Working Paper
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The views expressed are my personal views and not those of the Fare Revision Committee of the Government of Kerala of which I have been a member. Further, the views expressed in this paper are strictly those of the author and are not attributable to the RBI. I acknowledge the benefit of critical comments from an anonymous referee. Sections 2 and 6 have been revised substantially in the light of the comments.

ABSTRACT

The mainstay of the public transport system in Kerala is the private stage carriages (PSC), the economics of operation of which is the subject of this paper. The long run sustainability of the sector depends on the full recovery of costs. In the presence of fixed costs, there are various approaches to the full recovery of costs and Kerala has taken the approach of regular fare revision ostensibly to cover costs based on committee recommendations. Since 1999, fares are being revised on the basis of the National Transportation Planning and Research Centre's price index for stage carriage operations (PISCO) applicable in Kerala, which, it is argued here, is one of the causes of the poor sustainability of the industry. PISCO uses average kilometers run and average concessional load factor in the computation of fares, which leads to a situation of those running above average kilometers, and carrying below average concessional load factor making above average profits and others not covering their costs. The use of weighted load factor raises general fares with the travelling public, and not the society at large, subsidizing the concessional passengers. One of the solutions to this problem lies, firstly in moving over to two - part tariff and secondly to tax financing of student subsidy.

Key words: public transport, cost recovery, two-part tariff, tax financing, student subsidy

JEL Classification: L92, R 48

1. Introduction

Kerala is somewhat different from the other South Indian states in that the mainstay of the public transport system in the state is the private stage carriages (PSC). Whereas PSC is a very small percentage of the total number of stage carriages in Andhra Pradesh, Karnataka and Tamil Nadu, it accounts for about three fourths of the total number in Kerala. Considering the state of financial health of the Kerala State Road Transport Corporation (KSRTC) and its poor long time record of meeting the needs of the population, the compulsion to make the PSCs sustainable cannot be underestimated. This is all the more relevant as the trend the world over is to move away from public operators to private operators: Sweden, Britain, Denmark, and Norway have all moved this way preferring competitive tendering to bring down unit costs of operation (Hensher and Wallis, 2005). The maladies of the PSC sub sector could be arising due to the environment within which they have been operating, or the poor economics of their operation. A discussion of the economics of operation of PSCs is the subject of this paper. In particular, the effect of the pricing formula on the economics of operation is the main concern of the paper. Any discussion of the pricing of public transport cannot afford to ignore the issue of student fare and the associated subsidy. The paper ends with some suggestions to solve the problem of full recovery of fixed cost of PSCs drawing on the economic thinking that has gone into it over the last 100 and odd years.

The paper is organized in seven sections. Following this introduction, section 2 presents a brief account of the economics of full cost recovery when fixed costs are present. Section 3 is an exposition of price index for stage carriage operations (PISCO). Section 4 illustrates the variability in cost recovery for PSCs by kilometers run daily. Section 5 is a discussion of the options in fare fixation open to Kerala given the specificity of PSCs owned in ones or twos by individual entrepreneurs. Section 6 discusses the issue of equity arising out of cross subsidizing student fares and section 7 concludes.

2. The Economics of Pricing and Cost Recovery in Transport Industry

The inherent advantage of competition is that it provides consumers with choice and forces suppliers to provide their services as efficiently as possible. A potential problem is that in conditions of imperfections of the market, providers may not be able to supply the service at a competitive price which fully recovers the cost. If costs are not recovered, then in the long run sustainability of the industry would be at stake.

Economic theory tells us that when there are no fixed costs prices are kept at a minimum consistent with the suppliers recovering all costs in the long run. If there are no fixed costs, then marginal costs will be the entire costs of each unit of production. Once fixed costs are introduced into the situation, marginal costs are insufficient for capital cost recovery. This issue was intuitively considered in the mid-19th century and a solution was found in monopoly power needed to stimulate adequate investment.

> The monopoly power itself, however, was seen as needed to stimulate adequate investment, and without this guarantee of protection from competition it was felt that entrepreneurs would shy away from the sector. The result was either legislation that effectively gave monopoly power to a railroad company over a

certain jurisdiction but with rates of-return regulated so that excess rents could not be earned, or the taking over of railroads by the state (Button, 2005: p.243).

Many state governments in India have set up transport undertakings which are monopolies to address the problem. Karnataka, Tamil Nadu and Andhra Pradesh have followed such a path leaving few routes for private service providers. Kerala has, however, taken a route with monopolistic intent[1] but the Kerala State Road Transport Corporation owned by the government accounts for only about 25% of all the stage carriage buses in the state. PSCs account for the rest and are the mainstay of the public transport system.

