FACTORS IN FREIGHT CAR SUPPLY

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INTRODUCTION

The Wall Street Journal, the Great Plainsman and other publications tell us that there is a rail car shortage. The dual purpose of this article is to demonstrate that the shortage is one of rail service rather than rolling stock and to examine several of the mechanisms available to increase the quantity of rail service.

CAR DEMAND

The demand for rail service is difficult to quantify; however, the Interstate Commerce Commission (ICC) has provided us with estimates of the degree of car shortage (Table 1) [10]. It has found that the freight car shortage has been concentrated in three car types, boxcars, gondola cars, and hopper cars. The ICC's estimates of the shortage are in terms of car ownership and do not indicate the areas where apparent demand exceeds available supply. In fact, the Central Western and Northwestern districts are shown to have adequate ownership, yet, these are the areas in which demand for rail cars most frequently exceeds available supply [8].

Boxcars show the greatest deficits. These deficits are regional and are concentrated in the Eastern and Southern United States. Gondola car and hopper car deficits are about equally large and concentrated in the Southern and Western United States. It can also be seen that the shortage tended to be growing, even allowing for the 1965 estimates being based on potential traffic.

In a second document in the proceedings, referenced above, the ICC showed that the car shortage was especially acute for general service boxcars and quite seasonal [11]. Shortages in the September to February period averaged about twice those for the remainder of the year.

CAR SUPPLY

In the shortrun the supply of rail cars can be considered fixed. Thus, it might appear that an inventory of rail cars would be indicative of the shortrun supply of cars. In the period 1958 to 1968, the total number of railroad-owned freight cars declined 16 percent [1]. Rail cars, however are not homogeneous as to size or type; therefore, aggregative inventories are a poor basis for evaluation of rail car supply.

An examination of the 3 car types most suitable for carrying dry bulk commodities shows that the inventory of general service boxcars declined 39 percent between 1958 and 1968 [1]. Special service boxcars and covered hopper cars, however, showed increases of 342 and 106 percent (from bases of 52,600 and 58,800 cars) in the same period. These 3 car types are mutually substitutable when hauling bulk commodities and their total number has declined only about 9 percent.

Even on a disaggregated basis, the number of rail cars is not the best measure of actual car supply. The aggregate capacity, by car type, offers a closer approximation of the supply of rail services available to meet shipper demand than does numbers.

Aggregate capacity of all rail cars declined very slightly between 1958 and 1968 (0.1%) [18]. Of the 3 car types considered herein, (general service boxcars, special service boxcars and covered hopper cars) the capacity of general service boxcars showed the largest decrease (34.5%). Special service boxcars, however, increased 340.7 percent and covered hopper cars increased 151.3 percent. Aggregate capacity of the 3 car types under study increased 3,548,200 tons (8.9%).

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TABLE 1. ESTIMATED ADDITIONAL (ABOVE 1965 OWNERSHIP) CARS NEEDED IN EACH YEAR SHOWN, BY DISTRICT AND CAR TYPE[a]

District and year	Car type		
	Box cars	Gondola cars	Hopper cars
		1,000 cars	
Eastern			
1963	10.0	b	e
1964	4.0	b	3.0
1965	16.0[d]	b	c
Allegheny			
1963	12.0	e	e
1964	13.0	e	e
1965	16.0[d]	e	e
Southern			
1963	21.0	13.0	5.0
1964	18.0	14.2	1.7
1965	34.0[d]	14.0[d]	10.0[d]
Northwestern			
1963	e	16.0	17.0
1964	e	17.0	18.0
1965	e	17.0[d]	18.0[d]
Central Western			
1963	e	4.8	11.0
1964	e	5.7	13.0
1965	e	5.5[d]	14.0[d]
Southwestern			
1963	17.0	2.6	0.6
1964	19.0	2.4	0.3
1965	28.0[d]	2.4[d]	2.4[d]
Total deficiencies shown			
1963	60.0	36.4	33.0
1964	54.0	39.3	36.0
1965	94.0[d]	38.9[d]	44.0[d]

[a]Based on Ex Parte 241, *Investigation of Adequacy of Freight Car Ownership,* 323 ICC, decided June 18, 1964.

[b]Surplus exists.

[c]No estimate given.

[d]Based on potential rather than actual loadings.

[e]Sufficient supply.

Freight car capacity measured at a single point in time is still not the best measure of freight car supply. Clearly, a car can be offered for service more than once a year. The effective shortrun supply of rail cars is, therefore, influenced by both the aggregate freight car capacity and by the manner in which this capacity is utilized. Factors such as average speed, average daily hours of utilization, time spent loading and unloading and others all have an impact on the shortrun effective car supply.

