Chapter 3

OPERATIONAL PERFORMANCE OF THE INDIAN RAILWAYS

3.1 Factors in IR Operational Performance

The preceding exposition on the historical development of transportation infrastructure and the evolution of some of the best-known world railway systems reveals several common features between them, even though some appear to have fared better than others over the course of time. The principal aspects that have surfaced as common during the analysis are the rise of confrontation between railways and roadways, the difficulties of maintaining operational viability over all categories of railway freight against the backdrop of rising traffic costs and falling returns, and the methods for rejuvenation adopted by different world railways ranging from technological modernisation and upgradation, organisational streamlining and commercial specialisation, to the extreme policy recourse of financial autonomy, deregulation and privatisation. Despite the apparent abundance in solutions all directed to restoring the competitiveness of railway services so that they can effectively take on the roadways, traditional infrastructural problems of public-utility operation and social pricing of services still remain central both to railway economics and to the long-run interrelation of growth and development in transportation infrastructure to the economy.

Because of the social and developmental roles that impinge on the railways as a vital constituent of modern transportation infrastructure, assessments of comparative performance of a railway system across time and space must simultaneously cover both operational and financial aspects since commercial objectives and the maximisation of capital returns and profit cannot be the *sine qua non* of railway operation. Thus although railway development and the evolution of railway economics has broadly followed the same sequential course across the systems just studied, a range of policy experimentation has also been witnessed on each national railway system, which has had the object of bringing about the best working results given the resource endowment and the economic milieu of each country. The basis of all such experimentation has generally been the need to improve operational performance of the railways within a socially-constrained cost structure.

3.1.1 Growth of Intermodal Transportation Infrastructure

It has just been seen that the development of railways in India proceeded over three distinct phases. Initial commencement during colonial days followed the structure of guaranteed companies securing guaranteed minimum rates of return on private venture-capital. Later wisdom however saw the gradual takeover of private proprietary interests, so that by 1914, most lines were state-owned, although still operated by zonal railway companies without a coherent transport policy having been put into place. The benefits that accrued from the first phase were a levelling of foodgrain prices that preempted recurrent famines, cropping shifts following growth of an export market in primary agricultural produce, and impetus to internal trade and industry. Outward extensions of these benefits during the second phase saw urbanisation and the growth of towns and a strengthening of urban industry based on the hinterlands served by the railway freight network. Railway development in the second phase thus followed these internal imperatives adding more coherence to transport policy.[1] The extensive railway network that had been built over the colonial period was however trifurcated by Partition in 1947 into the regional networks of India, West Pakistan and East Pakistan, requiring a reorientation of the freight linkages within the old system through the institution of transportation planning.

In planning transportation infrastructure, the case for advance creation of transportation capacity in anticipation of future demand theoretically rests on two considerations: *firstly*, transportation is a non-traded commodity whose services are not importable, and *secondly*, investment in any kind of infrastructure is lumpy in character. It may become necessary therefore to fund the creation of transportation capacity even when current levels of demand for such services do not justify investment on the basis of commercial viability, while the lumpiness of investment may also make it necessary to create capacity on a larger scale than is immediately justifiable

if the benefits from economies of scale are to be drawn.

While development of the IR system subsequent to 1947 has expanded the railway network to 62,660 route-km and 108,513 track-km by 1994-95 (of which 79,495km constitute running-track), spread over 59 operating divisions and 7056 stations and staffed by 1,602,051 permanent and 69,000 casual employees, rolling stock deployment currently includes 6908 locomotives, 291,360 wagons and 39,214 conventional, EMU and other passenger coaching units. Thus the network now represents a total capital-at-charge of Rs.21,762.92 crore excluding the investments made on mass rapid transit projects, and caters to originating freight tonnages of 364.96MT [93MT in 1947] and 3.195 billion passengers.[2] Despite such apparently phenomenal growth, railway development in India after Independence has followed the reordered priorities set by national development planning, with the multiplication of goals and activities of the Indian state leading to severe resource-crunches and shifting plan-focii. Thus with more stress being laid recently on technology-oriented modernisation instead of on spatial proliferation of networks, a write-off of around Rs.2925.51 crore of railway capital since 1992 in metre-gauge stock and steam-based traction has reduced the number of operational stations from 7116, the number of locomotive units from 8268, and the number of wagon and coaching units from 346,394 and 39,283, respectively.[3]

Transport capacity constraints emerging due to a decline in investment in transportation infrastructure can become a matter of grave concern to a developing economy. Plan outlays made on the transportation sector and on the railways in particular, since the institution of Five-Year planning enable a reading to be made of changes in government infrastructural policy. In India, a sharp reduction in investment shares for transport and for IR is noticed particularly between 1966-79, for which there is no apparent rationale.[4] As a result serious transportation bottlenecks occurred during the 1970s, with consequent retardation in the rate of industrial growth. While the stepping up of plan allocations since the 1980s has partially eased that extreme situation, the falling value of plan allocations in undepreciated rupee terms has been acknowledged and in the review of achievements of the Seventh Five-Year Plan [7FYP], the Planning Commission notes that allocations to transport, power and communications in the past period did not reflect the high priorities attached to them, hoping in fact for private sector investment to bridge the gap.[5]

The sharpest growth in transportation infrastructure in India over the planning period has been witnessed by the roadways sector rather than by the railways, conditioned however by the fact that - at Independence - the roadways were in virtual infancy. Between 1950-51 and 1991-92, the Planning Commission estimated 475 percent augmentation of the road network in the country from 0.4 million km to 2.3 million km, with 1857 percent increase in the number of light and heavy commercial vehicles [CVs, *i.e.* trucks and other freight vehicles] from 82 thousand to 1.61 million. Over the same period, the number of passenger buses has increased by 988 percent from 34 thousand to 0.37 million. Corresponding percentage increases in railway infrastructure have amounted only to 17 percent for route network, 102 percent for traction and 171 percent for freight wagons, against 126 percent for passenger coaches.[6]

Quite obviously therefore, the buildup in freighting capacity over the era of planning has been strongly weighted in favour of the roadways. Interestingly, the Plan component in this has been largely confined to the construction of 1.9 million km of roads - in itself a daunting financing exercise, which probably also restricted the expansion of the railway route network over the identical period to 9064km. The overall transport achievement in terms of the magnitude of highways and feeder roads constructed is immense. However the logical corollary of such development has been a phenomenal increase in the number of on-road vehicles, especially since no spectacular commitment of government funds has been needed towards this. Growth of the roadways in India has therefore been served by a backbone of private sector investment following massive public expenditure on roads. In effect, this has followed inability on the part of the state to maintain a parallel rate of expansion in the railways, where all expenditure - including investments on route, rolling-stock and establishment - have to be financed from the public exchequer. It becomes quite evident that expansion of roadways operations on the scale implied should eventually raise fierce competition with the railways for freight traffic shares. It is however of special interest to note from the above figures that a similar degree of competition did not arise in the case of passenger services, since the expansion in the number of buses has not been nearly as large as that in trucks and other freight vehicles. Again, the expansion in passenger coaching on the IR system is fairly high (compared to that in route-km, for instance) pointing towards the fact that the railways still remain the primary mode of transportation for long-distance passenger traffic. Since the corresponding increase in route-km and traction units has been extremely modest, increased

density of passenger services would obviously be at the cost of freight operations, adding congestion costs to the latter. Bearing in mind that the social overheads borne by railways are already much higher for passenger than for freight traffic, a displacement of freight traffic by passenger services on congested routes imposes a severe social cost burden on IR.

It may therefore be noted, for most of the planning period, that the growth of roadways has been uncoordinated with the growth of railways. While later attempts have been made by Planning Commission committees such as the National Transport Policy Committee [NTPC] between 1978-80 and the Steering Committee on Perspective Planning for Transport Development in 1988, to promote transport coordination while retaining rail:roadway ratios for freight traffic ranging from 65:35 [IR Corporate Plan 1985-2000] to 72:28 [NTPC] projected for the year 2000, very recent estimates of the current intermodal ratios are 40:60 for freight traffic and 20:80 for passenger traffic[7] in 1996-97, much below the optimal intermodal ratios that had been projected by the expert committees.

Contrasting sub-periods, the bulk of growth in freight traffic in India has occurred since the 1980s, after the hiatus of the 1970s, with overall freight growth between 1950-71 having also been creditably high at 6.77 percent *p.a.* However the rate at which road freight has grown over the entire planning period, excluding the 1960s, has remained well over 10 percent (11.82 percent between 1950-71 and 12.81 percent between 1980-86). Railway freight, in comparison, grew at an average of just around 5 percent annually over both periods, and even between 1971-81 when the transportation sector as a whole suffered severe planning constraints as mentioned earlier, road freight grew at over 7 percent, compared to less than 3 percent annual growth for freight on the IR network.[8]

The current intermodal allocation of freight between roadways and railways would be deemed far from optimal, because of the efficiencies in energy-use, land-use and traction that are intrinsic to railways, particularly in long-haul bulk traffic. As such, road transport and rail transport are not strictly substitutes but in fact complement each other inasmuch as the advantages of one mode in one freight-category are compensated by advantages drawn by the other in another freight-category.

3.1.2 Social Considerations in IR Operations

Perhaps because railways have traditionally been run in the government sector in most countries, an onus has existed for their services to be treated as *public* goods, even though otherwise required to be run on commercial principles. The primary social objectives that are served by IR arise from having to provide mass rapid transit systems to the metropolises; intercity, medium and long-distance passenger transport; and low-cost prioritised haulage to several agricultural commodities and vital industrial raw materials. General subsidies on such services have to be recovered from the revenues drawn on other categories of freight, leading to the phenomenon of cross-subsidy. Another public utility aspect visible particularly in India is the use of railway construction as a development device to encourage flows of investment to backward and undeveloped areas. In face of low transportation capacity however, the pressure to maintain socially-preferred transport services has to be accommodated at the expense of commercially-preferable operations, leading up to a general loss of profitability. This is a problem which has constantly afflicted IR both in revenue and resource terms, culminating eventually in their current inability to fund the creation of transport capacity ahead of demand. Thus 'cross-subsidisation' dilemmas in the operations of IR manifest themselves at several levels, such as in competition between passenger and freight services and between different categories of freight services.

Suburban railway services have nevertheless formed a convenient hub for the mass rapid transit needs of the larger Indian cities where road space and other public transport systems have proved woefully inadequate to the task of moving masses of people to and from work, partly leading also to the recent explosion in metropolitan car-ownership. While because of overall economies of operation, railway-based public transportation systems of both the overland and underground variety are now being mooted as an ultimate solution and have in fact been initiated in certain metropolises, the major question that still has to be confronted is that of capital adequacy, since entrustment of MRTS systems to IR would reduce the availability of resources for railway development elsewhere. Secondly, as a subsidised passenger-based service, railway MRTS systems often develop at the expense of freight operations, applying a further squeeze on the economy. A partial solution to the problem can only be offered if funding for MRTS projects is separately provided

through civic bodies, instead of having to be borne by the Indian Railway Budgets.