The challenge confronting any transport supplier is how to ensure sufficient revenue is forthcoming to cover these costs (fixed) in addition to more traditional variable factors such as fuel. Various approaches have been adopted to cover costs:

Subsidies is one of the approaches used for long to recover the costs of capital. The argument is that once an investment has been made it is most economically efficient to maximize its use subject to the willingness of users to pay the 'incremental' costs of their actions. This has been the widely used policy for railways in Europe, and the United Kingdom in recent years with subsidized track being separated from commercially driven operations (Button, 2005: p.247). A problem with the system of subsidies is that it might lead to perverse incentives such as to resist pay rises for labour or to economise capital outlays. There is also a danger of rent seekers capturing the system, such as input suppliers inflating prices. A variety of mechanisms have evolved to contain these failures the details of which are not relevant here.

Monopolies can recover their full costs by either setting their prices or outputs. But there is a tendency for governments to intervene

1. The intent is evident from the nationalization of 31 major routes, for which PSCscannot get permits and can only enter and exit.

either through regulation or public ownership. There are also instances where government creates monopoly power; institutional monopoly comes through licensing or tendering out services. Licensing a set number of taxicabs in a city, or the tendering out of bus service are examples of institutional monopoly. A difficulty with monopolies is that of containing market power. Traditional rate-of-return (RoR) regulation which allowed prices to recover all costs together with a reasonable RoR was frequently captured by the industry or regulatory body that had a vested interest in avoiding confrontation. Various stakeholders exploited this situation.

Advanced revenue with capital adjustments is what many tour operators, contractual bus operators and freight railway companies in Canada and the United States of America resort to. Here the approach is to secure a more certain revenue flow and then to adjust capital outlays to earn a viable return.

Two, or multi-part tariff or separating out fixed from marginal costs and charging for each separately has been a standard way for many utilities to recover their full costs. In the case of telecommunications consumers normally pay an access fee and a usage fee. This is also common in many club memberships. Its successful use depends on both the relative importance of the capital element in costs and the frequency of use. When the service being offered is homogeneous and the use is regular and heavy it is most efficient (Button, 2005: p.255).

Thus, some mechanism has to be found to make the industry recover the cost and regulation is one of these mechanisms. As regards the transport industry in Kerala, regulation uses two instruments to achieve the objective of cost recovery or reasonable profit. Firstly, to run a transport service in a specific route a permit has to be obtained from the competent authority, namely the Motor Vehicle Department. By not allowing too many services to run during a specified time of the day, the limited passenger traffic is not distributed among too many operators

allowing for a minimum passenger load factor. Secondly, the passenger fares are not left for the market forces to determine; rather the state government regularly appoints committees to study the cost conditions and recommend passenger fares. These recommendations are generally accepted by the government and the service providers charge these fares.

In the context of full cost recovery a discussion of the concessional fare for students and the associated subsidy cannot be avoided. The rationale for the introduction of subsidy for student travel is to provide easy physical access to educational institutions for all classes of students. When the number of educational institutions was few and students had to travel some distance to access an educational institution charging fares lower than the general fare was one way to incentivize school education. The burden of subsidized fare cannot fall on the PSCs lest full cost recovery is affected. The alternatives then are either cross subsidization or tax financing of the subsidy. Both have their own welfare implications. In a situation when transport services are run by large monopoly fleet owners the subsidy can be directly paid to them as is done in Karnataka, Tamil Nadu and Andhra Pradesh. Such an option becomes administratively difficult when services are provided by PSCs owned in ones and twos by a large number of entrepreneurs. Some form of cross subsidization has to be resorted to. Kerala has adopted such a strategy.

We are not concerned with the issue of permits here. Turning to the fixation of the fares, it might not lead to the survival and growth of the industry if the principles of costing adopted are at variance with the accepted economic principles of costing. One important element here is the treatment of fixed costs of operating the service. The problem of transport pricing and cost recovery has to be solved within particular institutional and technological constraints. These constraints are often a combination of public subsidies, institutional monopolies and various forms of regulations. And there is no single way of recovering full costs.

3. Price Index for Stage Carriage Operations (PISCO)- An Exposition

In 1998, National Transportation Planning and Research Centre brought out a price index for stage carriage operations (PISCO) applicable in Kerala. The index considered eight factors which influenced the cost of operation of stage carriages. These components were: (i) fuel, (ii) lubricants, (iii) tyre and tube, (iv) spare parts and maintenance labour, (v) taxes and insurance, (vi) crew wages, (vii) cost of capital, and (viii) depreciation. Under each cost component, cost items are listed as shown in Table 1. For each cost item, unit quantity per kilometer is computed by taking an average yield (for fuel), average use (for tyre, tube and spares) and average kilometers run (for wages and tax etc.). For instance, 0.2222 is arrived at for fuel by dividing unity by 4.5 Kms assuming that a litre of diesel yields 4.5 Kms mileage. Similarly, a tyre is assumed to need retreading or replacement at the end of a run of 17,500 Kms showing the quantity per Km. of 0.000057142. For wages and salaries, the assumption made is that the bus needs four crew to run 250 Kms a day: 4 divided by 250 yields a unit quantity of 0.016. For tax, depreciation etc the denominator is taken as 82,500 Kms a year (250 Kms a day for 330 days in a year). The unit quantities were multiplied by the current price to arrive at the price index. The index value for 1996 was taken as the base year (9.821=100, not shown in Table 1) (NATPAC, 2010b).

