in-car air pollution may pose one of the greatest modern threats to human health” (International Center for Technology Assessment, 2000, 5). The number of deaths caused by transport related pollution are higher than the number of deaths from vehicle accidents (World Health Organization, 2002). The health cost of the lack of exercise associated with car use should also be considered (Vandegrift and Yoked, 2004) A detailed estimate of such costs is outside the ambit of this paper. We should, however, bear in mind that society pays a cost for the dubious speed advantages of mass car usage.

The calculations so far in this paper overestimate effective speeds, as they only look at internal costs (the costs borne directly by the user). It should also be noted that not all internal costs were included (e.g. costs of garaging the car were not included.) Non-users subsidise all users of motorised transport in Australia. The subsidy to road users has been conservatively estimated to be approximately $8 billion per year (Laird, 2000). If car drivers were required to pay the full cost of using their cars, including parking costs and the environmental and health costs associated with these cars, then their effective speeds would be even lower.

About 1/3 of total (car) transport costs are external in North America: " … user costs would need to increase 50% to internalise all costs" (Litman, 1999, 7). If we apply the same multiplier to the Australian case, effective speeds would be as low as 9.6 km/h (for the Toyota Landcruiser), and even the Hyundai Getz driver (at 19.1 km/h) would be going slower than a bus passenger.

Effective time loss for different transport modes

Public transport users have a particular advantage over car drivers in that they can use their time on the bus, the train, the tram or the ferry to do other things. This opportunity to use time in different ways is significant, as the following anecdote illustrates.

In late 2002 I took on a job that involved a substantial increase in time commitment. Our household had only one car, and I was commuting to work by bicycle or by bus. The commute took about an hour each way door to door (either by bike or bus). My wife and I felt that we needed to once again become a two-car family so that I could squeeze more work into every day. We went out looking for a second car.

While we were looking for a car I recalled a lecture I had given to my Transport Geography students on “Time Pollution” (Whitelegg, 1993a) and I reflected on just how little time (if any) I would save by getting a second car. I also thought about how I might be able to use my time in a bus, and soon decided that I could save more time by continuing to catch the bus to work, and paying for the occasional taxi when I needed to get home quickly late in the evenings.

I realised that I could use most of the bus journey for productive work: to read, to mark and to write. As a car driver I would need to concentrate fully on driving. On each bus trip, I can get about 30 minutes of effective work done on the bus. The trip by car takes 25 minutes door to door. Considering that about 10 minutes of the bus trip are devoted to walking, this means that less time must be devoted to exercise at another time. As a bus commuter I lose less ‘effective time’ than as a car driver. I also arrive at work less ‘stressed’ than the driver who has to cope with the challenges of peak hour traffic.

I have continued to commute to work by bus. Leaving aside the environmental and social arguments in favour of public transport, I can now see that catching the bus gives me more time to complete the tasks I need to do.

Policy Implications

Can we use the concept of effective speed to encourage people to use more socially and environmentally responsible forms of transport?

One way to make drivers more aware of the real cost of transport is to change the way they 'pay' for their use of the car: to shift from fixed to variable means of payment (e.g. from annual insurance and registration payments to weekly charges for fuel) (Sinclair Knight Merz, 2004, 6). This is known as the 'pay as you drive' strategy (Victoria Transport Policy Institute, 2004). If motorists had to pay several times as much for fuel, then any reduction in their mileage would be financially rewarded.

An alternative strategy to 'pay as you drive' is one that focuses driver's attention on their 'speed'. If we use the concept of effective speed, we can play on people's fascination with wanting to be the 'fastest'. Why would you drive a high performance car if it is (effectively) slower than a bus or a bicycle?

New cars in Australia now have stickers on their windscreens giving potential buyers information about fuel consumption and emissions (see Figure 3 for an example). This allows buyers to make a more informed decision about any trade-off they make between performance, economy and environmental impact.

If buyers find information on fuel economy of value, would they also find it useful to be told about the likely 'effective speed' of different cars? These effective speed calculations could be based on average full-time adult total earnings, as well as a thorough costing of the average costs likely to be associated with driving each vehicle (including the NRMA calculations of vehicle operating costs). Such information would clearly show that a Hyundai Getz is a significantly 'faster' vehicle than a Holden Monaro. Perhaps buyers should also be given indicative "effective speeds" for public transport in their city.

If potential new car buyers were presented with windscreen stickers showing "indicative effective speed", some of them may start to question their original decisions about which car they would purchase, and some may even question the decision to buy a car.

See Figure 4 for an example of an "indicative effective speed" sticker, providing information currently not available to drivers. This information could be presented as part of a package of information titled "effective economy".

