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Charles A. Lave

School of Social Sciences and
Institute of Transportation Studies
University of California, Irvine

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Institute of Transportation Studies
University of California, Irvine
Irvine, CA 92697-3600, U.S.A.
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TRANSIT DEFICITS AND PART-TIME LABOR: A CURE, OR ONLY A BAND-AID?*

Charles A. Lave
School of Social Sciences, and
Institute of Transportation Studies
University of California
Irvine, CA 92717

Introduction

The connection between labor work-rules and transit deficits has received a great deal of recent attention. In particular, the use of part-time labor has been widely advocated as a possible solution to transit's financial problems. Alas, it is not so.

This paper examines the potential savings from part-time labor and concludes that they cannot make a substantial reduction in the size of the transit deficit. Furthermore, and of greater importance, it seems possible that the contract concessions necessary to win the use of part-time labor will ultimately cost more than a simple continuation of current labor work-rules.

The paper also discusses the factors which have produced transit deficits. It is concluded that broad social forces outside the control of the transit industry are the major factors; hence it is unreasonable to expect the industry to solve the deficit problem.

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Some Background, and a General Principle of Cost-Cutting

The average U.S. transit agency covered only 53% of its operating costs out of fare box revenues in 1977.[1] A variety of ways of reducing this deficit have been proposed, but they can be usefully classified into two major categories: reducing costs of operation, or increasing revenues. The major component of operating cost is wages. The major determinant of revenues is passenger fares, since the number of passengers has been relatively stable over this period. Over the recent past, 1970-1976, transit wages rose 47% faster than the cost of living, while transit fares fell 13% compared to the cost of living.[2] Such a large imbalance between input costs and revenues need not necessarily lead to deficits in an industry, if they can be accompanied by very large increases in labor productivity. However, all published calculations of productivity within the transit industry show it to be either flat or declining.[3] Obviously then, given these simple facts, transit deficits must increase.

The transit industry and UMTA have worked diligently to deal with these financial problems, and a variety of cost cutting techniques have been tried: improved scheduling of bus maintenance, management by objectives, better fare collection systems, etc. Unfortunately, none of these innovations has made a significant impact on the cost problem, and to understand why this is necessarily so, we must understand a generalization which I call The Law of Large Proportions. In its briefest form, this law states: The Biggest Components Matter Most. The most effective way to change something (like operating costs) inside a system is to concentrate on its largest components because a small improvement in a major component makes more difference than a large improvement in a minor component. The application of this law in transit is particularly striking because of the enormous difference in the relative size of the cost components: labor costs amount to 80% of the total budget, while the remaining 20% is split among expenses such as fuel, tires, and depreciation.[4]

Cost cutting efforts have often ignored this Law, and have been ineffective as a result. Ten years ago mini-buses were justified, at least in part, as a way of cutting costs; but what they do is economize on the smallest component in the system, depreciation cost, while totally ignoring the major component, labor cost. Likewise when planners decided to build a new generation of "economical" rail systems they ignored the fact that capital investment was the overwhelming cost component and operator labor only a small fraction of the overall cost. Rather than concentrating on decreasing the size of the capital component they actually increased it by adding automatic train control systems in a misguided effort to economize on the tiny labor component.

Reducing Labor Costs: The Problem of Peaking

The principal barrier to efficient utilization of labor is the peaked nature of transit demand; two-thirds of daily trips are carried during the rush hours. Since transit systems must employ enough labor and purchase enough buses to handle this brief peak load, and since the labor and buses must then remain underutilized for the major part of the day, transit systems are being forced to operate in a very uneconomic manner.

