Unravelling Myths about Subsidies in Urban Transport

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Is urban public transport subsidised more than its private counterpart? Through a case study of urban transport in Pune, this article demonstrates that car and two-wheeler users receive larger subsidies than bus users when all costs imposed by transport modes are considered.

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This article challenges the popular perception that urban public transport, especially bus services in India are subsidised while cars and two-wheelers are not. It demonstrates through a case study of urban transport in Pune that a bus user is much less subsidised than a car or two- wheeler user when all costs imposed by transport modes are considered. In the process, it also examines some issues regarding municipal budgeting in Indian cities.

Costs Imposed by Urban Transport

Costs imposed by transport have been well studied in research [Lindberg 2002; Sen et al 2005; Shoup 2005; VTPI-TCA 2007]. For example, Litman lists 20 different costs in VTPI-TCA (2007). These include vehicle ownership, operation, road land value, road construction and maintenance costs, congestion caused, etc. Some of these costs are internal in that they affect only the user of the service without any impact on the rest of society, while many are external, i e, imposed by the user on the rest of society [Lindberg 2002; Sen et al 2005]. Thus, while the cost of owning a vehicle is internal, costs such as air pollution, congestion and safety risks are external as the rest of society is also affected by them, often more than the owner of the vehicle. Moreover, external costs differ across different modes of transport. For example, air pollution costs imposed by a car differ from those imposed by a bus. For this article, we define "subsidy" given to a mode as the sum of the external costs imposed (and unpaid) by the mode plus any explicit subsidy to the mode. Considering such externalities, which are typically ignored, drastically changes our understanding of subsidies.

Our primary interest is in exposing the relative subsidies enjoyed by the three modes rather than the actual values. Therefore, we perform a simple and approximate analysis to estimate some of the external costs that are usually not considered and arrive at roughly indicative numbers. Computing precise numbers requires more complex modelling [Sen et al 2005] that is beyond the scope of this article. We focus only on three modes of passenger transport, namely public transport buses, two-wheelers and cars. Moreover, we consider just the land and road construction costs.

Land Cost: Since land is a very precious urban resource, its opportunity cost is one of the costs of providing transport services.[1] For our purposes, we assume that road space is leased for transport services at a nominal rate of 3 per cent per annum.[2] We consider land used in two ways. The first is road land cost. This estimates the opportunity cost of land used to build roads. This cost is divided among different modes according to the amount of space they occupy at peak hours, since the amount of road space required is dictated by peak hour traffic. The relative road space occupied by each mode is obtained by multiplying its passenger car unit (PCU) number[3] with the share of vehicles of that mode in the total number of vehicles on road at peak time. The second is depot land cost. This is the cost of land given by the city to be used as bus depots. This cost is allocated only to the bus service.

Road Construction Cost: This covers the cost of building and maintaining roads. For simplicity, this cost is also divided among modes according to the space they occupy at peak hours, and ignores other factors such as the weight of vehicles, their speed, distance travelled, etc.

In addition to the two implicit subsidies considered above, we also consider the explicit subsidy given to the bus service. Therefore, the total subsidy (Rs lakh/day) availed by buses is the sum of the explicit subsidy, depot land cost and their share of road land and road construction costs. The total subsidy availed by cars and two-wheelers is the sum of their share of road land and road construction costs.

The percentage of passenger-km travelled by a mode is calculated from the available data for the percentage of vehicle-km travelled by the mode and its average occupancy. The subsidy per passenger-km for a mode relative to buses is obtained by dividing the total subsidy availed by a mode by its percentage of passenger-km and scaling it relative to the subsidy received by buses.

Table 1: Relative Road Space Occupied

	% of Total Vehicles on Road at Peak Hours	PCU	% Space Occupied at Peak Hour
Cars	17	1.00	22
Two-wheelers	71	0.50	46
Bus	2	3.00	8
Autorickshaws	6	1.00	8
Others	4	3.00	16

Table 2: Relative Passenger-km Travelled by Different Modes

	Average Occupancy	% of Total Vehicle Km	Passenger-Km (%)
Cars	1.2a	30	13
Two-wheelers	1.2b	55	24
Bus	25c	6	56
Autorickshaws	2	9	7
Others	0	0	0

(a) This figure is taken from Badami et al (2004).
(b) This figure is considered equal to that of a car, thought it would be lower.
(c) Pune buses have a load factor of 51%. Thus 25 is a conservative estimate of occupancy per bus.

Users (of both private and public transport) pay only a small fraction of these costs as price through a one-time vehicle registration tax, octroi on fuel, parking fees where applicable and (part of the) bus ticket fare.[4] The price paid being a small percentage of the total cost, it is appropriate to treat the entire cost considered here as a subsidy.