There are two steps from PISCO index to the computation of passenger fare per kilometer. The ratio of the current year value of PISCO to its base year value is the correction factor used for raising the fare. The fare is computed by dividing the total operating cost per Km plus return on investment by the average equivalent passenger load factor (EQLF).The underlying assumption is that the passenger load should cover all costs and should yield a reasonable rate of return on the investment. As the student passengers pay only 25% of the general passenger fare, the equivalent passenger load is the sum of average

Table 1. Computation of Price Index for Stage Carriage Operations (Ordinary) in Kerala, 1996 and 2005

Component	Unit	Quantity per Km- 1996	Index value- 1996	Quantity per Km-2005	Index value- 2005
Variable Cost					
HSD	Litre	0.22222	7.5	0.25	8.4375
Lubricants- Engine oil	Litre	0.10125E-02	0.11036	0.0010125	0.11036
Gear oil	Litre	0.1875E-03	0.01818	0.0001875	0.01818
Sub total			0.1744625		0.1744625
Tyre-New	One set	0.57142E-04	0.4657143	0.57142E-04	0.4657143
Retread	One set	0.57142E-04	0.1114286	0.57142E-04	0.1114286
Sub total			0.5771429		0.5771429
Spare and maintenance					
Diesel engine	Number	0.4E-05	1.12	1.74008E-06	0.4872233
Starters	Number	0.1666E-04	0.1989	1.30788E-05	0.1560825
Sub total			2.97365		1.9418356
Wages and salaries- av wage	4 persons	0.016	1.880736	0.012848	3.2120153
Sub total			2.651833		4.4144557
Fixed Cost					
Tax		0.1212E-04	1.5185454	9.96198E-06	1.2480373
Insurance		0.1212E-04	0.1343758	3.44156E-05	0.3815312
Cost of capital		0.1212E-04	1.7913336	9.39897E-07	0.1389026
Sub total			3.4442548		1.7684711
Depreciation		0.1212E-04	0.8451879	1.22417E-05	0.8535877
All components			18.166532		18.167456
Index			184.9764		100

Source: NATPAC, 2005.

Note: The table in NATPAC 2010 is more detailed. I have not shown the entire table here but only some items under each head for illustrative purposes.

general passenger km per trip plus average student km per trip multiplied by 0.25. The assumption is that the carriage operator should get cost plus return on investment and if students pay 25% of the fare, then the other general passengers should compensate by paying more.

As regards minimum fare, NATPAC has the following to say, "Minimum fare is fixed by applying the basic fare rate to the average passenger lead distance in city ordinary services or a minimum distance of say 5-7 Km which will be determined by the Government as part of their fare policy" (NATPAC, 2010a: p.59). Fixation of minimum fare higher than the actual fare, it is said, is a convention followed in the state to "compensate for the losses due to giving concessional tickets to students by both KSRTC and private operators" (p.59).

The price index found its application for revising the fares in 1999 in Kerala. The passenger fare per kilometer was revised from 22 paise in 1996 to 28 paise in 1999 for ordinary/ city/ mofussil/ town services. The PISCO was updated in 2001 and the fare revised to 35 paise per Km from 1 October 2001. The next revision of PISCO was carried out in November 2003 and the fare revision occurred in August 2004; the revision of the fare being from 35 paise to 42 paise per Km. The next revision of the fare from 42 to 48 paise was effected in November 2005. Thus, the successive fare revisions since 1999 were based on the raise in the PISCO index.

In the meanwhile the PISCO index came under severe attack on account of the unduly large weight attached to the spares and maintenance component. While changing the base of PISCO from 1996 to 2005 the weights of spares and maintenance, crew wages, tax, insurance and depreciation were changed to make them more realistic (Table 1). Under the spares and maintenance, for instance, the weight of diesel engine changed from 0.4x10-5 to 1.74x10-6 and that of clutch plates from 0.1667x10-4 to 1.30788x10-5. As regards wages and salaries, the weights changed from 0.016 to 0.012848 for wages and from 0.016

to 0.034915 for gratuity. For tax and cost of capital, the weights changed from 0.1212x10-4 to 9.96198x10-6. The changes in weights for wages, tax, insurance etc came about because the kilometers run per bus in a year, which was assumed to be 82,500 in the 1996 year base index changed to 100,000 a year in 2005.

The 2005- base PISCO was used for the fare revision in 2008, the revision being from 48 paise to 55 paise per Km. As the price of diesel was reduced in February 2009 the value of PISCO index dropped by a few points and the fare was reduced to 52 paise. It was again increased in February 2010 to the level prevailing in 2008 following the 7% increase in the value of PISCO in February 2010 compared to the 2009 level.