A Geographic Perspective

> "Beyond a certain speed, motorized vehicles create remoteness which they alone can shrink. They create distances for all and shrink them for only a few" (Illich, 1974, 30-31).

A geographic perspective provides an important insight into the issue of speed in cities. Not only is the effective speed of car travel in urban areas lower than we may have thought, we now have to travel further to get to destinations <u>because of</u> the impact of the car. The number of vehicle kilometres travelled is increasing far more rapidly than other indicators; almost three times the rate of population growth in Sydney between 1981 and 1997 (Newton, 2004). Shops, schools and other services are now spread further apart than they were before cars became the dominant mode of transport. People have to travel further now to gain access to the goods and services that they need. This is largely driven by the apparent mobility advantages of the motor vehicle, which have led to the demise of smaller shops and services close to where people live. Not only do cars give us minimal (if any) advantage in effective speed over such modes as bus, train and cycling, but everybody is further disadvantaged by the extra distances that the car has created. "In the final analysis, the car wastes more time than it saves and creates more distance than it overcomes" (Gorz, 1973).

The Futility of Trying to Increase 'Effective' Car Speeds

Is it unfeasible to increase effective car speeds within cities? Ivan Illich (1974) believes that it is:

> "Unchecked speed is expensive and progressively fewer can afford it. Each increment in the velocity of a vehicle results in an increase in the cost of propulsion, track-construction and – most dramatically – in the space the vehicle devours while it is on the move … High speed capitalizes a few people's time at an enormous rate but, paradoxically, it does this at a high cost in time for all" (Illich, 1974, 29).
>
> "High speeds for all mean that everybody has less time for himself as the whole society spends a growing slice of its time budget on moving people" (Illich, 1974, 37).

The arguments and the statistics of this paper support Illich's arguments. Our effective speeds (as well as trip speeds) by car are likely to decline significantly over the next decade and beyond. Car running costs are likely to increase as traffic congestion grows and the oil vulnerability problem worsens (Bentley, 2002). Research by the Bureau of Transport Economics indicates that by 2015, Canberra will be the only city which can expect to be congestion free, while "congestion costs in Brisbane will exceed those in Sydney and Melbourne" (Newton, 2004). Under congested traffic conditions, fuel consumption is "approximately twice that under free-flow conditions" (Newton, 2004). Thus not only will in-vehicle speeds be lower in the future, but running costs will be much higher than they are now. Perhaps by 2015, our effective traffic speed will be back to the 1850's situation, when Thoreau recognised that walking was faster than motorised transport.

Conclusion

The concept of 'effective speed' should be seen as one (of many) ways in which to highlight the ineffectiveness of private motor vehicles as a form of mass transport, as well as highlighting the superiority of public transport (and cycling). The concept is simple, even though calculating 'effective speeds' for specific situations may be complex. Given that 'speed' is so highly valued in our society, if motorists can be shown just how slow they are 'effectively' moving, they may start to question their love affair with the car, and consider changing their transport behaviour in ways that will lead to a reduction in greenhouse gas emissions.

A Final Caveat

Having argued in this paper that the car does not save us time, I should end this paper by noting the dangers of an obsession with speed and with 'saving time'. If we wish to develop sustainable and livable cities, we should be developing cities where people have good access to local services and facilities, ideally within walking and cycling distance or within easy reach by public transport. Cities do not necessarily need 'faster' transport. They need transport that does not destroy our environment and which supports the development of a strong community.

Table 1: "Effective Speed" calculations for Canberra drivers, bus passengers and cyclists, based on average trip speeds of 45 km/h for car, 25 km/h for bus, and 20 km/h for cyclist.

	MONARO	LANDCRUISER SAHARA	FACLON XT	HYUNDAI GETZ	ACTION BUS	BICYCLE
Operating cost/fares	13807.56	17013.88	9399.52	5503.68	966	400
Infringement fines	104	104	104	104	0	0
Car parking	49	49	49	49	0	0
Accessories	200	200	200	200	0	100
Tolls	0	0	0	0	0	0
Total transport costs	14161	17367	9753	5857	966	500
Income	40100	40100	40100	40100	40100	40100
Work proportion for transport	0.353	0.433	0.243	0.146	0.024	0.012
Work hours per week	38	38	38	38	38	38
Work hours per year	1824	1824	1824	1824	1824	1824
Work hours to earn car expenses	644	790	444	266	44	23
Other time for transport (hours)						
Walking to & from vehicle *	30	30	30	30	60	30
Cleaning car	12	12	12	12	0	0
Repairs and servicing time	4	4	4	4	0	25
Buying fuel, checking tyres etc	4.5	4.5	4.5	4.5	0	0
Hours in vehicle **	333	333	333	333	600	750
Total hours devote to transport	1028	1174	827	650	704	828
Effective speed in km/h	14.6	12.8	18.1	23.1	21.3	18.1

* Based on estimate of 5 minutes per day for car driver and cyclist, and 10 minutes a day for bus passenger.
** Hours in vehicle based on average trip speeds of 45 km/h for car, 25 km/h for bus, and 20 km/h for cycling.