The other important public utility aspect relating to IR concerns the setting of tariffs that reflect regional equity concerns rather than commercial considerations. Thus the railways in India charge uniform kilometre-rates and tonne-rates throughout the country, irrespective of the actual costs of sectional carriage and of haulage over various gauges. Since the basic rates are moreover pegged low, this encourages the pricing of certain railway services well below cost and increases revenue deficits.

It must also be acknowledged that the character of the transportation demands made by the Indian economy have changed dynamically over the planning period and will evolve further. The aspects of change most prominent in this process are the increasing rate of urbanisation, vastly-altered regional demand and locational patterns, and the changing commodity-character of overall freight flows. For this reason particularly, no transport plan can actually be framed for all time to come, since transportation infrastructure has to remain adaptable to predicted as well as evolutionary changes. Even though public-utility orientation will remain paramount for the railways in India so long as they operate in the public sector and the priorities of development remain unredirected, the major adaptation to policy that has to be made immediately is the restoration of profitability of railway operations, preferably through cost-reduction rather than tariff revision.

3.1.3 Commercial Considerations in IR Operations

A clash between social and commercial objectives is often inevitable in railway operations. While the pace of railway development in the long term would depend upon fair returns being provided to capital investments in IR, the scope for such returns is in practice circumscribed by the extent of social subsidies. In this aspect, public railway systems everywhere operate as the antithesis of commercial monopolies. Nevertheless, the sustainability of social objectives in railway enterprise depends on constant ability on the part of the railways to operate efficiently and bring down unit traffic costs. The public character of IR proves an obstacle to this because of the addition of a tacit social constraint of maintaining the railway workforce at its currently high levels. While wage components in railway costs become consequently high, the scope for inducting cost-reducing technology is also affected. Even with upgraded railway technology having been incorporated in more recent years, the rate of factor application per unit traffic (*i.e.* input-output ratio) thus remains high on IR.

Another peculiarity of IR is that it has remained a departmental undertaking of the Ministry of Railways without acquiring separate corporate identity, even while multiplying manifold in both scale and operation over the era of planning. Complaints in the public media about lack of professionalism, management discretion and work culture might in fact be rooted in this outmoded form of organisation which - at least at operational levels - is viewed as the manifestation of monopolistic attitudes within a public utility. In some sense therefore, the successful competition from roadways not only reflects economic differentials but also quality-of-service differentials vis-a-vis railway services.

For IR to turn this around and to function on more commercial lines, the disadvantages of monolithic and monopolistic organisation have therefore to be overcome, even as the efficiencies and economies of scale resulting from that organisational mode are retained. Sufficient scope exists to improve the coordination between IR and the major railway users both in institutionalising present operations and in planning expansions, and also in the integration of railway development into regional planning exercises. Once again, the degree of coordination called for requires that IR shed its departmental attitudes of balancing budgets, and acquire a forward-looking professional mindset. It is fairly obvious that the first result of such a shift will be the planning of railway infrastructural capacity well ahead of demand and the creation of an ability to engage the government ministries constructively when seeking capital funding.

3.1.4 Freight Traffic Adaptation

As has been observed earlier, the rather slow pace of augmentation of railway network and rolling stock in India over the planning period resulted in substantial compensating addition to roadways capacity and traffic. Within IR, the effect of expanding transport demands acquired twofold character in view of the capacity constraint - while there was increase in traffic and tonnage, there was also substantial increase in traffic density particularly on major corridors. Considering the zonal character of this increase however, traffic

density did not develop uniformly over all parts of the IR network and in fact followed the regional pattern of development. Certain rail transport axes - for example, North East India - therefore still carry low and even uneconomical traffic density.

Two reasons may lie behind this. Firstly, the character of industrial and locational linkages result in clustered development around regions where general infrastructure is strong, and it was therefore the areas served by major industrial corridors that attracted most of the industrial thrust of the Indian FYPs. Secondly and less obviously, the major traffic axes along which urbanisation and settlement is taking place in certain regions may lie at a distance from the alignments of rail routes and thus may be better served by the transport infrastructure on road rather than rail corridors. Either factor offers cogent explanation of the uneven patterns of regional development in the country.

It is particularly in the second case that the traffic forthcoming is in the form of small masses of goods and people, for the carriage of which railways are not deemed efficient. Sound economics underlies this. The high proportion of sunk costs and maintenance overheads on railway construction in any case adds considerably to the unit costs of carriage, and further, the optimum unit of carriage on the railways is the full trainload rather than individual wagon- or coaching-loads. With intergauge and intermodal transhipment also adding substantially to the costs of access and carriage, low-volume short-haul traffic proves to be non-optimal when freighted by railway. In contrast, the road operator bears very little by way of sunk costs since neither investment on road construction nor on fuelling facilities directly devolves on him. With the advantage of low breakeven points, it is but natural that low density traffic should gravitate to the roadways once roads are constructed, even where railway tracks have existed much longer. In North-East India, for instance, whatever traffic IR has been able to retain has been at the cost of substantial social subsidies.

The choice between public utility concerns and commercial considerations in such cases becomes difficult to apply. Discontinuation of uneconomic lines would release resources and maintenance funds for application where these are more needed. This would however mean also that costs already sunk into the development of these lines would have to be written off altogether, and several backward regions of the country would be sealed off from railway access for all time to come, with their subsequent development then depending entirely on the vagaries of roadways services. As the course of more moderation, IR has chosen instead to gradually withdraw from low-bulk, short-haul and piece-goods traffic (*traffic smalls*, in railway parlance). The reasons generally advanced for such withdrawal refer to the constraints on present capacity that render these services inferior and unremunerative. It needs also to be noted however that by doing so, the railways are surrendering the fastest-growing traffic segment, for which demand exists all over the country even on low-density sections at every point of time, the segment eventually being taken over by the roadways. Evidence for this emerges from the growing dependence of IR on a few select bulk commodities, which badly hits railway revenues in case of an industrial slowdown that affects the production of either of these commodities. Incidences of this have already occurred and have affected railway earnings in the past.

To restore themselves to a position of profit, it would appear that IR will have to take the roadways competition head-on by reentering the market for smalls traffic, both because traffic demands in this category are consistently steady and originate across the entire country, and because colossal wastage of the country's resources are involved when the smalls consignments travel over long-distance in single truckloads instead of being consolidated into railway trainloads. It is here that the most difficult questions emerge. It is well recognised[9] that the fact that railway capacity has gradually been committed entirely to core sector traffic of coal, POL, fertilisers, foodgrains and so on has left IR with no margin for the carriage of the general cargo and industrial traffic that is on offer. The excuse for allowing this residual capacity to lapse entirely has usually been the resource crunch, even though along with general cost-inefficiency of IR operations, implementation of IR's more grandiose projects like UNIGAUGE without proper traffic appraisal, and tardy execution of railway projects in general leading to phenomenal cost overruns might be held equally to blame for the paucity of investment in capacity creation at a time when growth of traffic demands has consistently outstripped capacity.

The need to move into containerised transport to build multimodal capabilities into transport infrastructure in India has also been recognised by the establishment of the public-sector Container Corporation of India [CONCOR] in 1989. However the essence of efficient container services over a transport network as vast as India's is the maintenance of competitive rates through multiplicity of agencies and services on offer. Thus

the monopoly mode of organisation is inappropriate to rapid development of the container segment of traffic, at least at the initial stages when the spread of the services are far more important than their size. It is when the spatial spread of these services is deemed adequate that they can be consolidated to optimal size by mergers and takeovers of efficient operations.

Nevertheless the major obstacles to any remarkable thrust being made in multimodal transport is the lack of equivalent infrastructural development of ports, shipping and waterways, and of depots, freight stations, warehousing and other handling and lading facilities. The development of a vast subsystem of transport management services comprising shipping and clearing agencies, and freight forwarders and consolidators is equally important. A World Bank study[10] points out fragmentation of services, rigid controls and regulations, constraints on the private sector and inadequacies of infrastructure as responsible for the poor logistics of trade in India. The problem can then be viewed from the point of coordination, where although IR would provide the core of services, the task of developing traffic to utilise these services should rest elsewhere. In practice, it would be private sector investment and involvement that would have to be counted on to develop containerisation, road railers, and multimodal collection and delivery stations for break-bulk freight.

In the study of the operational performance of the Indian Railways [IR] to be accomplished in the present chapter, it thus becomes imperative to analyse railway performance on the trends of certain well-identified financial and operational indicators in common use all over the world to assess railway working results. Of these, while annual *returns on railway capital-at-charge* hold significant diagnostic importance in defining general financial health on railway systems, three other operational indicators principally pertain to railway freight operations. These are, namely, the annual *originating tonnage* of railway freight over all loading points, the annual realisation of revenue-earning railway freight traffic (*i.e.* net of non-revenue earning departmental traffic) in terms of *net tonne-kilometres*, and the average freighting distance or *average lead* realised on freight traffic booked in the course of the year. After quick review of the growth of transport infrastructure in India in the post-Independence period, the chapter will evaluate the consequential role of railway infrastructure in serving development needs of the Indian economy by making increased movements of materials possible, against IR performance measured by the four indicators.

3.2 The Problem of Adequacy of Returns to Railway Capital-at-Charge

Railway financing has been subjected to scrutiny time and again for the problems it encounters on account of being characterised by technical indivisibility of railway assets, the scale and lumpiness of railway-capacity investments that render these beyond the reach of private investors, and the 'sunken' character of railway costs and very low returns. This does not detract however from the importance of improving efficiency of supply of railway services. The overall situation under which IR has operated has assigned disproportionate importance to the social objective of achieving allocative efficiency, hence proving an impediment towards generating profitable revenues like other commercial organisations.

Capitalisation of railways is not a single period phenomenon but a process of continued flow of capital to sustain the establishment. Thus investment on capital projects to develop railway operations is liable to be undertaken only when incremental capital outlays are assured. While the initial investment is 'sunk' into track building, network expansion and building assets, it is followed by demands for further investment in track & asset renewal, railway maintenance, etc. For the creation of railway capacity ahead of demand, it is thus imperative that the incremental outlay of capital should increase over time. A slowdown in such investment proves detrimental to railway development because of the consequent inefficiency in operational performance. Thus *repeated-dose* capital investments form the backbone of sustained profitability in railway operations. A study of railway capital flows in India is undertaken next to identify the slack and peak investment periods that have affected the operational performance of IR.

Figure 3.1 derived in three parts from the extended form of the table below illustrates trends in percentage incremental capital outlays on the railways in India since the first endeavours made by the British to develop a railway network within the country. The original time series being in nominal terms, the computed percentage increments take into allowance the general trend rather than the actual or deflated incremental trends. An average decadal series in nominal terms of total railway capital outlay, gross and net railway earnings and railway working expenses is also provided to aid analysis.