Subsidy Calculations

Costs: Pune has 10.4 sq km of land under roads [Environmental Status Report (ESR), Pune 2007]. Valuing commercial land in Pune at a conservative Rs 20,000 per sq m, the total road land cost for Pune is Rs 171 lakh/day. We consider the average of the amount explicitly spent on/allotted to road works in the last three years by the Pune Municipal Corporation [PMC Budget 2008-09].[5] This comes to an average of Rs 566 crore per year or Rs 155 lakh/day.

About seven acres of land are being used by Pune's bus service Pune Mahanagar Parivahan Mahamandal Ltd (PMPML) for their depots. So, the depot land cost is Rs 0.52 lakh per day. The explicit amount allocated for PMPML is Rs 25 crore or Rs 6.85 lakh/day (ibid).

Vehicle Data: Table 1 calculates the relative road space occupied by different modes using data from Pune City Development Plan [Pune CDP 2006]. This data is based on a detailed survey carried out in Pune in 2005. The PCU numbers are standard in transportation literature.[6]

Table 2 presents each mode's share of passenger-km, calculated from its share of total vehicle km (ibid). For simplicity, we assume that "other vehicles" do not carry any passengers, since our interest is in the other three modes.

Analysis Findings: Using the data for Pune, the total subsidies per day and relative subsidy per passenger-km can be calculated for each mode. Figure 1 (p 39) presents the overall subsidy enjoyed for each mode and Figure 2 (p 39) presents the relative subsidy per passenger-km for them. The following observations can be made from this. First, using just the external costs considered here, the total subsidy per day amounts to Rs 333 lakh, out of which explicit subsidies account for less than Rs 7 lakh a day – only 2 per cent, while the remaining 98 per cent is an implicit subsidy.

Second, comparing the total subsidy across modes, buses are subsidised about Rs 33 lakh per day, while cars are subsidised Rs 72 lakh and two-wheelers Rs 151 lakh. That is, two-wheelers as a mode receive 4.6 times the subsidy buses get, while cars get 2.2 times that. However, note that two-wheelers also carry about twice as many passenger-km as cars, as reflected in the per passenger-km subsidy analysis which follows.

Third, making a comparison on a per passenger-km basis, two-wheelers are subsidised 10.4 times as buses and cars are subsidised 9.2 times. It is slightly counter-intuitive that two-wheelers are subsidised more per passenger-km than cars. We believe this is because both the costs we consider are determined by the share of the mode in peak hour traffic and it is likely that cars use roads more in off-peak hours (such as the cars ferrying business process outsourcing (BPO) employees).

The data we use is from 2005 and the number of cars on road (at peak and non-peak hours) has grown faster than the number of two-wheelers since then. Therefore, it is likely that even for these two costs, cars are more subsidised if one could use current data. Moreover, if one considered only the peak hour passenger-km by different modes, cars would be more subsidised than two-wheelers and buses would be far less subsidised than seen here. This is because bus occupancy at peak hours is more than 100 per cent rather than the 50 per cent considered here while car and two-wheeler occupancy would be pretty similar and peak hour passenger-km by two-wheelers would be considerably more than cars.

Discussion

The most obvious conclusion is that public transport buses are far less subsidised than private motorised transport, both in absolute terms and terms of per passenger-km. This is highly regressive considering that cars and two-wheeler users are generally more affluent than bus users [Badami et al 2004; Baker J R et al 2005].

Moreover, 98 per cent of the subsidies considered are implicit. While the entire subsidy to cars and two-wheelers is implicit, only 80 per cent of the subsidy to buses is implicit. This explains the popular perception that public transport is subsidised while private transport is not because the only small visible element of the subsidy applies to buses while the much larger hidden subsidy is consumed mainly by cars and two-wheelers.

Other Costs: We briefly examine whether considering other costs paid by users of cars, two-wheelers and buses change the analysis conclusions significantly. A more detailed analysis is beyond the scope of this article. Some external costs not considered by us are now discussed.

First, cars and two-wheelers impose a greater air pollution cost than buses, both overall and per passenger-km. This cost includes the cost of healthcare due to respiratory illnesses, cost of lost productivity due to illnesses, etc. Second, cars and two-wheelers impose a far

greater congestion cost in terms of lost time and productivity than buses [Singh 2005]. Third, per passenger-km, the fuel consumed by a bus is 30 per cent of a two-wheeler and 10 per cent of a car. Therefore cars and two-wheelers threaten our energy security much more than buses, especially in the era of $ 130 a barrel of crude oil.