Furthermore, the concentration of demand during the peak period has become more pronounced over time. Peak to base ratios in transit rose from 1.8 to 2.04 during the 1960-1974 period, and consequently many buses are now in service for only six hours per day.[5]

A good deal of recent research has been done in England on the cost of serving peak hour passengers. A study in Bradford concluded that running a bus during the peak-hour cost 2.5 times as much as running day-base service because equipment and labor hired to serve the peak is underutilized the rest of the day.[6] Peak hour buses do operate with greater passenger loads, but even taking this into account the study concludes that day-base service covers 94% of its cost, while peak-hour service covers only 47% of its cost. Another study, in Merseyside, concluded that day-base operations earned a surplus of £ 2.73 per bus-hour of operation, while peak-hour operations ran a deficit of 43 pence per bus-hour.[7]

There are three possible solutions to lowering the costs associated with transit demand peaking:

1. The underutilized drivers can be put to work on non-driving tasks such as light maintenance, or clerical work. Or they can be used in non-conventional driving activities such as taxi services, charters, or school buses.
2. Contracts can be changed to permit the use of part-time labor. Management hires part-time drivers to cover the extra service needed during peak hours.
3. The peak/base ratio can be decreased by load-shedding, or reducing the number of peak hour transit passengers carried

on conventional transit systems and making greater use of para-transit modes like shared-ride taxis, van pools, subscription bus services, car pools, etc.

There has been little interest in the first solution, principally because of labor opposition, though some very small transit agencies do use it. There is little enthusiasm for the third solution because it reduces conventional transit service: it results in fewer driving jobs and fewer management jobs. Furthermore, some managers believe that the peak hour is their most profitable time of day and that loss of any peak hour transit service would cost money rather than save it. As a result, management has turned to the second solution, the use of part time labor, as a way of cutting cost. The potential savings from this option are examined below, and if the preliminary estimates are correct, it is not going to be possible to obtain major cost savings in this way.

Cost Savings Through Use of Part-time Labor

To date no property has had sufficient experience with part time labor to give a definitive estimate of the possible cost savings. However, three properties have made estimates of the magnitude of these savings.

Seattle METRO's new contract specifies that up to 50% of the total labor force may be part time drivers. Any part-time run is guaranteed a minimum of 1.5 hours of pay, and part-time drivers receive credit toward retirement, though they do not receive paid sick leave or vacations.

They estimate that when the new provisions are fully implemented it will reduce their operating costs by about 9%.[8]

Washington, D.C., METRO's new contract specifies that they may hire new part-time drivers up to 10% of the existing labor force. Any part-time run is guaranteed a minimum of 2 hours of pay, and part-time drivers receive fewer fringe benefits than Seattle. METRO management estimates that the use of part-time drivers will reduce operating costs by 1.3% in FY 1980.[9]

The third transit agency, which is about the same size as Seattle, analyzed the financial consequences of a potential new contract that made use of part-time labor. The agency assumed use of an unlimited number of part-time drivers, proportional fringe benefits for the part-time drivers, and proportionately higher supervision costs for the part-time drivers. The end result was a cost saving of about 2.5% of the total operating budget.

As part of their analysis, this agency also produced a number of simulated driver-schedules which we can use to explore the effects of load-shedding, that is, lowering the peak/base ratio. We compute the following results.

Base Line: peak/base ratio of 2.5, no part-time labor, and a relatively conventional set of work-rules.

Alternative #1: lower peak/base ratio from 2.5 to 2.0, but continue current work rules. Result: cost is 3.7% less than base line.

Alternative #2: peak/base ratio is unchanged, but work rules are altered to permit use of unlimited number of part-time drivers. Result: cost is 2.5% less than base line.

All three cases involve the same amount of transit service, that is, the same number of platform hours. The difference between them is in the part of the day in which the service occurs, and the kinds of drivers who perform it. The major conclusion from these simulations is that load-shedding accomplished a larger cost reduction than unlimited use of part time labor. Though highly interesting, these results must be qualified somewhat since the runcuts are only preliminary, and work is still in progress.

Viewed as a means of reducing transit deficits, the estimates from these transit agencies do not appear to be very promising: part time labor cut costs by anywhere from 1.3 to 9%. This is not a negligible savings, by any means, but neither is it going to remove the need for large, continued government subsidies of transit operations.