Between 1959 and 1967, the average speed of trains increased 1.1 to 20.3 miles per hour [18]. In the same period, the average distance traveled by a freight car increased nearly 8 miles per day to 51.5 miles. These figures can be used to determine that the time during which a car was utilized (moved toward some destination) remained nearly unchanged at 2.5 hours per day, assuming that average speed is directly related to average distance. Another factor especially worthy of attention is that the number of unserviceable freight cars decreased 3.1 percentage points between 1959 and 1967 when about 5 percent of the railroad owned fleet was undergoing or awaiting repairs.

Routing practices also have an effect on the effective shortrun car supply. In most instances, the shortest possible route will require the least time to complete the shipment and would tend to maximize the effective rail car supply. Section 15(8) of the Interstate Commerce Act gives shippers the right to select the routing for rail shipments. In the absence of shipper's routings, Section 15(4) of the Interstate Commerce Act prohibits, in general, requiring a railroad to embrace substantially less than its entire length in a through route. This prohibition results in routes of greater than the minimum length. Under existing statutes, there is neither administrative means nor economic incentive to reduce circuity in routing.

The ICC has established a measure of the extent to which actual route mileages exceed mileages of the shortest practical routes. This measure, the circuity factor, increased from 13 percent in 1950 to 15 percent in 1964 [7]. For 1964, circuity differed among car types as follows [7]:

Type of Car	Circuity percent
Box, general service	16.2
Box, special service	16.8
Gondola	16.4
Hopper, open top	13.1
Hopper, covered	17.5
All types	14.9

The circuity factor for shortage category cars is above average for all but the open hopper car type.

Circuity also differs between cars in local and cars in interline service with significantly more circuity shown for the latter service [7]:

	Circuity	
	Local	Interline
Type of Car	Percent	
Box, general service	10.9	17.2
Box, special service	7.8	18.0
Gondola	11.0	18.4
Hopper, open top	9.9	15.4
Hopper, closed top	10.2	19.7
All types	9.7	16.4

The net result of the supply factors previously discussed can be determined by comparing the revenue ton miles generated by railroads in 1958 with those in 1968. Revenue ton miles increased from 551.7 billion in 1958 to 744.5 billion in 1968 [12]. Although the total number of freight cars decreased 15.7 percent and the aggregate capacity decreased 0.1 percent in the same period, output as measured by revenue ton miles increased 34.9 percent. It appears that the small increases in car utilization and the decrease in the proportion of unusable cars have outweighed the reductions in number of cars and aggregate capacity. This, in turn, indicates that the so-called car shortage is not so much a deficiency in the number of rail cars as it is a low level of utilization and poor allocation of the available fleet.

In the words of the ICC, "*. . . the . . . problem is not so much the availability of sufficient cars to fill current shippers' orders as the use of the cars within a region" [15].*

The Commission added: *"Even in regions where the supplying of the type of car to fill shippers' requests involved the greatest delay, availability in general was at least twice the current orders" [15].*

In view of the relative ease with which railroad equipment can be financed, some observers of the situation seem doubtful that a serious absolute shortage of equipment exists. According to Gilbert Burch:

"Since locomotives and cars can be repossessed, financing them is almost risk-free . . . So during the past decade the carriers spent an average of more than $900 million a year on locomotives and cars. But other investments, such as new yards and line revisions, had to come largely out of cash flow, and amounted to only $300 million a year" [3].

These other investments would tend to improve utilization of rolling stock and their lack would cause utilization to decline. In fact, adding rolling stock

without commensurate additions to other facilities could result in a decrease in the effective supply of rail service.

PROPOSED SOLUTIONS

Either increasing the number of cars in inventory or increasing the utilization of cars, or both, might alleviate the car shortage. The available evidence suggests that rail service is more responsive to changes in utilization than to changes in car inventory. The probable impact on rail car utilization should, therefore, be the chief criterion for assessment of proposed solutions to the car shortage.

Demurrage

Loading and unloading time, which is subject to control by the users, accounts for about 18 percent of a rail car's life [2]. Conceptually, increasing demurrage charges would reduce the amount of time spent in loading and unloading. Between 1966 and 1967, minimum demurrage charges increased from $5.00 to $7.50 per day. In the same period, Boles and Gerald show the time spent loading and unloading decreasing 0.2 percentage points [2]. Boles and Gerald, however, indicate that their data will not support any conclusion as to the impact of demurrage on performance [2]. It is clear, nevertheless, that a modest improvement in utilization by railroads which control a car for 82 percent of its life would increase effective car supply more than would a similar improvement by shippers and receivers.