Fourth, cars and two-wheelers also use a lot of precious urban land for free or extremely cheap on-street parking. Apart from the land cost, such parking also imposes additional congestion costs. Fifth, cars and two-wheelers are also responsible for much greater numbers of fatalities [Mohan D and Tiwari 1999] and injuries per passenger-km than buses. Typically, these costs are almost never borne by users of the car or two-wheeler, imposing further costs on society. Finally, road infrastructure (used largely by cars and two-wheelers) often marginalises non-motorised modes such as walking and cycling, which are both the cleanest and most used by the poorest sections of society. This is in spite of the fact that 37 per cent of the total trips undertaken are on foot and 18 per cent are by bicycle [Pune CDP 2006].

So, considering all other external costs will only increase the subsidies to cars and two-wheelers vis-à-vis buses.

JNNURM and Other Special Expenses: Pune's budget for 2008-09 allocates about Rs 425 crore for projects under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and a proposed special purpose vehicle (SPV) for "public transport and special projects". These are not included in our calculations due to difficulties in distributing this amount across modes. However, as with the other costs, it seems likely that the implicit subsidies to cars and two-wheelers will only increase if these expenses are considered. For example: the proposed SPV lists about 40 items (with no budgetary break-up) out of which as many as 36 items are exclusively related to building roads, flyovers and tunnels while only four are related to public transport. As seen earlier, such road infrastructure is more beneficial to cars and two-wheelers than buses. Moreover, flyovers and elevated roads, which form 22 of the 40 items are used almost exclusively by cars and two-wheelers rather than buses.

In addition, the total cost of JNNURM approved bus rapid transit (BRT) phase I project is Rs 476 crore.[7] Of this, Rs 259 crore or 54 per cent is meant for building a river-side road, presumably for all modes of transport, thus further increasing the implicit subsidies to cars and two-wheelers.

Further, the BRT expense on other roads will also not affect the overall analysis much for two reasons. Firstly, even upon completion the proposed BRT network will occupy less than 10 per cent of Pune's road length. Secondly, even on BRT roads, the infrastructure built benefits all modes since it aims to streamline traffic by separating modes.

Municipal Budget Analysis: A detailed scrutiny of Pune's municipal budget [PMCBudget 2008-09] throws up some other interesting observations and priorities in municipal spending over the same three years considered for road construction expenses 2006-07, 2007-08, and 2008-09.

One, the road related expenditure is not easy to find in the budget document as it is distributed under several heads, including some unexpected ones. Some analysis reveals that the total road related expenditure (roads, signals, dividers, lighting, etc) is as high as about 44 per cent of the budget on average over the last three years!

Two, the average expenditure for primary education, secondary education, public healthcare and public hospitals combined is Rs 58 crore. In contrast, the total annual subsidy to cars and two-wheelers from just road construction and maintenance is Rs 388 crore – nearly seven times the amount spent on all those social services together.[8]

Three, the average expenditure for public health (including hospitals, etc) is Rs 38 crore, about half the total expenditure for "traffic management" consisting of traffic signals, road dividers, etc. Given this, one wonders about the justification for privatising public hospitals citing lack of budgetary support and it is unlikely that such a fund allocation would stand a test of citizens' priority.

Four, it is strange that 36 of the 40 items listed under an SPV to improve public transport are aimed at improving road infrastructure that will benefit cars and two-wheelers more than public transport. Moreover, while the 36 road improvement projects are thought out in detail (for example, flyover near Mundhwa, tunnel work from Senapati Bapat road to Paud road, etc), the four public transport items are mentioned only vaguely (for example, just "metro railway", "mono railway" and "water transport").

Figure 1: Total Subsidy (Rs lakh/day)

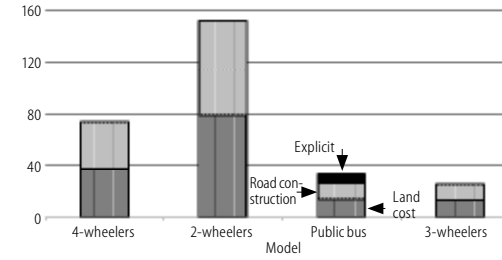
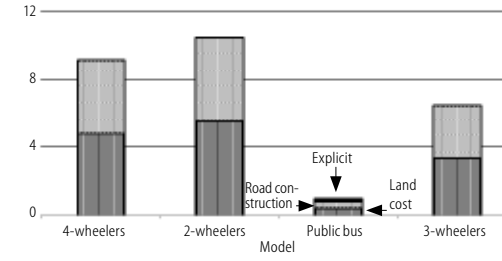


Figure 2: Relative Subsidy (per passenger-km)



Five, similar doubts also arise over the JNNURM budget. Though the JNNURM funds for transport projects are meant mainly for public transport improvement, a significant chunk of it is allocated to build a new riverside road presumably meant for all modes of transport.