However, a major weakness of these savings estimates is that they take the existing vehicle schedules as a given and only optimize in terms of what is there, rather than optimizing the vehicle schedules to take advantage of the flexibility offered by part-time labor. It may be the case that these existing schedules provide more day-base service than is actually justified by demand conditions, because it is very cheap to do so: the vehicles have already been purchased to serve the peak and would otherwise be idle. Even the operator labor is essentially costless since operators hired to serve the peak are guaranteed eight hours of pay. Thus they might as well be utilized during the off-peak rather than be idle. In effect, the schedule has been adjusted to the work rules.

If these claims are correct, and off-peak service is more frequent than would be justified by demand conditions (or by reasonable policy-headways), then a combination of part-time labor and schedule reductions could yield much greater cost savings than the 1.3%-9% range given above.

Modelling the Overall Effect on Transit Costs

The kinds of labor changes I have discussed above can only be implemented through the collective bargaining process, the give and take of negotiation. If management wants the right to use part time labor it must be prepared to give up something that labor wants in return. The exact exchange will be determined by a variety of economic and non-economic factors too complex to model here. However, some insight can be gained by looking at the outcome of a greatly simplified version of the bargaining process.

Let it be assumed that the bargaining process will involve management trading a particular rate of future wage gains in return for labor giving management the right to use a certain proportion of part-time labor. For example, suppose that management wants to use part-time labor to operate trippers, and that this change would yield a 15% reduction in total driver pay hours. (The trippers currently cost about time-and-a-half because they are operated as "biddable trippers," or as overtime tacked onto the end of extra-board runs.) The union will oppose the change "because it takes away our overtime and gives it to the part-timers"; and they are likely to demand an increase in the base wage rate as compensation for the loss in take home pay. Management will probably be willing to give some increase in the base wage to compensate for the change:

after all, if they can win a 15% reduction in total driver pay hours then an increase of, say, 2% seems a reasonable tradeoff.

Obviously the same kind of bargaining, and the same arguments would apply to a situation where management wanted to use part-time driver to cover regular runs with very long spreads (hence high penalty payments); and the increase in the base wage would be compensation for reducing the driver's spread-penalty-income.

To evaluate the overall effect of these kinds of bargaining tradeoffs we need a model of transit operating cost so that the relevant short- and long-term consequences of the contract can be calculated. I develop such a model in the next section.

A Simple Model of Transit Costs:

In a survey of 36 transit properties, Sproull found the following median cost relationships:[10]

DC = driver's costs = .5 (total cost)

ND = non-driver labor = .3 (total cost)

M = materials and other non-labor costs = .2 (total costs)

Hence for a median transit property

TC = DC + ND + M

100 = 50 + 30 + 20

Assume that the result of some innovation is to reduce the number of driver payhours by <u>s</u> percent. Thus the new cost would be $(1 - s) \times 50$; also assume that each of the three labor components would normally be expected to grow by some yearly percentage rate, d and n, respectively;

where, for example, a 2% yearly growth in driver wages would imply $d = 1.02$.

Thus we can rewrite the equation as:

$$TC = d\,(1 - s) \times 50 + n \times 30 + 20$$

That is, a labor negotiation causes a one-shot reduction in driver pay-hours, and after that the components go on growing as usual.

Note that only the incremental increase over any trend increase in wages due to inflationary effects, maintaining parity with other categories of workers, etc. is modelled here. Additional coefficients to take account of inflation and general wage trends could be incorporated in the model, but this would only complicate the algebra without affecting the analysis. Thus a 1% wage increase in this model means a change of 1% over and above any general increase which labor would normally have expected to receive.

For purposes of this analysis we assume that $d = n$; that is, the yearly rate of wage increase for drivers and other personnel is the same. (In fact, sometimes the percentage increase for non-drivers tends to be even larger, as when a lump sum amount negotiated for drivers is given to other personnel as well.)

Thus the equation now becomes,

$$TC = d(\,(1 - s) \times 50 + 30) + 20.$$

Table 1 presents projected yearly costs from this model under a variety of different assumptions about the amount of savings to be realized from use of part-time labor, and a variety of assumptions about how much management will have to give up in the form of greater wage increases in order to obtain the right to use part time labor.