Car Service Rules

In October 1967, a majority of the Association of American Railroads' membership adopted a set of car service rules. Essentially, these same rules were adopted by the ICC in Ex Parte 241 (1969). The rules require, in brief, that foreign cars be returned to their owners with reasonable expediency. During the course of the hearings and subsequently, both carriers and shippers opposed adoption of mandatory car service rules [17]. A check made in October 1965 showed that 50 percent of the cars checked were loaded in violation of the two basic rules. Certain carriers were found in violation at certain stations for from 90 to 94 percent of loadings [11]. As voluntary compliance seems lacking, it is doubtful that the existing car service rules can be relied upon to return foreign cars to their owners unless the ICC's ability to police the business community is greatly increased. Even where adequate policing is available, as in the case of the ICC's car service orders, returning cars to owning roads does not necessarily result in an optimum distribution of the car fleet. There is no reason to believe that car ownership will reflect shipper demand in the shortrun. Service rules or orders requiring only the return of foreign cars to their owners may actually contribute to a car shortage.

Per Diem

Railroads have two sources of operating income, freight charges and per diem payments. The latter are the rental charged by an owning railroad for the use of a car by a using road. Per diem payments are, therefore, the internal economic incentives that allocate the available rail car supply among railroads and also play a role in internal investment decisions. If they are set uneconomically high, foreign cars will be quickly returned to their owners at considerable expense. If too low, foreign cars will be retained indefinitely.

Through 1968, the ICC did not intend per diem payments to be car rental charges. Instead they were intended to represent an equitable sharing of car ownership costs [4]. The revenue potential of the car was not considered. This philosophy helps to explain the structure of per diem rates and the existing pattern of car ownership.

Between 1902 and 1964, a uniform system of flat per diem rates, ranging from $0.20 per car day in 1902 to $2.88 in 1963, existed. In 1964, a multi-level per diem system was instituted under which per diem rates varied directly with the value of the car. Cars with a value of $1,000 or less commanded a rate of $2.16 per day. Cars valued in excess of $20,000 commanded a daily rate of $7.74.

With per diem reflecting only the cost of ownership, railroads might be expected to purchase cars for interline service with ownership costs equal to or less than the per diem rate. The flat per diem rate would, therefore, tend to result in the purchase of relatively inexpensive equipment [6]. This tendency would be especially evident in roads originating large volumes of interline traffic. Shifting to a multilevel system would tend to result in the purchase of relatively expensive cars. This hypothesis is supported by the available data. Between 1960 and 1963, an average of 10,588 relatively expensive cars were purchased annually [14]. For the period 1964-67, the annual rate of purchase for expensive cars increased 240 percent. General purpose rail cars were acquired at the average rate of 24,899 cars per year in 1960-63. Their rate of acquisition increased only 15 percent following institution of the multilevel per diem rates. These data also suggest that the response to changes in per diem rates is quite rapid and that the per diem structure is an appropriate mechanism for adjusting the mix of rail cars.

In August 1968, the Interstate Commerce Commission instituted a system of car rental charges

which included both daily and mileage charges [5]. The concept of variable charges, depending on the age and original cost of the car, was retained. These charges ranged from $0.63 per day and 1.47 cents per mile for cars over 30 years old costing $1,000 or less to $10.22 per day and 4.60 cents per mile for cars under six years old costing from $39,000 to $41,000 [5]. There are no quantitative data available at this time with which to assess the impact of these changes. Logic would indicate that daily charges would tend to cause foreign cars to move off of the using line. Mileage charges would tend to keep empty foreign cars at rest. There is some talk in the railroad industry that the effect of the time and mileage charges has been to hold low value cars at destination points. Indeed, one group of railroads have charged that the time-mileage concept will intensify the existing car shortage [16]. There is at least some surface validity to this charge. Let us assume that an empty 30-year old boxcar in the $0 to $1,000 bracket must travel 1,000 miles in order to return to its owner's system. Thus, the using railroad must pay $14.70 in mileage charges. The daily charge for holding the car is only $0.63 or about 4 percent of the mileage charge which is essentially a fixed cost. The additional cost of holding the foreign car for a time in hopes of obtaining a return load is, therefore nominal. The car in the example could be held for 135 days before the total charges reached $100. Assuming further that the car was of average capacity, 53 tons, a rate of only $2.00 per ton would be required to show a gross profit after retaining the car for 135 days. Since plain boxcars tend to be both relatively old and relatively low cost, the 1968 car rental charges seem likely to have resulted in somewhat lower utilization of shortage category cars.