Table 3.1: Financial Attributes of Railway Performance in India

(a) Gap-Year Analysis *[in Rs.crore]*

Year	Total Railway Capital-at-Charge	Gross Railway Revenues	Railway Working Expenses	*Average Operating Ratio [%]*	*Average Annual Return on Railway Capital [%]*
1853	0.4	0.009	0.004	*45.6*	*1.30*
1859	22.5	0.572	0.277	*48.5*	*1.00*
1869	89.0	0.613	3.05	*55.7*	*2.29*
1879	122.3	12.08	6.26	*51.8*	*4.25*
1889	205.0	20.49	10.38	*50.6*	*5.28*
1899	308.6	29.37	13.94	*47.5*	*5.25*
1909	429.8	47.06	26.38	*56.1*	*5.38*
1918-19*	549.7	86.29	41.80	*48.4*	*6.01*
1928-29	831.4	118.87	74.62	*62.8*	*5.35*
1938-39	847.8	107.15	71.18	*66.4*	*3.86*
1948-49	758.8	234.12	184.06	*78.6*	*7.02*
1958-59	1356.6	393.90	334.58	*84.9*	*5.96*
1968-69	3101.3	899.07	756.26	*84.1*	*5.57*
1978-79	5023.9	2161.30	1900.47	*87.9*	*4.37*
1988-89	12987.5	9528.62	8791.29	*92.3*	*5.23*
1991-92	17712.5	14113.74	12572.79	*89.1*	*7.43*

(b) Interdecadal Growth

Period	Decadal Change in Railway Capital-at-Charge	*Annualised % Change in Capital-at-Charge*	Decadal Change in Railway Revenues	*Annualised % Change in Gross Revenues*	Decadal Change in Working Expenses	*Annualised % Change in Working Expenses*
1854 to 1859	22.1	*971.20*	0.6	*1798516.01*	0.3	*2290.24*
1860 to 1869	44.8	*19.89*	5.6	*347.54*	3.1	*200.38*
1870 to 1879	33.3	*3.74*	6.0	*6.11*	2.8	*17.41*
1880 to 1889	82.7	*6.76*	8.4	*5.60*	4.1	*13.43*
1890 to 1899	103.5	*5.05*	8.9	*2.46*	3.6	*8.55*
1900 to 1909	121.3	*3.93*	17.7	*1.34*	12.4	*12.70*
1910 to 1918-19*	119.9	*2.79*	39.2	*0.59*	15.4	*14.87*
1919-20 to 1928-29	281.6	*5.12*	32.6	*0.59*	32.8	*7.79*
1929-30 to 1938-39	16.4	*0.20*	-11.7	*0.02*	-3.4	*-1.57*
1939-40 to 1948-49	-89.1	*-1.05*	127.0	*-0.10*	112.9	*17.84*
1949-50 to 1958-59	597.8	*7.88*	159.8	*0.34*	150.5	*8.68*
1959-60 to 1968-69	1744.7	*12.86*	505.2	*0.33*	421.7	*15.10*
1969-70 to 1978-79	1922.6	*6.20*	1262.2	*0.07*	1144.2	*16.69*
1979-80 to 1988-89	7963.6	*15.85*	7367.3	*0.07*	6890.8	*38.77*
1989-90 to 1991-92	4725.0	*12.13*	4585.1	*0.04*	3781.5	*17.39*

Source: Data abstracted from RFFC [1993] :*Railway Fare & Freight Committee Report*, 1(3):57-62, Annexures 3.I & 3.H

**N.B.: The railways in India switched over to financial-year accounting from the year 1918-19*

(c) Piece-wise Regression Results

Early Period: [1856 to 1910]	CR = 5.246 - 0.106 CO r^2 = 0.610 *t*-coeff = 9.353
Middle Period: [1911 to 1946-47]	CR = 5.628 - 0.029 CO r^2 = 0.001 *t*-coeff = 0.211
Post-Independence Period: [1947-48 to 1991-92]	CR = 4.871 + 0.074 CO r^2 = 0.073 *t*-coeff = 1.834
Reversed Regression	CO = 1.782 + 0.989 CR r^2 = 0.073 *t*-coeff = 1.834

Note: CaC_t = Railway Capital-at-Charge in period *t*

CO_t = Incremental Railway Capital Outlay in period *t*

NE_t = Net Railway Revenue Earnings in period *t*

CR_t = Return on Railway Capital-at-Charge in period *t*

& $CR_t = NE_t / \Delta CaC_t = NE_t / [CaC_t - CaC_{t-1}]$

3.2.1 Historical Analysis of Railway Capital Returns

A component that relates closely to incremental capital outlays is the net capital return on capital invested in the railways, defined as the ratio of net earnings to additional capital-at-charge in any given year, where net

Figure 3.1: **Financial Performance of Indian Railways over Different Historic Periods**

Fig 3.1*a*: *Financial Performance [1856 to1910]*

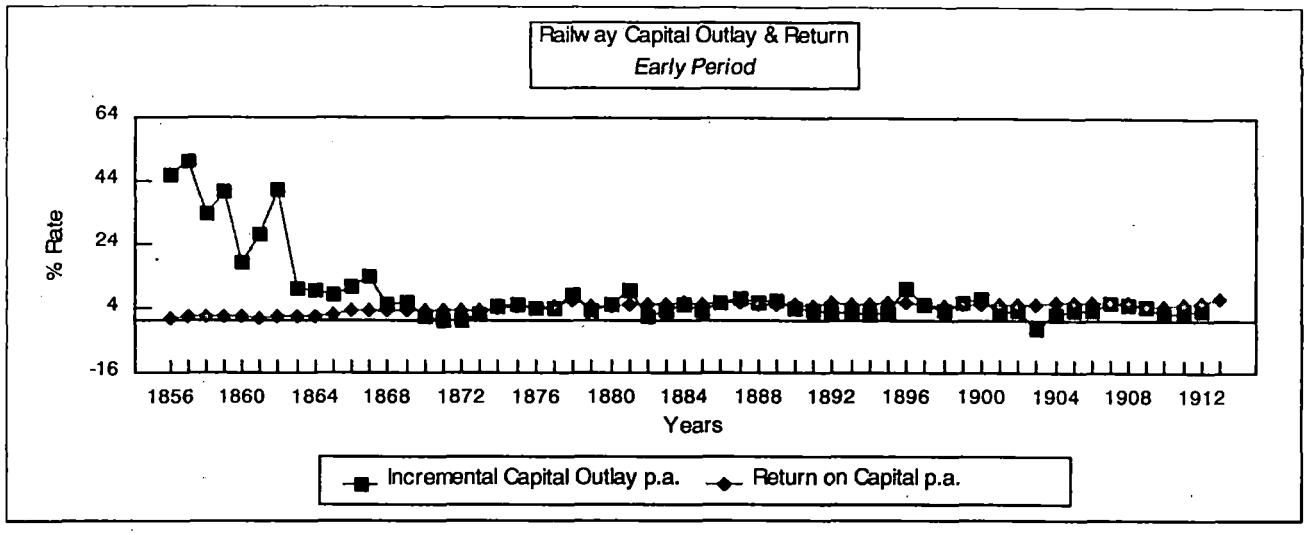


Fig 3.1*b*: *Financial Performance [1811 to 1946-47]*

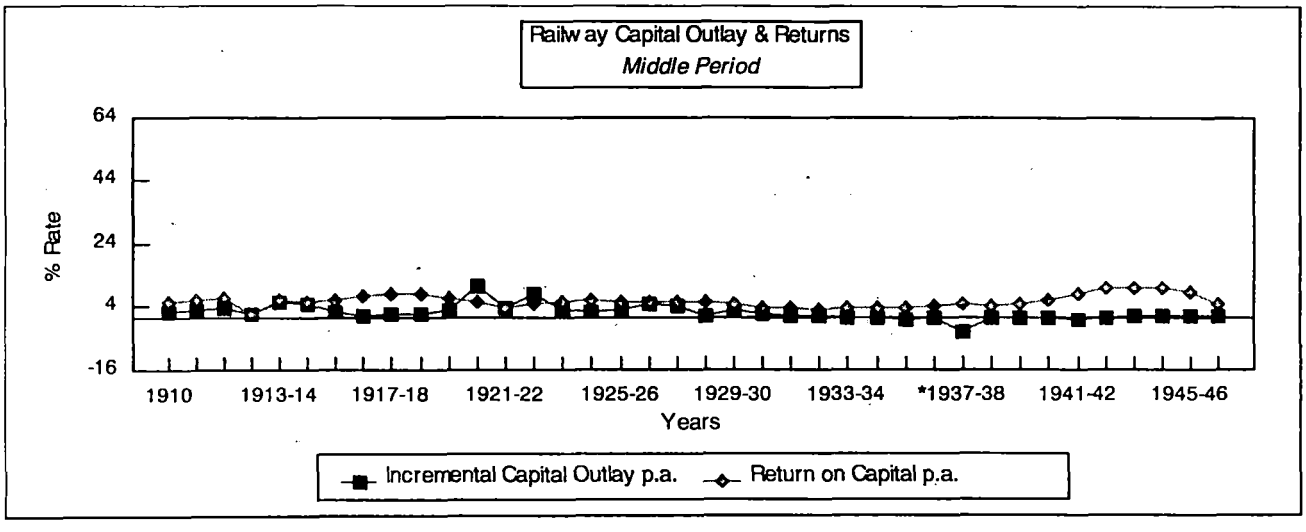
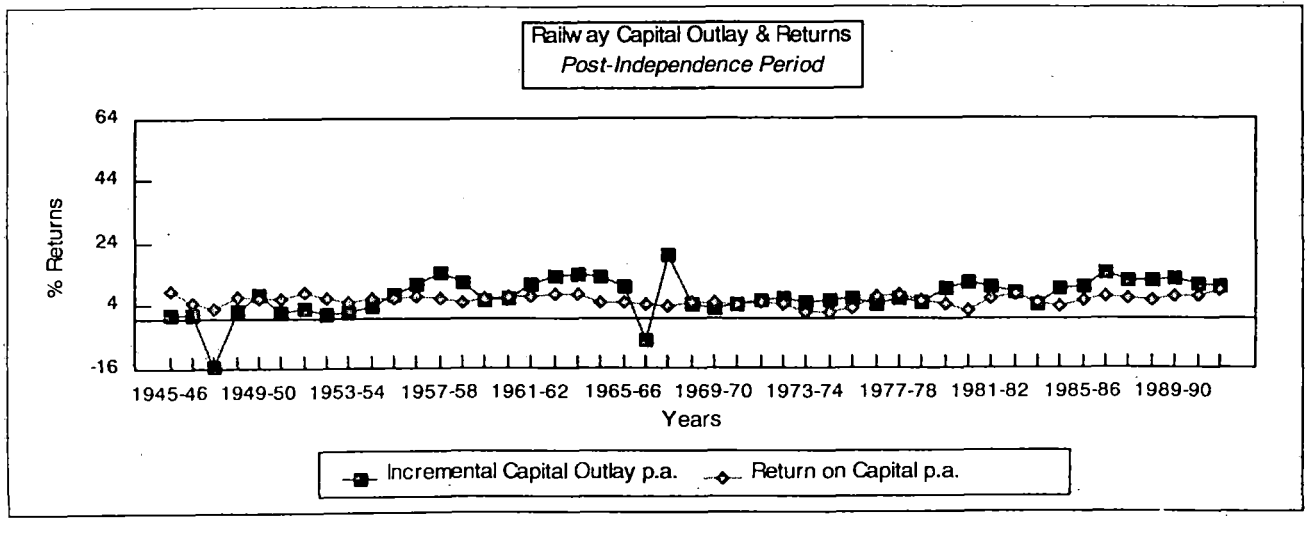


Fig 3.1*c*: *Financial Performance [1947-48 to 1991-92]*



earnings are total railway revenues net of normal railway working expenses. The level of net capital returns thus provides indication of the efficiency of utilisation of railway capital and also of the financial viability of railway operations. Although data for the above is available as a continuous timeseries beginning 1853, the summary of the decadal levels of returns since presented in Table 3.1 provide sufficient overview of the financial performance of railways in India over 138 years of railway operations. The associated graphical representation segregates annual capital increments and returns in growth (percentage) terms over the three phases of early, middle and post-Independence railway development. Examination is first made of the bivariate regressions of the capital returns series on incremental capital outlays for the three sub-periods mentioned, and yields interesting insights into the relationship between the two capital variables.