Overall, the use of PISCO for revising the passenger fares of the stage carriages involves the following assumptions which have significant policy implications. Minimum fare is only the fare for the average lead distance in city ordinary services and it has no other economic significance. All the cost components including the crew wages, tax and interest are converted into per Km cost using an average run per day of 250 Kms initially (till 2005) and 300 Kms later. Per Km cost is translated into passenger fare by taking an average equivalent passenger load factor which builds cross subsidization into the formula leaving space for hardly any policy initiative.

4. PISCO related Profitability Factors

Part of the reason for the poor profitability of a large segment of the private stage carriage operators in Kerala is the PISCO and the fare computation method followed in the state. There are four or five specific ways PISCO affects the profitability: the use of average kilometers (250 till 2005 and 300 later) in converting the cost components into unit quantities in the index; converting crew wages, tax, insurance etc., into unit quantities as if they are variable cost components; using average EQLF for translating per kilometer cost into passenger fare; and building

student concession into the EQLF. This section seeks to elaborate these problems with examples.

Among the cost components shown in Table 1, high speed diesel, lubricants, tyre and tube, spare and maintenance vary with the kilometers run and are truly variable in nature. The more the kilometers run higher the total expenditure and it varies directly with the kilometers run. In other words the unit cost is constant. As regards the rest of the cost components, namely crew wages, tax, insurance and depreciation, the expenditure does not vary with the kilometers run a day (of course, within certain limits) - and that is exactly the reason they are called fixed cost- and the more the number of kilometers run a day the cost per Km becomes smaller as the fixed cost gets distributed over larger number of Kms. Under such conditions, when the average is taken to compute unit quantities those running below the average do not recover the fixed costs and those running above the average make supra profits, other conditions remaining the same.

Let us take the computations shown in Table 4.2 of NATPAC 2010a. It is shown that the total variable cost is Rs. 13.432 per Km and the fixed cost Rs 9.5912 per Km (taking a run of 300 Kms a day). The operator has to recover Rs 2877 a day to cover the full fixed cost including a reasonable return on capital; the variable costs are covered irrespective of the Kms run as they vary proportionately with the Kms run. The operator recovers the full fixed cost if the bus runs for 300 Kms a day. If the Kms run is only 200 a day, then the recovery is Rs 1918 and there would be a shortfall of Rs 959 a day. At the same time an operator who runs the bus for 400 Kms a day makes an extra profit of Rs 959 a day. There is no solution to this problem as long as the PISCO index is being applied for determining the passenger fares.

How seriously does the problem of average kilometers affect the profitability of PSCs? The current PISCO based fare fixation formula is inherently disadvantageous to private operators and advantageous to

KSRTC. In KSRTC, over two-thirds the number of all their services run for over 300 Kms a day whereas in the private sector 100% of their services run for less than 310 Kms. Over 50% of the services of private operators run less than 265 Kms a day: "Buses were operated between 220 Kms to (sic) 310 Kms daily … On an average they operated 263 Kms daily and 85876 Kms annually" (NATPAC, 2010a, p.12). Under the current fare structure almost all the private operators will run a deficit on their fixed capital account as hardly any one runs for over 300 Kms a day. A recent sample survey of the PSCs in Ernakulam showed that only 12% of all the buses in the district run for over 300 Kms a day. About 12% of the buses run for less than 200 Kms a day incurring a deficit on fixed cost of over Rs 959 a day. About 40% of the buses run on an average about 230 Kms a day incurring a deficit of about Rs 670 a day. Thus, the problem is serious and a solution to this conundrum cannot be found in the current formula.

Turning to the issue of minimum fare, the logic of its determination explained in the NATPAC Report is full of contradictions. It is not clear why the minimum fare should be fixed by applying the basic fare to the average passenger lead distance in city ordinary services? What has city ordinary services to do with the economics of mofussil services, or the profitability of stage carriages elsewhere? Why was the convention of fixing minimum fare higher than the actual fare introduced? If a convention does not make economic sense, then don't we have to do away with it? How did the question of minimum fare compensating losses due to giving concessional tickets to students arise? Where is the loss when in the first place the equivalent passenger load factor is used?

The cost of operation per Km is translated into passenger fare per Km by dividing the former by an average passenger load which takes the average student Km per trip of 6.29 and average general passenger Km per trip of 34.23. Since students avail 75% ticket concession and pay only 25% of the general fare, the Equivalent Passenger Load Factor

is taken as 35.8 (34.23 + 6.29x0.25). The problem with the average passenger load factor is that the average is influenced by large extreme values and often a large proportion of values at the lower end fall below the average. The large proportion of buses carrying passengers below the average will not be able to recover their capital cost. The problem worsens if the average load factor is low for those buses which run below average number of Kms a day. We illustrate the problem by taking the results of a recent survey of stage carriages operating in Ernakulam. The average number of passengers a day for a sample of 64 buses is 1145.48. But about 48% of the buses carry a passenger load below the average. They would not be able to cover their fixed costs. Almost all of them run less than 300 Kms a day leading to a double burden: the burden of lower Kms as well as lower passenger load. Of course, one could argue that those running less than 300 Kms a day might have a passenger load above average to compensate the lower daily run. But the Ernakulam survey shows that only about 25% of those running below 300 Kms a day get a passenger load above average. Thus, the double burden cannot easily be ignored.