The first row shows the base case, where transit costs start out at 100 units at time zero and remain at 100 throughout the simulation, since only incremental costs are being modeled. In the first case, row 2, we assume that management wins the right to use enough part time labor to cut total driver pay hours by 10%; and that in order to win this right, management agrees to give the drivers a 1% per year greater wage increase than they otherwise would have done. Notice that in the first year, total costs have been cut to 95.8 units,[11] but also notice that they are growing; and by year number 7 are equal to 100.4 units, and hence total costs are higher under the new contract than they were under the baseline contract. Case #2, the third row, assumes that it is possible to reduce total driver pay hours by 15%, and that management agrees to give the drivers a 1% per year greater wage increase than they otherwise would have done in compensation. Case #3 assumes that a 20% reduction in total pay hours is possible, and that management gives up a 1% wage increase.

Cases 4, 5, and 6 show the results if managements gives up a greater wage increase, 2%, in order to obtain the right to use part-time labor. In each row we have underlined the year in which the costs under the new contract equal the cost under the base-line contract; and of course, for every year following that the new contract becomes progressively more expensive than the old contract.

The first six cases, rows 2 to 7, assume that the initial labor/management bargain goes on 10 years: every time the contract comes up for renewal, the argument comes up again--management asks to continue the use of part timers, and labor demands compensation for their loss of

TABLE 1: Net Effect of New Contract

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
BASE CASE: No wage increase, and no reduction in driver pay hours.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1% per year compensating increase in base wage:										
CASE # 1: 10% reduction in driver pay hours.	95.8	96.5	97.3	98.0	98.8	99.6	<u>100.4</u>	101.2	102.0	102.8
CASE # 2: 15% reduction in driver pay hours.	93.2	94.0	94.7	95.4	96.2	97.0	97.7	98.5	99.3	<u>100.1</u>
CASE # 3: 20% reduction in driver pay hours.	90.7	91.4	92.1	92.8	93.6	94.3	95.0	95.8	96.6	97.3
2% per year compensating increase in base wage.										
CASE # 4: 10% reduction in driver pay hours.	96.5	98.0	99.6	<u>101.2</u>	102.8	104.5	106.2	107.9	109.6	111.4
CASE # 5: 15% reduction in driver pay hours.	94.0	95.4	96.9	98.5	<u>100.0</u>	101.6	103.3	104.9	106.6	108.4
CASE # 6: 20% reduction in driver pay hours.	91.4	92.8	94.3	95.8	97.3	98.8	<u>100.4</u>	102.0	103.7	105.3
2% per year increase during first contract period, 1.5% during 2nd period, 1.0% during 3rd.										
CASE # 7: 10% reduction in driver pay hours.	96.5	98.0	99.6	<u>100.8</u>	102.0	103.2	104.1	104.9	105.7	105.7
CASE # 8: 15% reduction in driver pay hours.	94.0	95.4	96.9	98.1	99.3	<u>100.5</u>	101.3	102.1	102.9	102.9
CASE # 9: 20% reduction in driver pay hours.	91.4	92.8	94.3	95.4	96.5	97.7	98.5	99.2	<u>100.0</u>	100.0
2% per year increase during first contract period, 1.0% during 2nd period, zero from then on.										
CASE #10: 10% reduction in driver pay hours.	96.5	98.0	99.6	<u>100.4</u>	101.2	102.0	102.0	102.0	102.0	102.0
CASE #11: 15% reduction in driver pay hours.	94.0	95.4	96.9	97.7	98.5	99.3	99.3	99.3	99.3	99.3
CASE #12: 20% reduction in driver pay hours.	91.4	92.8	94.3	95.0	95.8	96.5	96.5	96.5	96.5	96.5

income. The realism of this assumption is obviously going to vary across properties. Rows 8, 9, and 10 show an alternative assumption: a 2% increase during the first contract (3 years), a 1.5% increase during the second one, a 1% increase during the third, and nothing from then on. That is, labor's bargaining power over this issue gradually declines as the industry becomes accustomed to the idea. Rows 11, 12, and 13 show the same concept, but with a faster rate of adaptation: 2% during the first contract, 1% during the second and zero from then on. The assumption of gradual adaptation in these last six cases causes the net-loss points to shift to the right, but most of the cases still do reach a net loss.