Rational Pricing and Impacts

It is widely accepted that public transport requires lesser infrastructure, consumes less fuel and causes less congestion, pollution and accidents than private motorised transport. This is also reflected in documents of the Indian government [GoI 2006; Eleventh Plan Report (2006); GoI 2008]. Moreover, since public transport is often the only means of transport

accessible to the poorer sections of society, there is also a socio-economic justification for subsidising it.

However, our study shows that the average car and two-wheeler user is subsidised more than the average bus user through underpriced or free infrastructure. Such underpricing only increases the demand for cars and two-wheelers as they do not bear the full cost of the service [GOI 2006; MRTS 2006].

It is interesting to contrast the existing urban transport pricing situation with the electricity sector. The National Electricity Act and electricity reforms insisted on cost-based pricing in order to expose all the costs involved in electricity supply [E-Act 2004] in spite of the fact that this would affect the poorer sections of society the most. However, the urban transport sector seems to ignore cost-based pricing though the beneficiaries are the better-off sections of society.

If urban transport planning were to minimise the total (external and internal) societal cost, it would have the following advantages: (i) correct the regressive subsidies that exist today and make it fairer for the poorer sections of society; (ii) make more funds available for public transport; (iii) encourage greater use of public transport; (iv) provide the commuter a greater choice based on the true cost of each mode; (v) decrease the internal cost borne by each commuter, since there would be lesser need to invest in buying and running a vehicle; and (vi) greatly reduce the need for infrastructure expenses by the city.

This is not to say that public transport systems in India do not need improvement. In fact, they need drastic and urgent improvement. However, the ills of our public transport systems and their governance are separate topics, beyond the scope of this article.

But what is clear is that cars and two-wheelers getting greater subsidies than bus users cannot be justified on any economic, social, environmental or policy grounds. Therefore, there is an urgent need for correction in the structure of urban transport pricing in Indian cities. Different cities around the world have adopted different ways of addressing the hidden subsidies to private motorised transport. For example, London and Stockholm have introduced congestion charging. Singapore has severe restrictions on ownership and usage of cars, while Bogotá restricts their use on different days. Other pricing options available include road usage charges, fuel cess, greater vehicle taxes, unsubsidised parking etc. Each Indian city can and must choose the solution best suited to its local context from the available bouquet of options. As a first step, the city administration must explicate all such hidden subsidies and place them in the public domain. Thereafter, a transparent and participative process can help identify the best solution. This will not only send the right signals to transport users but also improve the city's economic, social and environmental health. In other words, rationalising the pricing can start off a virtuous cycle, which would be in the larger public interest.

Conclusions

This article exposes the hidden subsidies enjoyed by users of cars and two-wheelers, thus marginalising the needier sections. Since such a subsidy structure defies all rationale, there is an urgent need for reform in urban transport pricing in our cities. Rational pricing of urban transport can not only move people away from private modes to more desirable public modes but also help improve access and mobility of the poorer sections of society and provide more funds for other social expenses.

The analysis in this paper also highlights some misplaced priorities and a certain lack of transparency in municipal budgets. For example, Pune's budget allocates less money to public health than to providing signals at junctions and dividers on roads, and proposes an SPV ostensibly to improve public transport but actually containing a large number of road improvement projects that will primarily benefit private motorised vehicles. This highlights the need for greater transparency and public participation in municipal budget preparation, as this will help in allocating funds according to public needs and priorities and help citizens better understand how their money is being spent.

NOTES

1 For example, could the space have been better used for, say, a primary school or a public hospital?
2 The figure of 3 per cent is chosen to reflect a nominal lease rate of a non-depreciating asset.
3 The PCU number of a mode reflects the road space required for a vehicle of that mode, considering the road space requirement of a car to be one.
4 Other prices paid by users such as fuel, insurance, etc, are internal, i e, they do not compensate for the external costs imposed. Hence, they are not considered.
5 Note that this does not include many other road related expenses such as road lighting, signals, speed breakers, etc, all of which may contribute another Rs 150 crore.
6 We assume that all the "other" vehicles have a PCU of 3, to minimise the road space share occupied (and therefore subsidy enjoyed) by cars, two-wheelers and buses.
7 This is not the amount budgeted to be spent in the current year, which is only Rs 300 crore.
8 In comparison, buses get just Rs 44 crore a year.

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