While increments in railway capital outlays over the first two periods relate inversely to capital returns, the relation becomes positive in the post-Independence period, implying that incremental capital investments in the formative stages of railway development do not bring immediate returns until railway operations have taken off. Thereafter, additional investment adds more credibly to railway revenue generation. From regression results, nearly two-thirds of the variation in railway returns over the *early* period can be ascribed to injections of capital made into railway construction with high correlation, although the investment relationship is inverse and significant. Since the bulk of private railway investment in India which went into construction of an extensive route network over the short spell of the first two decades after the advent of railways could be termed *sunk* capital, low returns on the same were unavoidable until traffic had developed a sufficient volume. Thus it was only towards the turn of the century that capital returns rose to a percentage level that exceeded the rate of capital increment, both because of traffic improvement and a drawdown in the annual rates of capital injection after the period of construction was over. Although the operational improvement is seen to have carried into the *middle* period, the relationship of capital returns with capital injections turns more unstable with a low correlation coefficient and an insignificant *t*-statistic. The middle period is partly an aberration from the rule in the sense that exogenous factors like the two World Wars and the World Depression between them affected capital flows as well as the operational performance of the railways - subperiods with the highest capital returns being associated with the war effort. The post-Independence period on the other hand shows radical differences. With the spurt in capital investment following commencement of planned railway development, the relation between capital injections and returns turns positive, with stronger correlation and higher significance. Low r^2 values over the middle and later phases of railway development render the relationship of capital outlays to returns unstable over time, implying that after initial construction of route networks, longer term factors like the level and utilisation of railway capacity come more into play in determining the level of incremental capital outlays. Since much less of this capital investment now goes into route expansion, gestation lags become correspondingly shorter and the returns more immediate so long as the traffic response is prompt. Incremental outlay of capital varies with the availability of resources for investment and for meeting the working expenses of railways. While an increase in availability enhances investment possibilities, a decrease seriously affects the level of capital increment with resources having to be diverted to finance working expenses. The reversed regression which seeks to identify the effect of capital returns on the level of capital investment thus shows a stronger positive relationship, establishing that in the most recent phase of railway development in India, it has been the prevailing level of railway returns which has effectively determined the quantum of additional capital investment and not vice versa. The changing relationship between the two capital factors during different phases of railway development warrants further elaboration because of the critical importance that capital returns have in determining the attractiveness of railway investment.

In India, railway investment has subserved different purposes at different times. During the early phase, the objective was moulded by the political and economic exigency of colonialism, which allowed the state to underwrite the vast corpus of private capital investment despite low capital returns. In the middle phase, the volume of investment was determined by the compulsions of war and depression and by the need for continuing state action to prevent recurrence of the famines which had periodically plagued the country. During the planning era on the other hand, railway investment has been largely focused around the urgency of establishing an industrial base and balancing growth of the country's regions. Within the pre-Independence period, the earliest decades commencing with award of the first railway construction contracts of 1849 were dominated by highly capital-intensive construction projects for route & track, financed by direct borrowings from a then-healthy London financial market. The initial phase was thus marked by network extension that bridged the spaces of the country and created new agglomerated markets. Fig 3.1*a* which illustrates the phase,

displays highly fluctuating incremental capital outlays exemplifying the lumpiness of the 'sunk-capital' investments undertaken between 1856 and 1868, with negligible returns accruing to capital-at-charge. The relative position of railway outlays versus returns in India was in fact similar to all railway construction projects undertaken in other countries during the early period and moreover is generally characteristic for all infrastructural projects. Capital returns thus only registered an uptrend after 1861 when new traffic demands began to materialise from the newly-uplinked markets. Once operations stabilised after completion of major trunk routes over that period, incremental investment outlays declined considerably.

Railway administration had by this time entered another phase with government taking over the task of railway construction from private companies, who would henceforth be concerned solely with the operation of the railways. Because of the past experience with company renewal funds, whereby high accounting losses from railway operations could be shown because of the practice of debiting replacement expenditure to costs rather than to revenue capital, future safeguards were simultaneously instituted which included abolition of renewal funds. While the takeover thus saved the government from having to meet interest guarantees, the level of new investment also suffered as little private capital was forthcoming without assured incentives and because the London money market had in the meantime begun to dry up. Gross railway earnings as indicated in Table 3.1a however began to improve since 1869 with the railway companies showing better traffic performance. Till 1869, working expenses had also been at levels well below gross earnings, allowing a certain amount of reinvestment by the railway companies. Between 1873 and 1910 however, additional investment was restricted merely to maintenance of railway operations and thus averaged 4 percent as can be seen in the figure. The occasional spurts during the period indicate sporadic acquisition of capital assets to replenish stocks.

It is interesting to take note of the degree to which railway investment suffered after government takeover of railway construction. The returns on capital invested during the period show an apparent constancy, with no lagged response that is attributable to incremental capital outlays, probably because of the low order of these increments. Indian railway history however shows that a recovery from the situation of static railway investments which prevailed between the late-1880s and the turn of the century, had been made by 1910 when the Mackay Committee recommendation for further expansion of the route network marks a concurrent uptrend in incremental outlays. This phase was however shortlived, and the middle phase of railway development more affected by exogenous aberrations, as already stated.

Thus the period commencing in 1910 and ending with Independence, which is illustrated by Fig 3.1*b*, shows sorry levels of railway investment as a whole, although in several subperiods capital returns show a rise which can be attributed to intensive use of the railway system. Expansion of the network however remained depressed since the major trunk and feeder routes had already been constructed. Although the period would thus appear to present a transportation 'equilibrium' where a static network was being utilised with different degrees of efficiency which reflected in the annual rate of capital returns, an important evolutionary change was taking place in the economy during the period. Two parts to this change were internal developments within the markets that had been networked by the railways, and multiplication of their downstream linkages which generated increasing industrial demand for transport services and consequently yielded higher revenues from smaller traffic expansions. The WWI period was however marked by an initial investment slump and lowered returns as revenue-earning traffic had to make way for military materials and provisions. After the war, the initial spurt in railway investment which peaked between 1920-21 and 1922-23 was mainly on account of the replacement of overused assets. Then for the first time, the Indian railways suffered a major setback from sharp decline in their gross revenues consequent to the high cost of operations and to an industrial slowdown once the production impetus provided by war had petered out. This postwar setback was however temporary, and increase in the momentum of internal trade improved the rate of returns.[11]

By now, overall concern of the government had turned to the more longterm problem of making the railway companies self-supporting, rendered more acute by the fact that, with abolition of renewal funds, even the replacement of railway assets was then being financed by capital borrowings. Resultant deterioration in the capital position of the railways was sought to be reversed by the IRC recommendations of 1921. Although the IRC reforms endowed the Indian railway companies with financial autonomy, their impact on financial health of the railways is not seen as sustained. Thus while the reforms were successful in improving efficiency and revenue earnings, capital returns on the average declined from 6.01 percent p.a. between 1909-19 to 5.35 percent p.a. between 1919-29.

During the postwar recovery, economic prosperity had prevailed in general. The railways thus generated revenue surpluses and were able to substantially increase capital-at-charge, as a result of which investment projects for augmenting the network and capacity were undertaken in a hurry which adversely affected cost estimates.[12] As a consequence, the operating ratio (the percentage of working expenses to revenues) increased from 48 percent to 63 percent in just ten years following 1918-19. Recessionary conditions which then prevailed over the greater part of the 1930s reduced the chances for recovery since no investment was forthcoming, and returns fell further to an average 3.86 percent p.a. between 1929-39 with only marginal increase in capital-at-charge over the same period. While incremental capital outlay declined continuously and hit an all-time (negative) low in 1937-38, gross railway earnings after 1931 also fell drastically, raising operating ratios since the working expenses of the railways still had to be sustained. Additional investments made thereafter then remained at low percentage levels till commencement of a new phase after Independence. However intensive utilisation of railway assets during the WWII period raised capital returns to an average of 7.02 percent p.a. during the decade 1939-49.

Fig 3.1*c* which illustrates the post-Independence period commences in a sharp drawdown in incremental railway capital outlays and reduced capital returns over 1947-48, following division of railway assets and stocks between the Indian Railways and the Pakistan Railways. The years between 1948-1951 thus saw an investment pickup on account of the urgent need to replenish railway stocks. The period thereafter which begins with the commencement of planning then shows an interesting pattern of alternate rising and falling waves in incremental outlays and capital returns coincident with the FYPs. Capital investment increased markedly with the 1FYP when effort was made to restore the operational capabilities of IR. With the 2FYP, the plan objective of industrialising the country also sought a corresponding widening of the infrastructural base of the economy and was therefore marked by continuous rise in incremental capital outlays to the railways, with an investment peak occurring just after the mid-plan. A fall thereafter was soon reversed with commencement of the 3FYP. The trends for the two FYPs thus show twin humps of investment over consecutive plans until industrial recession commenced in the mid-1960s with a sharp dip in capital outlays during the annual plans. It is pertinent to note however that the increases in incremental outlays during the 1950s and 1960s did not bring about a rise in traffic and either immediate or deferred increase in the rate of capital returns to any appreciable extent, which probably proved a disincentive to the planning of further railway capacity increases ahead of existing demand. For this reason, the pattern of low incremental investment during the IR 'plateau' until the end of the 1970s appears to have been dictated by the low level of capital returns, rather than vice-versa. As a result, the reversed regression relationship appears more typical of the period after the 3FYP during which incremental capital outlays were determined by the expected level of returns rather than being autonomously determined.

Another observation about the overall post-Independence pattern of railway capital outlays and returns relates the unevenness of the investment on railway development. The period itself can be divided into three sub-phases of high capital growth during the early plans, a slump through the middle, and gradual recovery in the period commencing with the 6FYP. The question of causality is important here. Although the first sub-phase spanning the first three plans initiated forward-looking autonomous growth in railway capacity independently of traffic demand, the purpose of the high capital outlays made during that time was to strengthen the downstream linkages of IR in order to stimulate the later growth of demand. The shift in the policy attitudes towards selective management of demand through the modernisation of operations instead of general augmentation of capacity which is observed in the intermediate period accompanies dwindling capital returns, down from average levels of 5.96 percent p.a. between 1949-59 to just 4.37 percent p.a between 1969-79. Not till commencement of the 6FYP was there another a noticeable investment hump, which is seen to be followed by yet another during the 7FYP. An interesting feature of the relation between capital returns and outlays is the subsequent return to the original order of causality where incremental capital investments again apparently determine the level of returns, although with noticeable lag. This reordered relationship which again becomes prominent towards the end of the 1970s then continues into the contemporary period. The phase after the 5FYP can thus be described as a period of rejuvenation for the railways in India in capital terms, from their capacity slump in the middle period.