<u>Summary of Results: Part-Time Labor and Costs</u>

It can be seen that with the exception of only 3 cases, a seemingly important reduction in total pay hours during the first year is eventually wiped out, and ultimately the labor force makes even more money than it did before the new contract. Furthermore, in all of the cases the "compensating base wage increase" quickly wipes out a substantial fraction of the initial pay hour reduction.

In view of the projected range of savings from the use of part-time labor of 1.3% to 9% presented earlier, the cases in Table 4 whch seem most realistic are the 10% rows (Cases 1, 4, 7, and 10); and these cases all reach a net loss point within seven years.

The analytic point is that the savings that can be achieved through the use of part time labor are a <u>one-shot reduction</u>: yes, management can reduce driver pay hours the first year, but they cannot do it every year; whereas the wage rate increases go on compounding forever. And a further compounding effect is achieved through the way in which driver and non-driver wages tend to go up together in most properties.

From management's perspective the conclusion of the analysis would be something like this, "Any extra pay increase you give to obtain the use of part-time labor is quickly going to grow to haunt you; the savings from part-time operators are not large enough to allow this kind of bargain. Concentrate the discussion on the improvement in working conditions that will result from part-time labor. After all, overtime and premium pay were originally justified as compensation for undesirable work shifts; if hours can be made more regular then the reduction of 'compensating' pay is no real loss to the operators."

From labor's perspective the conclusion would be something like, "Give management the right to use part time labor if they wish, but above all, keep your eye on the operator wage increase itself. That is the important factor. Maybe you give up some operators now (insist that it be through attrition only), but if you trade this for a better yearly wage increase you will more than make up the difference eventually."

From society's perspective the results are simply discouraging. A 1.3%-9% cost reduction does not cure a 47% deficit. On the other hand, cost-cutting changes with greater result than this are rare in any industry; and such changes are clearly worth pursuing even though they will not cure the deficit problem. It must also be pointed out that society played the major role in creating the deficit in the first place, as will be seen in the next section.

Searching for a Villain: Labor, Management, or Society

The transit deficit has increased enormously over the past decade and is continuing to grow. To the extent that it is useful to look for a villain behind the deficits, we should be careful to remember that the major fault does not lie with management or labor, but rather with the new goals that society has assigned to transit: transit has been asked to solve the congestion and pollution problems by running more service during peak hours to attract commuters out of cars; it has been asked to solve the mobility problems of the transit dependent by running frequent service through low density suburban neighborhoods; and it is even asked to help solve the poverty problem by giving highly subsidized fares to the poor, and to senior citizens.

The end result of these new social policies is that transit revenues cannot keep pace with costs: 1) Fares must be kept low for everyone in order that they not harm the few poor people we are concerned with (no one has had the courage to try targeting the low fares to the relevant groups rather than shot-gunning them through the entire population); and 2) buses must run in low density neighborhoods where they cannot possibly attract enough patronage to pay their costs.

At the same time, these new social policies cause an automatic decrease in labor productivity: 1) The drivers who operate these low-patronage routes cannot possibly serve as many passengers per hour as they did in the "old days." 2) The increased social emphasis on diverting peak hour commuters onto buses creates a corresponding peaking problem in the demand for buses which, in turn, causes the scheduling of highly undesirable work shifts, and labor rightfully demands that these undesirable shifts receive extra pay compensation--either a bonus payment for working an 11-12 hour split day, or a make up payment to assure that they receive a full day's pay for their full-time job commitment even though management can only figure out how to use them for 6-7 hours per day.