Incentive Per Diem System

Grunfeld proposed criteria for an effective structure of per diem payments: (1) Per diem charges should reflect seasonal and cyclical levels of demand so that railroads are indifferent as to whether its cars are operated on the home line or a foreign line. (2) Per diem charges should reflect the costs of owning the car in question [6].

In an order, dated April 28, 1970, the Interstate Commerce Commission instituted a system of incentive per diems to take effect on June 1, 1970. From September through February, this system adds an additional charge for unequipped boxcars to the existing daily charges. Incentive charges vary in the same fashion as the multilevel per diem charges. For example, for a car in cost bracket $0 to $1,000 over 30 years old, the incentive charge is $0.04 per day. For a car in cost bracket $39 to $41,000 5 years old or less, the incentive charge is $12.98 per day. The multilevel per diem (varying with the value of the car) rates met Grunfeld's second criterion. In addition to stimulating investment in high cost equipment, such multilevel rates would also seem likely to bring improved utilization of such equipment. It is questionable, however, that the multilevel per diem rates in effect since 1964 have had such an effect. Since 1965, the ratio of car loadings to number of cars for covered hopper cars has varied between 19.51 (1968) and 20.72 (1966) [13]. Since the ratio stood at 19.01 in 1963, little change is evident. The incentive per diems, however, tend to better meet both of Grunfeld's criterion than did year around stable rates and (in season) will tend to counteract the relatively high mileage charges. The order establishing the incentive per diems requires net revenue from incentives to be invested in plain boxcars. No other per diem plan has had any direct effect on the level of investment in rolling stock.

In addition, the Interstate Commerce Commission has made it clear that they remain willing to modify the rules concerning incentive per diems [9]. Such willingness seems likely to allow market factors to be reflected into the car rental pricing structure more readily and more rapidly than before. The effect of the incentive per diem plan remains to be seen.

CONCLUSIONS

It is clear that per diem payments play a crucial role in the car investment decision process and an equally critical role in the level of car utilization. The level of per diem payments is at least as critical and possibly more critical than the system under which they are assessed. Not only is the absolute level critical, but the relative level among car types for multilevel charges and between time and mileage bases are also important. Payments set either too high or too low will result in: (1) undesirable allocations of existing supply and (2) undesirable investments in cars. In view of the continuing car shortage, it seems reasonable to conclude that, thus far, none of the per diem payments have been at the right level.

The incentive per diem system seems to be the most desirable of the per diem systems yet adopted. Its impacts on all areas of the problem, within the railroad's control, allows seasonal market factors to be reflected into the pricing structure and takes ownership costs into account. The combination of an incentive per diem system, demurrage charges, car service rules and service orders seems likely to be the best solution available at this time.

A Proposed Solution

In addition to seasonal variations, demand for rail cars seems likely to show regional and short term cyclical variations. It is unlikely that the necessarily

cumbersome machinery of national regulations can ever effectively cope with short term conditions. The only complete solution would seem to lie in a free market for the use of rail cars capable of responding on a daily basis or more frequently.

Despite the appeal of a free market, it is unlikely that such a market could be established under the current law, since a market implies voluntary participation. Intermediate and terminating rail carriers are not free to participate or abstain from the market for rail cars since they must accept any car tendered to them under a through route. Nor could they, under current law, refuse to establish through routes. Equity seems to dictate that intermediate and terminating carriers should reimburse a car owner for its use. Since the willing price of intermediate and terminating carriers for the use of foreign cars may be well below the costs of ownership and since they must accept any car properly tendered, it appears that they must be coerced into such payments. Thus, a system of uniform (with regard to time, car type and ownership costs) charges must be continued.

A partial solution might be an additional increment added to the existing per diem structure in the form of a bid or offer. The bidding railroad would offer an additional payment over and above the established per diem charge. Similarly, a railroad with surplus cars would offer to make them available for an additional payment. This additional charge would be paid to the owning line for the time that the car remained on the bidder's line. This restrictive feature is made necessary by the inability of intermediate and terminating carriers to refuse a properly tendered car. They should not, therefore, be bound by a price which they had no voice in establishing. Under the proposed system, intermediate and terminating carriers would be liable only for the car rental payments established by the ICC.

Even though the commission does not hold incentive per diems as a sole and final remedy, neither is it suggested that an additional increment will solve the car shortage problem. Optimizing the size, mix and distribution of the rail car fleet can only be obtained under a pricing structure which reflects short term shipper demand. The additional increment would, however, tend to reflect short term market conditions and, as such, would be another step in the right direction.

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