With reference to the whole period that is being reviewed here, which spans the history of the Indian railways from their inception, the striking observation can be made that returns to railway capital have average out to below 5 percent p.a.. Even if focus is restricted to the present century, in order to obviate the long 19th

century teething-period when traffic was still developing, capital returns only rise to 5.48 percent p.a.. In comparison, railway capital returns over the post-Independence period average out to 5.40 percent p.a., *i.e.* are lower even than average railway returns over the nine decades of the century. It is well identified therefore that the problem of low capital returns on the Indian railways has persisted at all times, seriously affecting the prospects of railway growth in the long term. Although it might be argued in partial defence that the low percentage returns to post-plan capital investment occur at least partly as a result of the high level of incremental outlays which have rapidly increased the capital base of IR, the fact still remains that returns of barely over 5 percent are unlikely in the near future to stimulate growth of railway capacity and traffic. It stands to reason then that capital adequacy on the railway network shall for a long time to come have to depend on autonomous government support. It may also be noted that the highest annual returns of 9.9 percent p.a. recorded over the present century were during WWII in 1943-44. In post-planning era, the highest returns recorded were 8.7 percent p.a. in 1991-92, and in most plan-years have averaged well below 6 percent. Low returns to investment thus remains the bane of IR.

The foregoing analysis of investment trends and the financial position of Indian railways reveals that periodic replenishment of capital stock becomes imperative both for maintaining operational levels of the railways as well as for tuning transportation capacity to the momentum of development generated within the economy. While exogenous factors have from time to time been responsible for deterioration in the finances of the railways, policy attitudes towards infrastructural investment in general also assume a decisive dimension. Besides the limitation of a part of railway revenues having to be mandatorily deposited towards general revenues of the government, interest charges on borrowed railway capital lower net earnings and the scope for further incremental investment. As a result the depreciation reserves which are statutorily maintained for the renewal of assets have periodically been drawn upon to tide over a financial crisis, such as for instance, during WWII when withdrawals towards meeting working expenses were made from the Depreciation Reserve Fund and contribution to general government revenues had to be deferred.[13] The importance of the relative modes adopted for financing renewal and net investment on the railways hardly needs further emphasis, and is undertaken as an exercise in the next section.

3.2.2 Sources of Indian Railway Finance

Since times when the earliest railways were built in India by sterling companies, several metamorphoses in railway capitalisation occurred until the system finally settled into an eventual mode of government finance through plan and non-plan components of the General and Railway Budgets. The first guarantee arrangements were made with two sterling companies as early as 1849, at a time when railway development in Britain was also in its heyday. However the extension of guarantee only became *de rigeur* from 1856 onwards, when Dalhousie observed in his famous 'Railway Minute' that the conduct of commercial undertakings did not properly fall within the purview of government.

Over the period from 1858-59 until 1918-19, when the ownership of the railways in British India was repurchased by government against the payment of capital-at-charge and operating responsibilities entrusted to management companies, cumulative losses to the government on the payment of guarantees amounted to nearly 6.8 million pounds. The mounting burden of guarantees had already aroused criticism earlier, and for several years after 1869, capital expenditure on railways was in a large proportion being met directly by the state. An alternative experiment with 20-year subsidies that was tried out with two companies in 1862 failed to attract private capital. Nevertheless, following the Great Famine of 1878 which led the Famine Commission to stress the need for rapid development of railway, reliance was again placed on private railway capital without however conceding guarantee terms.

After 1893, when the trunk network had already been constructed, railway development mostly focused on the branch and feeder network where the scope for operating profits was lower. Hence terms of individual contracts were frequently amended with the overall object of sustaining capital inflow. While the major initiative for railway development by stimulating private capital inflows devolved on government, some of the Indian princely states also built railway networks of their own either under state or company ownership while District Boards also contributed to railway capital through special cesses, in both cases demarcating an alternative cost-sharing mode. Although by the time the IRC reviewed the position in 1920-21, only around one-seventh of the track network (or around 41,000km) remained under company control, extensive

public pressure for state ownership of railways caused government to take over major systems like the East Indian Railway and Great Indian Peninsula Railways, and to let other lines revert through efflux of time. It is to be noted that the period coincides with the amalgamation of railway companies in Britain, reflecting the extension of thinking.

It has already been noted elsewhere in the present chapter that the period thereafter saw a partly exogenous slump in capitalisation levels which deepened with world depression, although no further change in railway financing modes occurred until the return to state finance with railway nationalisation and formation of IR after Independence.

3.2.3 Dividend Liabilities of Indian Railways

The more interesting aspect of the period after WWI relates to revision of the modes for financing replacement investment. Separation of railway from general finances was made in 1924 under recommendation of the IRC or Acworth Committee, with the purpose of rendering railway administration independent of Government's Finance Department, and for introducing in-house accounting procedures accompanied by annual contribution to a reserve fund explicitly set up to finance the renewal and replacement of railway assets. Railway finances have been administered since 20 September 1924, by the Financial Commissioner, Railways, in separation from the Accountant-General, Public Works Department. The first of the above purposes in fact indirectly acknowledged the need to delink railway capital flows from the trends in economic activity which define the size of government budgets. The IRC recommendations in general sought to professionalise railway management while maintaining constant internal capital support for railway operations. It needs to be noted that most of the pre-Independence railway network was already in place in 1924 when the IRC recommendations were made. Thus the object of the recommendations was not primarily to finance railway expansion, but to maintain existing operational levels without capital drawback - a position which remained fundamentally unchanged until the inception of planning in independent India necessitated the sinking of new capital into railway construction and upgradation.

In order to compensate government for the loss of direct revenues that would ensue from the separation of finances, the two substitute concepts that arose were that of a *contribution* or *dividend* from working surpluses earned by the railways, and an *interest* against railway capital-at-charge. The first of these, as an annual contribution to the general revenues of the government, was to be payable as first charge on net railway receipts, and would be secured against the reserve fund. The annual contribution was later reviewed and revised under the Railway Convention of 1943 into a specified sum payable as dividend. Since the contribution over and above interest on capital has been payable to general revenues in all years since 1924, with the eventual railway surplus or deficit only being accounted after its settlement, the dividend provision has become the bone of contention ever since the IR have begun to suffer shortfalls on the capital account and in budgetary support.

A Railway Reserve Fund had also been created for the Indian railways through the Separation Convention of 1924, to which credits were liable to be made from net revenues after the contributions to general revenues had already been made. The proportion of surplus that could be so credited was scaled by a sharing formula between the railways and government on the total magnitude of surplus earned. After the nationalisation of railways from 1950, the fund was renamed the Revenue Reserve Fund [RRF] and appropriations from the railway surplus could be credited to it subject to parliamentary approval. The RRF was to serve as security for dividend contributions to be made to general revenues, and could also be tapped to meet any deficits that might occur against railway operations. However the introduction of the principle of deferred dividend liability from 1978 led to dissolution of the Fund since its original purpose had been lost.

The review of railway conventions made in 1949 after Independence, endorsed the nationalisation of the Indian railway companies, according the general taxpayer the status of sole shareholder. The Government of India gave effect to this recommendation on 1 April 1950. Although - after slight modifications in their spirit - dividend contributions were liable to continue, dividend reliefs were given on certain exempt categories of capital including losses on strategic, new or unremunerative lines, and a part of railway works-in- progress. On the latter works however, and on shortfalls in net railway revenues, the payments due would cumulate into a deferred dividend liability payable against future surpluses. Total payments made by Indian railways to general revenues of the government between 1924-25 and 1992-93 amount to Rs.12,204 crore, or 62.66

percent of total railway capital-at-charge. Till the Railway Convention of 1949, railway payments had also included the concept of an annual contribution from surplus, and a contribution of Rs.474.86 crore over and above normal dividend had been committed on this count between 1924-25 and 1949-50, before the concept went out of force.

Dividend payments by IR have accrued against a perpetual liability on non-repayable capital loans sourced through budgetary support from general government revenues and bearing interest in perpetuity. Together, all such loans are accounted as railway capital-at-charge. A supplementary source of capital allowed since 1992-93 has credited some part of net revenues to a Capital Fund which can be used to finance capital projects. All other railway investments, are to be met from internally-generated resources, including expenditure on renewal and replacement of railway assets, which may be met from the Depreciation Reserve Fund [DRF]. Except over the depression years between 1930-31 and 1939-40 when there were temporary defaults in payment in the contribution or dividend part, the railways were able to make regular contributions to government revenues uptil the end of the 3FYP in 1965-66. Thereafter as net revenues slipped, regular shortfalls appeared which were made up either by withdrawals from the Railway Reserve Fund which secured them or through current borrowings from general revenues, or else were carried forward as deferred dividend obligations. The largest shortfalls in dividend payments occurred towards the closing years of the 4FYP, and at the commencement and the end of the 6FYP.

3.2.4 IR Provisions for Capital Depreciation

Other special-purpose capital funds maintained by IR at different points of time included the Development Fund [DF], the Accident Compensation, Safety & Passenger Amenities Fund [ACSPF] and the Pension Fund. Another source of extra-budgetary bond financing was created more recently with the establishment of the Indian Railway Finance Corporation [IRFC] in 1986 to organise leasing of railway rolling stock. Since the primary source for renewal and replacement funding had shifted in 1924 under IRC recommendations, from current railway revenues to the DRF, a few words might be said about evolution since then of the depreciation provisions. The 1924 Convention had first laid down as a scientific principle that replacement and renewal of railway assets should be financed by funds specifically laid by for the purpose rather than by drawing upon current revenues. Although the amounts to be credited to the DRF initially covered the original cost of renewable assets, it was decided after 1936-37 that drawals from the fund could be made on the basis of either original or present cost, depending on which of these was greater, even though any excess replacement expenditure over original cost remained chargeable to capital. Only after 1949 did the depreciation provisions become more realistic, since they now allowed the securing of railway assets at full replacement costs, allowing also for improvement and inflationary components. Annual contributions to be made to the DRF by the railways had, before nationalisation, been estimated either by accounting or *ad hoc* provisions against the depreciation of wasting and non-wasting assets. The principle of fixed appropriations was continued between 1950 and 1983, until the practice was changed under recommendations of the Railway Reforms Committees [RRC]. Contributions to DRF since then have been made at around 2.6 percent of the current replacement cost of assets, with allowance of 8 percent for inflation upto 1992-93, which was subsequently raised to 10 percent.