Searching for a Villain: Bargain Fares and Excess Service

Since our conclusion from the analysis of part-time labor was that the deficit problem is not going to be solved from the cost side, we now turn to the revenue side of the picture. The factors behind lagging revenues are not difficult to find: first, despite greatly increased costs, transit fares have not even been able to keep up with inflation--they fell 13%, in real dollars, between 1970 and 1976.[12] Second, expansion of service into the suburbs has taken bus-miles of service from high density cities and moved it into low density neighborhoods where it cannot attract as many passengers per bus-mile: route-miles of service increased by 103%, while bus-miles traveled remained constant, during 1970-1976.[13]

Without question, raising transit fares and dropping low-patronage routes are the most effective, fastest actions that could be taken to reduce transit deficits. Yet these actions are rarely considered because of the political forces allied against them. Urbanists want low fares because they believe this will encourage commuters to switch to transit and hence preserve our cities. Environmentalists want low fares because they too believe that price incentives can get people out of cars, and hence reduce smog and energy consumption. Liberals want low fares because they are concerned about the budgets of poor people. And finally, even the transit unions want low fares because greater transit demand means more jobs. It seems likely that all of these groups are greatly overestimating the price elasticity of demand for transit services during rush hours and ignoring the fact that transit's greatest handicap, from the perspective of potential users, is not its cost but its slow travel times.[14] Also, as we have argued above, it makes little sense to subsidize the fare for everyone in order to help the few poor families who are our target; some kind of direct "user subsidy" would be far cheaper and more effective.

But in any event, if we make a conscious public decision to continue low fares and excess service, we may not then turn around and attribute the blame for the resultant deficits to "inefficient management" or "greedy unions." That deficit is society's fault, not theirs.

Conclusion

Part-time labor can reduce operating costs, though it is not going to be a panacea for the financial problems of the transit industry. Furthermore, the kinds of contract concessions necessary to win the use of part-time labor can ultimately cost more than the initial savings in operator costs. Hence, such contract changes must be approached cautiously, with very careful consideration of long term costs. Alternatively, it may be simpler to attack the peaking problem directly through load-shedding visa supplementary paratransit services.

Finally, no cost cutting measures are going to reduce the deficit to zero so long as transit is required to undertake so many diverse, uneconomic social goals.

FOOTNOTES

1. APTA, Transit Fact Book: '77-'78 Edition, American Public Transit Association, Washington, D.C., 1978, pp. 20-21.

2. Public Technology, Inc., Proceedings of the First National Conference on Transit Performance, UMTA-DC-06-0184-77-1, September 1977, pp. 41, 48.

3. Lave, Charles, "Transit Productivity and Transit Deficits," Institute of Transportation Studies Working Paper, University of California, Irvine, September 1979.

4. Sproull, William, "A Method for Evaluating the Relationship of Research, Development and Demonstration Programs to Operator Labor Cost Components in Bus Transit Systems," unpublished Ph.D. dissertation, The American University, Washington, D.C., 1973, Chapter 2.

5. Control Data Corporation, Wells Research Company. Trends in Bus Transit Financing and Operating Characteristics, 1960-1975, 1978, p. 7-6.

6. Oram, Richard L., Peak Period Supplements: The Contemporary Economics of Urban Bus Public Transport in the U.K. and U.S.A., Pergamon Press, in press, p. 51.

7. Ibid., p. 52.

8. PTI, Transit System Productivity, Public Technology, Inc., revised edition, Washington, D. C., July 1978, p. 19.

9. Personal communication from WMATA.

10. Sproull, op. cit., Chapter 2.

11. The 10% cost in driver pay hours reduces this component from 50 to 45; then add in other labor of 30 for a total labor cost of 75. This

cost grows at 1% the first year and becomes 75.8; add in the 20 for materials and we get a total cost of 95.8.

12. Sale, James E. and Green, Bryan, "Operating Costs and Performance of American Public Transit Systems," APA Journal, January 1979, p. 25.

13. Ibid., p. 23.

14. Meyer, John R. and Gomez-Ibanez, Jose A. Improving Urban Mass Transportation Productivity, Final Report, UMTA Grant No. MA-11-0026, Harvard University, February 1977, p. 39.