Table 2: "Effective speeds" of the four cars and the bus passenger, if trip speeds are increased by 10 km/h (to 55 km/h for cars, and to 35 km/h for the bus), and then to 90 km/h for the car and 45 km/h for the bus.

	MONARO	LANDCRUISER SAHARA	FACLON XT	HYUNDAI GETZ	ACTION BUS
Total hours if 55 km/h for car and 35 km/h for bus	967	1,113	767	590	533
Effective speed for above trip speeds (km/h)	15.5	13.5	19.6	25.4	28.2
Increase in effective speed for an extra 10 km/h trip speed	0.9	0.7	1.4	2.4	6.9
Total hours if 90 km/h for car and 45 km/h by bus	861	1,007	661	484	437
Effective speed for above trip speeds (km/h)	17.4	14.9	22.7	31.0	34.3

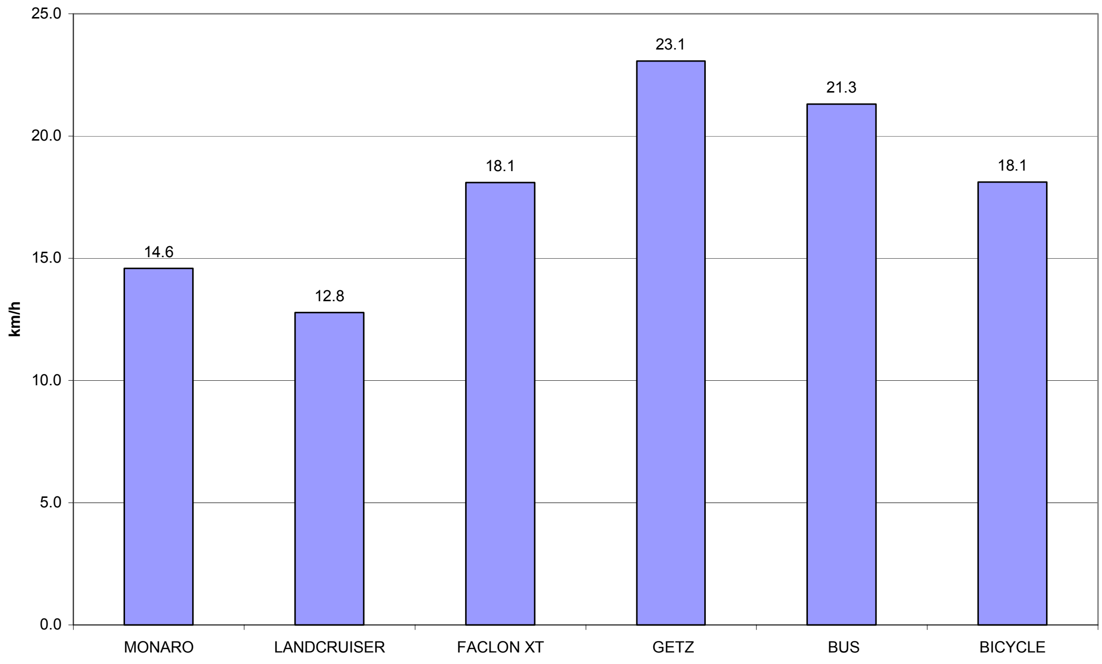


Figure 1: Estimated effective speeds for single occupant car drivers, bus passengers and cyclists in Canberra (not including external costs).