The RRC recommendations had basically arisen after the investigation by the Committee was confronted by huge physical arrears in renewal and replacement of railway assets which would require consolidated investments of Rs.26,000 crore (estimated at 1981-82 prices) to wipe out, and the 2.6 percent provision was calculated against the current replacements costs of these worn-out assets. The practice before this had been to subjectively fix the depreciation appropriations in line with the estimated withdrawal for every given year. Also, though DRF was not included within overall plan resources till the end of 4FYP, its inclusion thereafter had left IR powerless to decide its own priorities for replacement and renewal, leading to a paradoxical situation where as DRF balances rose steadily, the arrears in physical renewal also mounted. A certain amount of accounting jugglery between the Finance Ministry and the Railway Board was associated with this circumstance, which arranged that additional capital support to IR from the government's general revenues would be scaled according to the balances accumulating within the DRF. Although superficially, the arrangement should have had no effect on capital expenditure by IR, what resulted in practice was that the additional capital grant attracted perpetual dividend liability, which would have not been the case if the IR had been allowed to finance renewals from internal resources which had been vested in the DRF.[14]

Another RRC recommendation designed to ease unfair capital pressures on IR stated that appropriations to the DRF should not be given the goby in attempts to meet dividend obligations during years when the revenue performance of the railways had been bad. Previous occurrences of this practice had often bled IR of its internal resources.

Summing up the foregoing, the asset-renewal position on IR has hardly changed since the time when the IRC was constrained to make caustic observations[15] on the bad accounting practice of allowing old, overaged and fully-depreciated railway assets to remain on the books, instead of writing them off from Revenue. Since the practice has since continued through deferment of capital expenditure on renewals and replacement, and as just stated, through payment of dividends ahead of making DRF appropriations, the railways in India have often been able to present an 'unreal, rosy financial picture'[16] hardly reflective of their dire assets position.

The fact that no separate provisions have been made at any given time against the *arrears* of depreciation arising from the deferment of renewal expenditure has been another disturbing feature. High levels of such arrears have existed on the Indian railways system during the two world wars, the depression years and again, during and after the 1970s. Even the RRC recommendation requiring that special budgetary support of Rs.260 crore *p.a.* be extended as a subsidy for wiping out arrears has not been assented to. The RRC also noted specifically that tariff revisions should not be made against these arrears - which actually represent costs that should have been written off - since this would penalise current railway users for past omissions.[17] It may also be noted from the above that perpetual dividend liability has worked to the long term detriment of railway finances, since no consideration has been given to revenue shortfalls while requiring the dividend to be credited. Hence in such cases, the RFFC recommended waiver of the dividend shortfall for a maximum period of 5 years, over which IR would be required to nurse their operations back to health. Although no occasion has arisen to seek support, after the uptrend in rates and revenues following the recent revisions in tariff, the evidence of the past makes a strong case for inclusion of this provision.

3.3 Early Freight Performance of Indian Railways

Two distinct periods can be discerned in the history of railway transportation in India. Prior to Independence the main objective had been the introduction of a mechanised transportation system to serve political and economic policies adopted by the British government. In the post-Independence phase, transportation concerns have focused on meeting national needs adequately so as to register a sustained development of the economy.

Within the pre-Independence period, two features stand out that are not consistent with each other. Mechanisation of economic flows following from the building of the railways generated growing volumes of merchandise and trade, inspite of which the country failed to progress economically. Secondly, while the railways in India soon became the major mode of transport, fulfilling one of the essential prerequisites for economic growth, they proved wholly inadequate in generating development momentum. Early administrative policies of the government that had guided the construction of railways were not conducive towards their viable operation, but the losses arising against payouts of the interest guarantee had to be borne by the Indian taxpayers. Nor did the colonial policy of using the railways to facilitate the transportation of raw materials to British manufactures enhance the prospects of industrialisation in India and increased movements of freight on the railway system as its further consequence. Such obvious disincentives were further aggravated by a policy of levying low tariffs on freight originating in or destined towards ports, which effectively favoured imports of foreign manufactures and exports of raw materials.[18] This was especially detrimental to industrialisation, since while it generated activity around port- cities, the inland centres suffered the decline of many domestic industries including Indian handicrafts. Nascent industry nevertheless developed near the ports, as exemplified by the growth of textile manufacturing at Bombay, and of the mill sector comprising oil, flour and jute mills in the vicinity of Calcutta, both centres reaping benefits from low freight rates on their respective raw materials.[19] The mining of coal was also stimulated but did not bring forth the development of heavy industries until the advent of planning in the post-Independence era.

Although data availability for the early railway period is obviously limited, three operational aspects of growth in freight transport operations, namely originating tonnages, net tonne-kilometers and average freighting leads of Indian freight might now be scanned to identify factors in the growth of the economy prior to Independence. Although railway reformation brought on by the Acworth Committee Report of 1921

had endowed the Indian railway companies with organisational autonomy from the state exchequer after separation of Railway and General Budgets, this did not translate immediately into increased financial or operational viability. Boom conditions in the economy had in any case abated over the 1920s, and the larger part of the 1930s was beset with severe recessionary conditions, even though India with its low level of industrial development was somewhat insulated from the throes of world depression. But, as the Acworth Report had then commented, the railway companies did not maintain data other than standard financial indicators in the preceding years and hence the earliest compilations of technical data refer to a period well into the 1930s. These are presented in the table, with data for the years that immediately followed freedom in 1947 being included to provide a sense of their continuity.

Table 3.2: Early Freight Performance of the Railways in India

Year	*All-gauge* Originating Tonnage *[MT]*	*All-gauge* Traffic *[billion NTKm]*	Average Lead *[Km]*	Running Track Network *[Km]*	*BG+MG* Gross Passenger -Km	*BG+MG* Gross Freight -Km	*BG+MG* Total Train-Km	*BG+MG* Freight Train-Km	Wagon -Days	*BG+MG* Online Wagon Fleet	Wagons Daily Offline	Total Wagon Fleet
1938	85.75	35	408	38007	56.3	88.3	283.7	110.22	74898	199148	9836	208984
1939	89.82	37.1	413	37996	55.6	93.2	286.6	115.37	75386	199830	10237	210067
1940	90.63	40.0	442	37933	57.0	98.6	289.8	119.07	76365	202958	9400	212358
1941	95.00	44.7	471	38568	58.9	107.4	299.1	130.49	75932	201958	8592	210550
1942	92.36	44.8	485	38598	51.2	102.4	253.6	121.96	74167	197264	7927	205191
1943	93.17	45.3	487	38615	53.9	101.4	247.0	119.55	74076	196517	7416	203933
1944	98.15	45.4	462	38992	60.8	104.1	257.9	122.44	77388	206237	8610	214847
1945	98.25	46.5	474	39090	64.2	108.6	273.9	127.92	84752	226425	11232	237657
1946	89.11	43.0	483	39061	64.0	102.1	285.8	121.16	87995	235331	16858	252189
1947	70.92	32.5	458	32165	48.1	76.7	220.6	91.71	74620	198965	13028	211993
1948	79.76	36.4	457	32039	52.0	83.5	235.7	94.61	72552	193874	15278	209152
1949	89.11	40.6	456	32502	54.8	94.0	253.6	105.39	73235	194510	15068	209578
1950	92.87	43.7	470	32565	59.6	98.7	262.1	111.50	74857	198305	15133	213438
1951	98.25	47.0	478	34317	62.3	104.9	280.1	117.62	75283	198943	15777	214720
1952	98.66	46.8	475	34518	62.8	106.4	284.6	120.19	78197	206579	15943	222522
1953	99.67	47.7	479	34686	65.2	107.3	288.5	118.58	81461	215137	15854	230991

Source: Adapted from *IRYB 1953-54*, Directorate of Statistics & Economics, Ministry of Railways, Government of India, New Delhi; all figures have been converted to appropriate metric units

The period under consideration is influenced by two major political events which had transport consequences in India as well as the world. WWII which commenced in 1939 and culminated in 1945 involved the Indian economy into Britain's war effort because of its status as a British colony, and took its toll as resources were diverted towards serving and provisioning military objectives. The second event which had its impact within India was the achievement of independence from British rule in 1947. Euphoria over the end of colonial bondage was however severely dampened by the partition of India and transfers of territory, population and associated resources, which that event entailed, leading to partial recession within the economy.

3.3.1 Freight Traffic & Tonnage Trends

No marked tendency towards growth in tonnages carried on the railways is visible over the war-affected period of 1939-1945, although these nearly constant tonnages were being carried over greater distances because of the freight logistics of WWII and its eastern war theatre. As a result the rise in tonne-km traffic over the war period is much stronger than that in originating tonnages, and the dip in tonnages between 1942-43 is hardly reflected in the corresponding net tonne-km figures The second dip in both tonnages and traffic in 1946 is likely to have followed the lessening of the buoyant effect of the war on the railways, and marked contraction in both tonnages and traffic in 1947 was a direct consequence of the partition of the country and its railway system after the attainment of independence. It will also be seen that the division of India implied greater loss of originating tonnages than of traffic. The Indian Railways seem to have been occupied over the rest of the 1940s in recovering the traffic and tonnages lost as a result from Partition.

Further evidence of this divergence between tonnage and traffic trends is found in the figures on average freight leads. The immediate expansion in journey distances brought on by the onset of WWII is seen to have been largely maintained after the end of the war, although average freight leads declined slightly from the high of 487km reached in 1943. The immediate impact of Independence is seen to have been a fall in

journey distances of which one of the principal causes was the separation of the major northern port of Karachi. It is only well into the 1FYP period that average leads begin to recover, along with tonnages and tonne-km traffic.

Considering freight tonnages and freight traffic on the Indian railways in the late-1930s and 1940s in associative terms, these are seen to have been more tonnage-influenced than distance-influenced at the end of the 1930s, also reflecting the lower traffic leads of that period. While WWII boosted both rail tonnages and freight traffic, the growth over the war period was influenced more by rising freighting distances rather than rising tonnages. The steepest fall in both tonnages and traffic thereafter occurred in 1947, and at least three years elapsed before these could recover to the pre-partition levels of 1946. While the degree of association between tonnages and tonnage-distances remained largely unchanging in most years under current reference, the correspondence was skewed towards tonnages originating in two periods of the late-1930s and again in the two years immediately following Partition in 1947. It might however also be noted that the intrinsic reasons for the skewing (as apart from historical reasons) were different between the two periods, since while the late 1930s saw quickly rising tonnage freight relative to average haulage distances, the events some ten years later brought about more contraction in journey leads than in freighting tonnages. The latter situation was obviously brought on by losses of territory and a part of the railway network.

It is nevertheless noticed that over the entire period under review between 1938 and 1953, tonnage trends were more static than growing, even though the traffic and distance composition would have been changing. An inference that could be drawn from the relative constancy of the former is that of full utilisation of the railway capacity then existing, without significant addition to this capacity taking place. Since the war effort would have involved new tonnage traffic, freightage of this could only have been possible through substitution of existing tonnages, leading to results as dangerous as the manmade Bengal Famine of 1942-43, which arose basically through the lack of timely transportation of foodgrains and other relief material because of saturation of railway capacity by military traffic. In fact, the reduction in military traffic with the end of the war is matched by an immediate fall in originating tonnages. The data would also imply that railway and freight operations in the colonial period were not growth-oriented, but simply 'marked time', in a manner of speaking. The lack of growth in tonnages would have been sustained by the relatively constant population with relatively constant living standards. In contrast, the recovery in railway operations following 1947 would have been qualitatively different since it had to be based on restoration of railway network and equipment through new investment, to meet the needs of a smaller population. Thus the main impact of Indian Independence on the railways was - for the first time - a forward-looking regimen of growing investment, growing operations and growing traffic demands.