The method adopted for converting per kilometer cost into passenger fare is by using the weighted load factor. In the current context when the average Student Passenger km per trip is 6.29 and the General Passenger km per trip is 34.23 (Total Passenger km per trip of apprx. 41) full fare is collected from only 35.8 Equivalent Passenger Load Factor(34.23 + 0.25x6.29). ***In essence this would mean the General Passengers have been paying about 13% more to compensate the concessional fare of 25% of the prescribed general fare paid by the students***. As the travelling public are mostly from the lower income groups- higher income groups have other modes of transport claiming more road space!- the better off in the society do not pay for the sustenance of the public transport industry in the state (see Section 6 for details). The reasonable returns on investment are assured by cross subsidizing the student fare by the non student passengers and not the general public.

The student fares have been frozen since 2001. The concessional fare, which was 25% of the prescribed general passenger fare between 1994 and 2001, became an even smaller proportion of the general passenger fare (Table 2). Currently, the per kilometer student fare is only about 15% of the general passenger fare and the minimum student fare is only about 12.50% of the minimum fare for the general public. The freezing of the concession fare and applying the weight of 0.25 in the formula of EQLF has meant that the general passengers continue to pay about 13% higher fare to compensate the loss on account of student concessions. The actual loss is slightly higher as the realization from the student travelers is only about 15% of the general fare as against the assumed 25%. This component of the loss is borne by the bus owners.

Table 2. Impact of Student Concessions on General Fare

Year	Student Fare as a % of General Passenger Fare		Impact of Concession on Passenger and Fare Loadings	
	Per Km. Fare	Minimum Fare	EQLF	Fare Loading
2001	25	25	35.8	13.18
2004	-	20		
2005	18.23	16.67	35.38	14.53
2008	15.91	12.50	35.23	15.02
2009	16.83	14.29		
2010	15.91	12.50	35.23	15.02
2011*	14.34	12.50	35.13	15.34

Note: * arrived at by taking a 10% increase in passenger fare. EQLF-equivalent passenger load factor = number of general passenger + (student fare proportion x number of student travellers); Fare loading is the proportion by which general passenger fares are raised to compensate for the loss on account of student concession.

In effect, the loss for the operators is higher as the last ten years have seen other categories of travellers being offered concessions, such as the physically handicapped, deaf and dumb and the mentally retarded. There is some estimate of these numbers by the KSRTC, which needs to be scrutinized; but the number of such concessional passengers other than students does not enter the Equivalent Passenger Load Factor.

The average student load used in the EQLF is about 15% of the total passenger load and like all averages this too would affect the profitability of the PSCs favourably or unfavourably depending on whether the students' share in the total passengers is lower or higher than the average. The problem would be serious depending on the variation in the students' share around the average. In the survey of PSCs carried out in Ernakulam district, about 31% of all services showed students' share to be above 15%. The problem would be mitigated to some extent if these services carried above the average number of total passengers. Unfortunately, about 17% of all services carried below the average number of total passengers and above the average share of students thus bearing a double burden. A further layer of burden is added by the kilometers run a day. About 80% of the services carrying above average share of students in total passengers also run for less than 300 Kilometers a day. These are important factors in the profitability and sustainability of the PSCs.

In sum, the major problem with the PISCO index and the method of computing passenger fare is that some of the basic economic principles have not entered it in any systematic way. The government too has not issued any policy guidelines to give direction to the method of computation. For instance, there is hardly any policy direction as to who should bear the burden of concessions to a whole class of passengers. An index not informed by policy guidelines or economic principles has played havoc with the profitability of an industry characterized by wide variation in the number of kilometers run a day, the number of total

passengers carried and the share of concessional passengers in the total and so on.

5. Some Options in Fare Fixation

How do we solve the problem of full cost recovery of fixed cost of private stage carriages in Kerala drawing on the economic thinking that has gone into the issue over the last 100 years or so (Section 2 above)? Given the structure of the transport sector in the state, dominated by private stage carriages largely owned in ones or twos by individuals, subsidy, institutional monopoly and advanced revenue with capital adjustments on a general scale are ruled out. However, each of them might be relevant and could have applications as we show below. That takes us to a consideration of two-part tariff, separating access fee and usage fee, linking the former with the number of users and the latter with the distance travelled by the passengers.