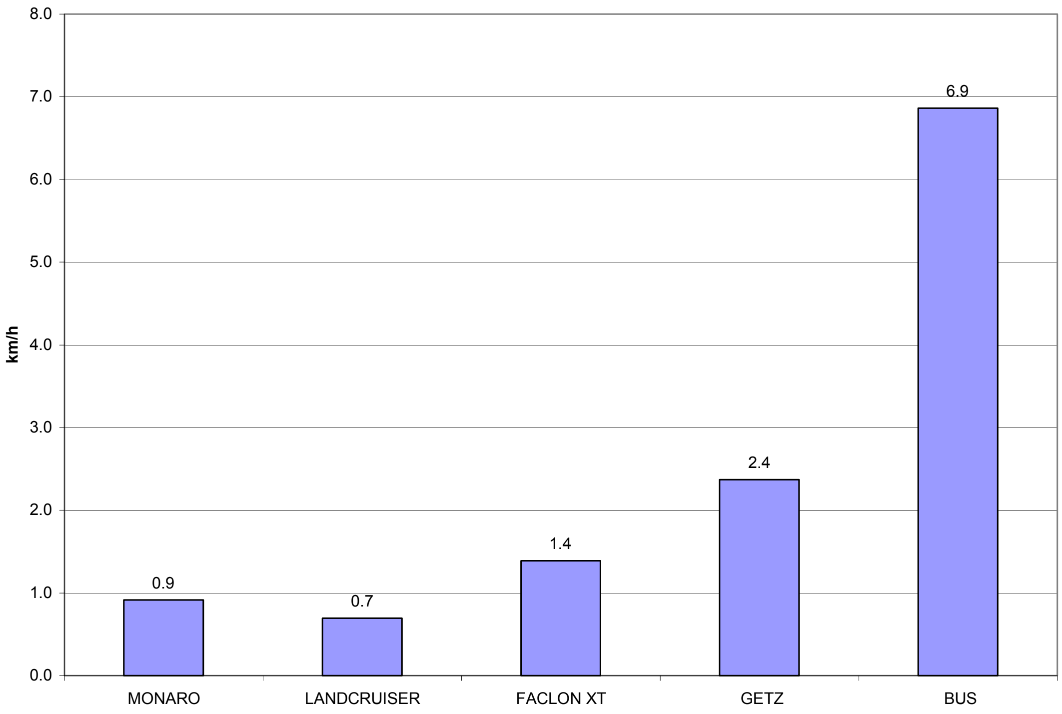


Figure 2: Impact on effective speed of an increase of 10 km/h in trip speed for car drivers and bus passengers in Canberra.

Effective Speeds: Car Costs are Slowing Us Down, Australian Greenhouse Office 2004,
www.greenhouse.gov.au/publications

Figure 3: Example of fuel consumption sticker from a new car sold in Australia

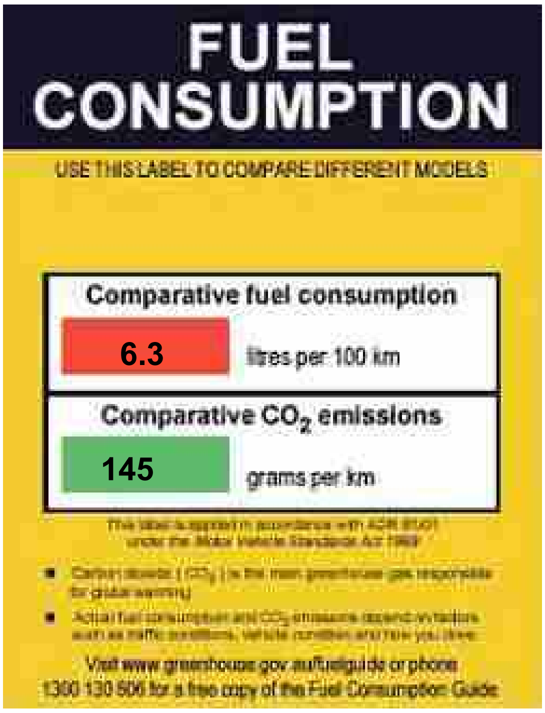
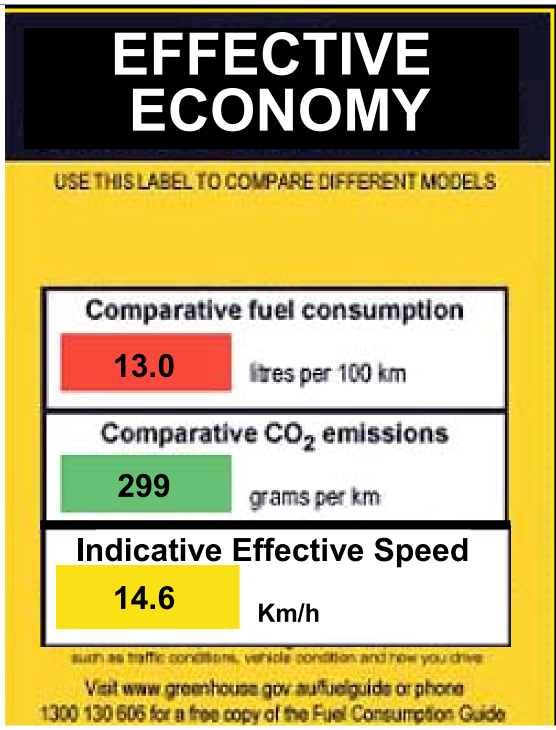


Figure 4: Mockup of sticker for new cars, showing "Indicative Effective Speed" as part of the "Effective Economy" information.



Effective Speeds: Car Costs are Slowing Us Down, Australian Greenhouse Office 2004, www.greenhouse.gov.au/publications

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