Although this first assertion of infrastructure-building for a new country may seem somewhat unremarkable in terms of addition to tonnage freight, it needs to be remembered that the recovery just mentioned was achieved after the transfer of a significant proportion of the broad-gauge [BG] network associated with Karachi Port to West Pakistan. This transferred portion had been a major corridor for the carriage of freight to and from North India and hence had high traffic as well as high capacity from the use of the broader BG vehicle platforms. After Partition, the Indian portion of this traffic had to be largely rerouted through the port of Bombay.

3.3.2 Operational Intensity of Railway Freight

Substantiation for the inference on increased intensity of freight operations on the railway system because of military imperatives during the war years is found while considering relative passenger-intensity *versus* freight-intensity of rail movements in the period under reference. It is noticed that the war years between 1941-45 all show a common increase in freight train kilometres, while at the height of the war this increase had to be achieved through restraint on passenger operations, even at the cost of increasing empty haulages, reflected in deviation between net and gross freight intensity as represented in the freight-train-km and gross freight-km data. The fact that such a trade-off had to be made also substantiates the situation of saturated railway capacity faced by the Indian economy in those years. The effect of Partition on the relative intensity of freight and passenger operations is also observed to have caused an immediate fall in passenger movements to a sharper degree than the associated fall in freight intensity. But with recovery of the economy, freight and passenger movements also multiplied, with neither having to chase out the other, since railway capacity was also being augmented.

As had been earlier witnessed in respect of WWI, the onset of conflict brought about sharp escalations in railway operations, but at the eventual cost of overuse of railway equipment and inventory till the point of capacity decline. It would be interesting to examine whether this course of events was replicated during WWII. Consideration may therefore first be made of the associations between online railway wagonfleets and the intensity of wagon use. In general, over the time period under consideration the rate at which wagons were deployed for freight operations bore a more or less constant ratio to the available stock of wagons. However - especially in view of war-exigencies - the deferral of wagon replacement in order to sustain the high levels of freight operations necessitated by war would cause deterioration in the quality of online wagonfleet, and it needs therefore to be explored whether such a situation did indeed occur over WWII.

A part of this evaluation would rest on whether increases in the intensity of use of railway wagons as measured in *wagon-days, i.e.* as standard multiples of their standardised 5 hours of online deployment, were matched by lateral expansion of the online wagonfleet or not.[20] Where matching was maintained, the hours of wagon-use and wagon maintenance and replacement schedules would remain unaffected by increases in freight traffic, as operational intensity would have been optimised. But since such idealised circumstances could hardly have been sustained through a period of war, where replacements and maintenance could be expected to suffer because of prior commitment of financial as well as material resources to the war effort, periods might well exist when increased military traffic could only have been carried by extending the normal hours of wagon use.

Turning to wagon data for the war years, it can be seen now that the sharp increase in freight traffic during WWII were sustained on the increased intensity of wagon use, generally without significant augmentation in the online wagonfleet, although as many as 3128 wagons were added in 1941 as part of the war mobilisation. Since sharp falls subsequently took place in the availability of wagons online, the dip in tonnages in 1942-43 noted in the preceding study of freight operations is now seen to have been the partial product of static hours of wagon deployment over longer traffic leads, all reflecting the debilitated condition of the online fleet. Significant restorations of the wagonfleet were therefore necessitated as the war rose to a climax in 1944-45, in order to increase the availability of wagons for deployment. Once WWII was over, a fleet decline set in again after the fall-off in traffic reduced immediate freight pressures on the online fleet, and intensified in the aftermath of Partition because of further loss of traffic. The consequent pressures were absorbed by increasing wagon deployment, evidence of which is offered by the fast-increasing ratio of wagon days to wagonfleet, at least till 1948-49. Gradual recovery of the economy subsequent to that period saw fleet acquisitions rise over the planning era, lowering wagon deployment to more acceptable levels.

An important performance statistic widely used in evaluating railway systems across the world is the ratio of net tonne-km traffic to wagon-days, which serves as a productivity index for the deployment of railway wagons. Over the war-years, the increase in tonne-km traffic stayed consistently ahead of the increase in wagon deployment, reflecting higher tonnage loadings and longer haulage distance for each wagon online. The hill was crossed in 1945 when the war ended, and productivity per wagon dwindled further over the next three years, during which the Partition-induced slump in tonnages and traffic brought railway operational productivity down to a new low. The recovery in wagon productivity after 1948 may be deemed especially strong after consideration that the size of the railway network administered and the spatial spread of freight services had both been reduced by the loss of territory. Thus the trend set by the economic renaissance within the country after the achievement of Indian Independence, raised both traffic handled as well as productivity, with the implication that better utilisation of the online wagonfleet was being made. Since augmentation was also simultaneously being made to the online fleet, the improvement in productivity was not being achieved at the cost of wagon overuse and longterm deterioration of fleet quality, as had been the case when operational freight productivity had risen over WWII.

Another productivity factor usually defined for the railways relates to the intensity of track use, defined in turn by the running frequency in freight services. In terms of this index, clear demarcation occurs between pre- and post-Partition phases because of the underlying truncation in the IR network-size. Over most of the war-years, increases in freight demands were met more by increasing the intensity of wagon use than by increasing the intensity of track use, mainly following from the lack of idle inventories of rolling stock and traction units. The loss of a part of the running inventories consequent to Partition, immediately brought about a drastic reduction in the running intensity of freight services, both because of the lack of equipment and reduction in traffic demand, although the slow buildup in rolling stock thereafter would indicate that the

constraints operating were more on the equipment side than in traffic demand. As a new pace for railway operations was then set by the advent of planning in India, increased productivity in railway operations has since been indicated both by more optimal wagon use and increased track use, as the data would indicate.

Table 3.3: Growth of Freight Traffic on Indian Railways 1950-51 to 1994-95

	FOR REVENUE-EARNING FREIGHT TRAFFIC					
Year	Originating Tonnages *MT*	*Indexed Growth*	Net Tonne-km Traffic *billion NTKm*	*Indexed Growth*	Average Traffic Lead *Km*	*Indexed Growth*
1950-51	73.2	*100*	37.6	*100*	513	*100*
1955-56	92.2	*126*	50.4	*134*	541	*106*
1960-61	119.8	*164*	72.3	*193*	603	*118*
1961-62	125.6	*172*	75.4	*201*	600	*117*
1962-63	139.4	*190*	83.1	*221*	596	*116*
1963-64	147.6	*202*	88.6	*236*	600	*117*
1964-65	148.8	*203*	88.7	*236*	596	*116*
1965-66	162.0	*221*	99.0	*264*	611	*119*
1966-67	164.0	*224*	99.2	*264*	605	*118*
1967-68	162.4	*222*	101.2	*269*	623	*121*
1968-69	170.8	*233*	108.1	*288*	633	*123*
1969-70	173.8	*237*	111.8	*298*	643	*125*
1970-71	167.9	*229*	110.7	*295*	659	*129*
1971-72	170.1	*232*	116.9	*311*	687	*134*
1972-73	175.3	*240*	121.2	*323*	691	*135*
1973-74	162.1	*221*	109.4	*291*	675	*132*
1974-75	173.6	*237*	121.4	*323*	699	*136*
1975-76	196.8	*269*	134.9	*359*	685	*134*
1976-77	212.6	*290*	144.0	*383*	677	*132*
1977-78	210.8	*288*	150.3	*400*	713	*139*
1978-79	199.6	*273*	143.9	*383*	721	*141*
1979-80	193.1	*264*	144.6	*385*	749	*146*
1980-81	195.9	*268*	147.7	*393*	754	*147*
1981-82	221.2	*302*	164.3	*437*	743	*145*
1982-83	228.8	*313*	167.8	*447*	733	*143*
1984-85	236.4	*323*	172.6	*460*	730	*142*
1985-86	258.5	*353*	196.6	*523*	760	*148*
1986-87	277.8	*380*	214.1	*570*	771	*150*
1987-88	290.2	*396*	222.5	*592*	767	*150*
1988-89	302.05	*413*	222.4	*592*	736	*144*
1989-90	309.97	*423*	229.6	*611*	741	*144*
1990-91	318.40	435	235.8	628	741	144
1991-92	337.98	462	250.2	666	740	144
1992-93	350.05	478	252.4	672	721	141
1993-94	358.72	490	252.4	672	704	137
1994-95	364.96	499	249.6	664	684	133

Source: Compiled from *IRYB*, various years, Directorate of Statistics & Economics, Railway Board, Ministry of Railways, Government of India

3.4 Railway Freight Trends over the Planning Period

After the upheavals that followed the partition of India involving dislocations of freight flow patterns and translocation of populations, as well as the loss of 10,523km of the railway route network, an initial slump in operations followed while the economy took stock of the residual Indian Railways infrastructure as it recovered. Estimates of traffic loss in 1947-48 would amount to 18.19 million tonnes-originating and 10.73 billion tonne km in terms of freight traffic, as well as 15.90 billion passenger km. As the losses in railway assets had also extended into rolling stock including traction, 29.44 million freight train km as well as 34.27 million passenger train km were lost over the year. Over 36 thousand wagons or nearly a seventh of the online freight fleet was transferred to the western and eastern Pakistan Railways systems. While the inventory loss represented the physical reduction in freight infrastructure , the traffic losses they caused combined traffic transfer to the Pakistan Railways, with traffic lost on the Indian network because of the uncertainties prevailing in the post-Partition period. Thus for IR, the years immediately after 1947 were years of recovery.

The momentum of this recovery did not however take long to escalate into a railway boom because of

renewed impetus provided by the institution of Indian planning in 1950-51. The mood of the economy of decidedly upbeat in the early post-Independence period, partially because of the accumulation of sterling balances over WWII, and because the resurgence of nationalist feeling strengthened the Government resolve to build a strong economy. Table 3.3 above depicts operational trends of IR since then, with the annual figures from 1960-61 onwards covering the 35 years following the first two Five-Year Plans and occasional hiatuses that interspersed them. The performance parameters considered in the table all pertain to revenue-earning freight operations, with departmental traffic is excluded.

It may be noted in overview at the outset that the broad trends in IR operational performance indicate more or less continuous growth in freight operations spanning the entire period since institution of planning, as both loading tonnages and tonnage distances show several-fold increase. Reference to the indexed values of this increase in the table however shows that the growth of railway freight traffic in net tonne-km terms has been much stronger than the growth in freight tonnages, the sixfold increase in traffic generated by the quadrupled originating tonnage providing strong indication of widening in the distributional spread of railway operations coincident with progress of the economy. A more ambiguous trend is evident however in the table in figures for the average journey leads over which railway freight has been transported, which show a rise in freighting distances by nearly 50 percent. These overall trends are now analysed over various phases of planning in India in order to identify features peculiar to each which can provide operational indicators of the extent to which the development needs of the economy have been served by the railway infrastructure.