Minimum fare is computed so as to cover the fixed costs incurred in running the stage carriage services. These expenses are incurred to bring the bus on road as a stage carriage and include salary of staff, insurance, tax and capital costs including reasonable return on capital. These costs need to be shared by all passengers using the services and cannot be tagged to the kilometers run for the reasons already gone into in Section 3 above. Fixed costs- not just those listed in Table 1, we include wages and salaries, tax, insurance, cost of capital and depreciation under this head- per day as computed by different organizations are as follows: Rs 3235 (All Kerala Bus Operators Organisation- AKBOO), Rs 2635 (Kerala State Private Bus Operators Federation-KSPBOF), Rs 2907 (PISCO). This cost has to be shared by all the passengers on an equal basis. Then the information on total number of passengers travelling a day can be used to arrive at minimum fare as shown in Table 3.

An overall average number of passengers travelling a day cannot be taken for the computation of the minimum fare for the reasons already

elaborated in the earlier sections, namely that over 50% of the buses will be carrying passengers below the average and will not cover their costs. The Ernakulam survey suggests that only 5 out of 64 stage carriages carried less than 800 passengers a day. Hence, if we take 800 as the denominator for computing the minimum fare it would address the full fixed cost recovery of almost all private stage carriages. The small proportion that is disadvantaged- if for reasons beyond their control- may be compensated in other ways as elaborated below. The data available from KSRTC too suggests that 805 is the average daily passengers carried per bus in the three depots- Neyyattinkara, Kollam and Thiruvanthapuram- totaling 279 buses. In the case of KSRTC, average can be used as the problem of distribution among buses running varying kilometers or carrying varying passenger load does not arise.

The fare shown in Table 3 cannot be taken as minimum fare as any passenger entering a bus travels a certain distance, at least the first stage of up to 2.5 Kms, the fare for which also needs to be included in the minimum fare. At the current diesel prices and spare and maintenance charges the variable cost per Km, taking all the cost components in Table 1 not included in fixed cost as defined in the previous paragraph, would be Rs 14.05, which translates into a passenger fare per Km of 31 paise at a passenger load of 45. The minimum fare would, then, be what is shown in Table 3 plus 78 paise. Thus, whether we take the AKBOO cost or PISCO cost minimum fare of Rs 5 (4.04 +0.78 or 3.63+0.78) would fully recover the fixed costs of operation of private stage carriages.

As the minimum fare is the fare for Stage I (upto 2.5 Kms), the fare for each of the higher stages would increase by one rupee that is the fare for each stage of 2.5 Kms, as shown in Table 4. The one rupee increase for each stage leaves enough margins for about 25% increase in fuel costs in the months to come. In other words, another hike in per kilometer fare would become necessary only after a 25% increase in diesel price from its current level. Such a buffer is needed as the fare increase often takes place only many months after the hike in fuel prices.

Table 3. Computation of Minimum Fare (Fixed Cost Component)

Type of Service	Passenger Per Bus a Day (General + Student)	AKBOO- Rs 3235	KSPBOF Rs 2635	PISCO Rs 2907
Minimum Fare Computed without Student Concession				
Ernakulam City	1160 + 400	2.08	1.70	1.86
Thiruthipuram -Chalakudy	745 + 305	3.08	2.51	2.77
Palakkad- Nemmara	785 + 295	3.00	2.44	2.69
KSRTC Neyyattinkara	845	3.83	3.12	3.44
KSRTC TVM Long Distance	480	6.74	5.49	6.06
Ernakulam Survey	800	4.04	3.29	3.63

Table 4. Fare for the Different Stages, Existing and Proposed

Stage (Kms)	I- 2.5	II-5.00	III-7.50	IV-10.00	V-12.50	VI-15.00	VII- 17.50	VIII- 20.00
Existing Fare (Rs)	4.00	4.50	5.00	5.50	7.00	8.50	10.00	11.00
Proposed Fare (Rs)	5.00	5.00+1.00 = 6.00	5.00+2.00 =7.00	5.00+3.00 =8.00	5.00+4.00 =9.00	5.00+5.00 =10.00	5.00+6.00 =11.00	5.00+7.00 =12.00

It may not be the case that all the 8% of the buses who carry less than 800 passengers a day do not fully recover the fixed costs. Some of them might not be incurring the total amounts of fixed costs as listed above for the simple reason that their seating capacity is less than what is taken as the standard. The information provided by a sample of private stage carriage operators in their quarterly returns as per Rule 158 MV Act suggests that over 50% of the buses have a capacity (sitting plus standing) less than 44, and a quarter of all less than 33. Fixed costs in such cases are less. Private stage carriage operators have the option of plying smaller buses in routes with lesser number of passengers.

Another option recommended for consideration is the night and early morning services with enhanced fare structure. It is generally seen that PSCs are averse to run services during early hours and late evenings, which could be owing to poor revenue collection. An enhanced rate structure might partly solve this problem as with less number of passengers the collection could be higher. The available information on other modes of travel used by passengers, number of services curtailed owing to poor custom, the increased traffic etc are too scanty to arrive at an informed rate structure. All that can be attempted is to begin something on an experimental basis and wait for the response of the travelling public and service providers. Such an experiment could be on the lines of 25% higher fare on all ordinary services beginning 8PM and ending 6AM.

There are two important implications of fixing minimum fare to cover fixed costs:

(i) Once fixed costs are removed from the per kilometer rate and hence passenger fare per kilometer, it is much simpler to relate diesel price hike to passenger fare as over 70% of the variable costs are accounted for by the fuel cost. Then a 10% increase in fuel price will be compensated by a 7% increase in the passenger fare with the minimum fare unaffected. The share of fuel cost in

total variable cost is bound to go up as the diesel pricing system moves away from the administered price system and it is important to move towards a simpler system of kilometer fare fixation without waiting for the recommendations of a committee.

(ii) Minimum fares affect the revenue of the city and mofusil services more than the longer routes. It is seen that around two-thirds of all the passengers in the city services travel up to 5 Kms or first two fare stages, whereas the share of the first two fare stages is less than 25% in longer routes and around 50% in mofusil routes. Consequent to such predominance of short distance passengers in city services it is often sensible to keep the minimum fare low to encourage more travelers in that category; or to get people shift away from private modes of transport, such as auto rickshaws for better traffic management and reduce congestion. Various policy instruments are available to achieve this goal: capital subsidy by the local governments (the argument of the JNNURM for the Municipal Corporations to share 10% of the capital cost) is one such. Similarly, if a particular local body wishes to subsidise students from the locality or workers commuting, then it could consider capital subsidy, or pay the vehicle tax in return for a reduction in the minimum fare in that route (See Appendix I for detailed computation).

6. Student Concession and Passenger Fare

Concessional fare for students in public transport serves a social purpose by providing physical access to education to a whole class of students. As the burden of the subsidy cannot be borne by the PSCs lest cost recovery is affected, it has to be borne either by the government or the travelling public. Kerala has gone for cross subsidization by using EQLF in the fair fixation formula. By its very nature any system of cross subsidization leads to income redistribution with welfare implications.

In order to understand the income redistribution effect of cross subsidization it is necessary to characterize the population dependent on public transport in Kerala. When the concessional student fare was introduced in 1963 the travelling public was almost entirely dependent on public transport with few private vehicles on the roads of Kerala. In 1965-66, in Kerala for every one stage carriage there were only about four private cars and one motor cycle. Thus, the travelling public which cross subsidized the student fare was more or less the same as that which benefited from the subsidy with little scope for redistribution. More or less the same picture existed even in the early 1990s. In 1990, for every one stage carriage there were only about eight private cars, 16 motor cycles/ scooters and about four auto-rickshaws in Kerala. By 2009, the proportions have changed drastically: for every stage carriage there were about 51 private cars, 195 motor cycles/ scooters and 28 auto-rickshaws. It may be inferred that a sizeable proportion of the adult population from among the middle and upper income groups who were earlier dependent on public transport is no more dependent on it. However, the poorer segments of the population continue to be dependent on public transport. Their use of public transport must have increased with the increase in the level of urbanization and shift to more service sector employment. As a sizeable proportion of students belonging to the non- poor groups use public transport, the poorer segments of the adult population who use public transport may be paying for their travel.

How much more do the general passengers pay to cross subsidise student concessions? The minimum fare for students, which was set at Re 0.50 in 2001, has not been revised for over 10 years. It is a big drain on the shorter routes as the number of students traveling in the first two fare stages would almost equal the number of general passengers in a number of routes. When minimum fare is set to cover the fixed costs as shown in Table 3, the student concession causes the general fare to go up by over 15%. Taking the average number of passengers travelling in

a day to be 800 and the student share to be 15%, at the current concession fares the minimum fare would go up by 15%, that is 3.63 to 4.19.

There are two major implications of the current Kerala Pricing Model:

(i) As the EQLF is arrived at by weighing concessional passengers at 0.25 of the adult general passengers, the burden of full recovery of the cost of running the bus falls on the general passengers who pay fares about 15% higher. The general travelling public by paying higher fare subsidise the concessional passengers; the bus owners or KSRTC do not bear the burden. This is most iniquitous, as such burden, often called social cost or social responsibility, should be borne by the society at large and not the poorer segment of the population who have to depend on public transport. The richer segment of the population owning private transport vehicles not only use more of road space and cause more pollution, but also do not bear the social responsibility!

(ii) The use of EQLF to translate the per kilometer cost into passenger fare leads to inequity among the stage carriage operators. Those buses carrying the passenger load in accordance with the EQLF would meet the cost and make a normal profit. Those who carry below the EQLF of 35.8 would make a loss and those who carry above the EQLF of 35.8 would make supra profits. One is not referring to the lower or higher load owing to competition or nature of the route. An example will clarify this issue. Suppose two buses A and B both carry 41 passengers. Suppose bus A carries 30 general passengers and 11 students (EQLF of 32.75) and bus B carries 39 general passengers and 2 students (EQLF of 39.5). Both the buses carry the same number of passengers but bus A would make a loss of 10% and B would make a supra gain

of 10%. The problem is greatly minimized when stage carriages are operated by fleet owners (such as KSRTC). The formula such as EQLF does not allow for transfer from gainers to losers to equalize earnings of stage carriage operators.

It is imperative to do away with EQLF and use the passenger load factor to convert the kilometer rate into passenger kilometer fare. This in essence is moving away from cross subsidization to tax financing of student fare subsidy. Such a move will eliminate both the issues raised above, namely (i) and (ii), general passengers subsidizing the concession fare of the students and some bus owners gaining and others losing on account of carrying different proportion of the total load as concession load. However, this solution would lead to two new issues: (i) how should the student concession be implemented? and (ii) what should be the system of reimbursement?

There are a few well known methods which could be adopted in the implementation of the student concession scheme:

(i) One of them could be to issue vouchers to all eligible students who will have to present them to the bus conductor during travel. The bus conductors present the aggregates of these vouchers to designated offices of the government to collect the equivalent cash. The Department of the Government which finances the scheme will have to make the cash available. The advantage for the students is that they could travel with dignity in any bus running in the route concerned. The disadvantage of such a scheme would be that it is administration intensive as the vouchers will have to be distributed in the first instance, collected by the conductors and then again to be presented, verified and reimbursed. The cost of administration could be very high and further that there could be scope for manipulation.

(ii) An alternative could be a web-based registration of all eligible students with the stage of travel and the bus entered at the time of

registration. An identity card could be issued to the students with these details and it would be obligatory for the bus specified in the card to carry the students. The students cannot avail the concession in any other bus. The amount to be reimbursed can automatically be arrived at on the basis of the information available on the registration site. Reimbursement could also be carried out using electronic clearing system once the specified bus enters a bank account number on the site.

System (ii) could be extended to all other classes of concession travelers. The advantage of (ii) above is that at any point of time information on the number of students or others availing concession, the amount being reimbursed under each head etc., will readily be available.

7. Conclusions

The practice of combining fixed and variable costs to arrive at a per kilometer running cost taking an average daily kilometer run of stage carriages adversely affects their sustainability. The average equivalent load factor adds a new dimension pushing certain segments of PSCs further in the direction of a slide. The EQLF also introduces serious inequities placing the whole burden of concessional travel on the shoulders (pockets?) of the poorer travelling public. It is time a serious rethinking is done on these issues.

The system of two-part tariffs discussed here would go a long way in simplifying the system of fare fixation in Kerala. Relating minimum fare to the fixed costs of operation opens the gates for the local governments to participate in their traffic management. As shown in Appendix I, sharing part of the fixed costs by the local governments would lead to a substantial fall in the minimum fare taking traffic away from auto-rickshaws, motor cycles and cars reducing vehicle density considerably. It would be worth trying it on an experimental basis in

Thiruvananthapuram Corporation area for a few months. It is time the local governments also become part of the traffic management systems rather than putting the entire onus on the traffic police.

Instituting a system of public subsidies for student/ concessional travel would go a long way in dispelling the general feeling that carrying them leads to a loss, which in fact is not the case owing to EQLF. They would be treated with dignity once it is accepted that they too pay full fare, although indirectly. It would also provide a clear picture about the magnitude of the subsidy flowing into different groups of concession holders.

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Appendix I

Minimum Fare under Various Cost Scenarios

For ease of illustration of the minimum fare under various cost scenarios, we take the fixed cost per day with amounts (in Rupees) fairly close to reality (See Section 4, the NATPAC figure is Rs 2907) but rounded off to multiples of 800, or fraction of it as follows:

Salary	1600
Insurance	100
Vehicle Tax	300
Profit	500
Depreciation	300
Overhead	200
Total	**3000**

1. No Subsidy (Current Scenario): Fixed Cost per Day, Rs 3000
   Minimum Fare (Fixed Cost component) = 3000/800 = 3.75
   Minimum Fare (FC component + I Stage Km Cost) = 3.75 + 1.00 = 4.75 rounded of to 5.00

2. under Capital Subsidy: Fixed Cost per Day, Rs 3000 - 500 - 300 = 2200
   Minimum Fare (Fixed Cost component) = 2200/800 =2.75
   Minimum Fare (FC component + I Stage Km Cost) = 2.75 + 1.00 = 3.75 rounded of to 4.00

3. Under Capital Subsidy, insurance and Vehicle Tax Subsidy: Fixed Cost per Day, Rs 3000 - 500 - 300 -100- 300 = 1800
   Minimum Fare (Fixed Cost component) = 1600/800 = 2.00
   Minimum Fare (FC component + I Stage Km Cost) = 2.00 + 1.00 = 3.00

The implications of capital subsidy are interesting to work out. If the Municipal Corporation of Thiruvananthapurm decides to implement

subsidy under Scenario 3, then it would incur an expenditure of about Rs 5 crores per year on the 110 buses. The maximum fare for a 10 kilometer travel would then be just Rs 6 and most of the travelling public would travel by bus. Autorickshaws, cars and motor cycles would come out less and traffic management would ease greatly and so too vehicular pollution.

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