3.4.1 Rising Tonnages

Growth in originating freight tonnages over the planning horizon of eight five-year plans has not been smooth and has instead delineated phases of strong to moderate growth. The first phase of sustained growth covered the period of the first three FYPs from 1951-66 and was especially marked after the 2FYP, when the sectoral model for Indian planning was adopted and raised the emphasis on capital-led growth. As the railways were an infrastructural sector and moreover one with strong upstream and downstream linkages, a focus on railway investment was inevitable over the period and was initially encouraged by strong freight loading trends. Increase in railway capacity over 2FYP and 3FYP was in fact in advance of the growth of traffic. But with projected traffic failing to materialise over 3FYP and freight targets remaining under-fulfilled, slack appeared in IR's operational performance which continued into the period of the Plan Holiday and the 4FYP between 1966-74. It was also during this period that the first Oil Shock hit the economy and had cost-raising impacts on IR similar to those witnessed in the country- railway systems earlier reviewed. Thus the period between 1968-75 might be regarded as a 'plateau' period in railway operations when railway tonnages hovered around a static level instead of showing any marked tendency to increase.

In the meantime the excess capacity that had been created over 2FYP and 3FYP had dispersed as the economy slowly adjusted to the triple traumas of the 1965 Indo-Pakistan War, the 1966 famine and the rupee devaluation that followed. Adjustments to the two Oil Shocks however continued over the 1970s during 4FYP and 5FYP and the minor recovery in tonnages in 1975-78 after the first adjustment again went into a tailspin. The decade of the 1970s might therefore be considered as a period where the railways were not able to lead the revival of the economy, and financial performance over the period, which was considered earlier, will corroborate this. It may also be noticed in relation to Table 3.2 that the levels of plan investment on railways showed a sharp proportionate decline in the 1970s compared to the early plans, and the nominal railway outlay of Rs.1326 crore in the 3FYP was only surpassed during the 5FYP with a devalued rupee. The railways at the end of that plan were in virtual doldrums.

A study of corresponding plan investments will show a rise of nominal outlays on railways during 6FYP and after, reflecting belated realisation on the part of planners of the 1970s having been a 'lost' decade as far as infrastructure building was concerned. Although in proportionate terms, the outlay was smaller than in the previous plans, the impetus it provided combined with a recovering economy to push railway operational performance back into a growth curve. These trends continued through the succeeding plans uptil the present point of time, during which plan investments also continued to increase even as budgetary support dwindled. The period of the 1980s thus represents radical reversal of the earlier stagnation which had lasted for nearly 15 years following 3FYP, and needs to be accorded attention.

One of the important developments in Indian transportation planning, which coincided with the launching of

the 6FYP, was the submission of the report of National Transport Planning Committee of the Planning Commission [NTPC] in 1980, to be discussed at length later. The NTPC Report was a coordination and perspective planning exercise that extended freight projections over the surface transportation modes into the 21st century and thus provided a stronger input for freight transportation planning in the FYPs. Despite dormancies in railway freight witnessed over the 1970s, the NTPC correctly diagnosed these as a symptom of general recessionary conditions in the economy rather than as more permanent lacunae, and predicted a rise in total railway freight traffic to between 435-468 billion net tonne-km by the turn of the century. It also held that uncoordinated growth of the roadways over the period reviewed had succeeded in diverting freight flows away from the railways because of overall shortages in railway capacity, and that the competition that had emerged was in fact wasteful as far as the allocation of planning resources was concerned, since bulk transportation capacity had to improve as a prerequisite to general economic recovery. Bulk transportation was in any case the preserve of IR and worked to the benefit of the PSU-dominated capital goods sector of the economy, hence the programme for economic revival stressed investment on the railways as an adjunct to plan and budgetary support for the industrial PSUs. These revisions of priority came at a time when official economic policy in India underwent its first liberalisation vis-a-vis the use of foreign capital funds and borrowings, which combined to restore buoyancy to railway freight operations.

The railway freight position in the 1990s has been coloured by the major tariff increases in 1992-93, after which a surplus character has been restored to the Railway Budget. Thus while financial performance of IR has improved since then, the enhancement in earnings has not entirely carried into the corresponding tonnage loadings which in fact show a setback immediately following the hike in freight rates, reflecting an elastic response. Nevertheless, originating freight tonnages at the present instant of time have risen very creditably to 430MT in 1997-98.[21] The major qualification that really needs to be made in this connection is that whereas the NTPC predictions were made on the basis of an ideal 72:28 ratio freight share between IR and the roadways, the current IR originating freight tonnages represent a loading share of 40 percent. In this sense IR is carrying less traffic relatively than would be warranted by the NTPC share projection, and traffic of around 32 percent - or around 344 MT of equivalent freight - has been lost to the roadways sector.

3.4.2 Growing Traffic Kilometerage

Complications are introduced into the study of long term railway trends by any changes that might take place in the commodity-composition of freight flows. In aggregated operational terms, this dimension of the traffic study would reflect upon the relative divergence of net tonne-km trends from trends in originating tonnages since for instance, increasing specialisation of railway freight operations towards carriage of bulk traffic would cause sharper rise in tonnages than in net tonne-km, and vice-versa. The patterns evinced by the data present phase-wise alternations, which shall now be considered.

As earlier remarked, the overall tendency has been for journey-tonnages, *i.e.* net tonne-km, to rise at a faster rate than tonnage growth. In itself, and for reasons opposite to those alluded to in the preceding paragraph, the relative observed patterns of growth in net tonne-km versus originating tonnages would indicate in all probability, that the increased tonnage traffic reflects spatial expansion of the national market as much as it does the growing specialisation of IR freight operations towards bulk carriage. However the oscillating relationships observed between respective trends indicates that phases exist when growing traffic has been more the result of growth in bulk-freight tonnages, than of multiplication in shipments, and the analysis of such phases merits attention.

On the theoretical plane, the relationship between originating tonnages and net tonne-km in a developing economy would follow the *ex hypothesi* course of tonnages rising because of GDP increases and traffic kilometerage rising because of market expansion. Over the period of the first three FYPs, tonnage and tonne-kilometre increases are observed to have proceeded in step, with parallel increases being sustained through rising capital investment over the Plans and consequently increased IR freightage capacity. The implication here would be that the growth of transport infrastructure led the growth of the economy and that expansions took place both in the size of market and traffic volume. However following the 3FYP, a noticeable plateau was reached in traffic - also noted earlier with reference to tonnages, the principal reason for this being the downscaling of capital investments on IR in the subsequent FYPs, mainly because traffic trends over the early 1960s aggregating 203MT over 3FYP had not met the Plan's projections of 248.9MT of

originating tonnages.[22] With hindsight, comment has been made in respect of this plateau phase[23] that the cutbacks which took place in the plan investment scales in the railways, and in the transportation sector in general, now appear inexplicable in the face of the needs of the growing economy, although these may not have seemed quite so evident at that time. Nevertheless severe transportation bottlenecks,[24] along with the mix of other factors such as agricultural and Plan setbacks, industrial recession, Oil Shocks, etc., which had kept originating tonnages relatively stagnant between the mid-1960s and the end of the 1970s, were also responsible for the slowdown in market expansion, accounting for restrained growth of railway freight traffic when assessed in net tonne-km. The freight impact of the two Oil Shocks was much stronger in its traffic manifestations than in tonnage-terms - 1973-74 and 1978-79 being the only two years over the entire 40-year longitudinal series when there were significant absolute declines in traffic levels.

Although in net tonne-kilometre terms, freight traffic on IR has risen considerably overall during the time-frame of the present study, attention also needs to be paid to shorter periods where traffic has spurted or else has been relatively stagnant. Traffic patterns that have risen over the long term may then be summarised accordingly. In contrast to possibly exogenous traffic setbacks in the two years just identified, smart spurts are observed to have occurred in the commencement-years of every Plan since the 5FYP. However instead of these traffic spurts then being consolidated over the Plan into a marked and sustained growth of railway freight operations, the recurrent pattern has been that of an initial rise followed by relative constancy of traffic over the remaining plan-years. The point is more easily revealed by examination of the first set of associated diagrams in Fig 3.2.

Fig 3.2*a* among these reveals relative contrasts between tonnage- and traffic-rates of growth in Table 3.2. While the rate of growth of tonnages has been relatively steady as earlier remarked, the traffic- rate of growth has been an increasing function of the former. Nevertheless the strongest traffic spurts that IR have witnessed since 1960-61 occurred in clusters around the period from 1974-75 to 1976-77, from 1984-85 to 1986-87, and from 1990-91 to 1991-92. The three periods respectively mark the initiation of the 5FYP, 7FYP and 8FYP and indicate that the levels of infrastructural and/or traffic adaptations were remarkably strong within them. However the reasons for these spurts and their subsequent impact over the remainder of the plan need not necessarily have been identical. Thus traffic increases that commenced the 5FYP would partially have been the symptom of buoyant expectations induced by the plan, as well as an adaptation of the Indian transportation system to conditions brought on by the first oil crisis, which in fact rewarded the railways since the cost cascades they induced affected the roadways more severely. This latter factor would have noticeably been absent in the traffic spurts of the 1980s and 1990s, so that these would have resulted entirely from buoyancy induced by the plans.

Inferences drawn on increases in traffic in net tonne-km terms however tend to be ambiguous because of the dualistic construction of the net tonne-km traffic indicator, which reflects both originating tonnages as well as freighting distances. Thus the inference that traffic expansion during the mid-1970s proceeded at least partially from the temporary recovery of a segment of short-haul freight from the roadways because of sharp increases in cost needs further corroboration. This corroboration is provided by declines in average traffic leads during the period which would reflect a change in IR's freight-mix through carriage of a larger proportion of the short-lead and smalls (i.e. less than full-wagonload) traffic that was being carried on the roadways just prior to the oil crisis. Such features are absent in the declines in average traffic leads over the subsequent period, since no new oil crisis preceded them.

In sum, it might be said that IR freight traffic has risen ahead of IR freight tonnage both because of market expansion and development in a growing economy, and because a freight-mix change in this traffic has taken place as a result of exogenous as well as technological factors. It is particularly the technological factors in traffic adaptation that indicate the growing specialisation of a railway system, which however may or may not entirely be in consonance with the needs of that growing economy. It would also follow from the foregoing that the most significant change in the IR freight-mix, i.e. the shift to bulk, occurred in the mid-1970s and was therefore at least partially the consequence of the adaptation of the Indian economy and its transportation infrastructure to the allround cost-restructuring also noticed across the world, following worldwide escalation in prices of petroleum, oil & lubricants [POL]. However, the shift to bulk would also reflect a loss of other tonnages to the roadways and the confinement of the IR freight operations to the carriage of specialised freight with specialised freight-handling equipment and vehicular rolling-stock. This therefore warrants that the pattern of change in freighting distances for IR freight operations be more closely

Figure 3.2: Comparative Time-Trends in IR Originating Tonnages, Traffic & Average Freighting-Distances over the Planning Period

Fig 3.2a: Freight Traffic vs. Tonnage Freight

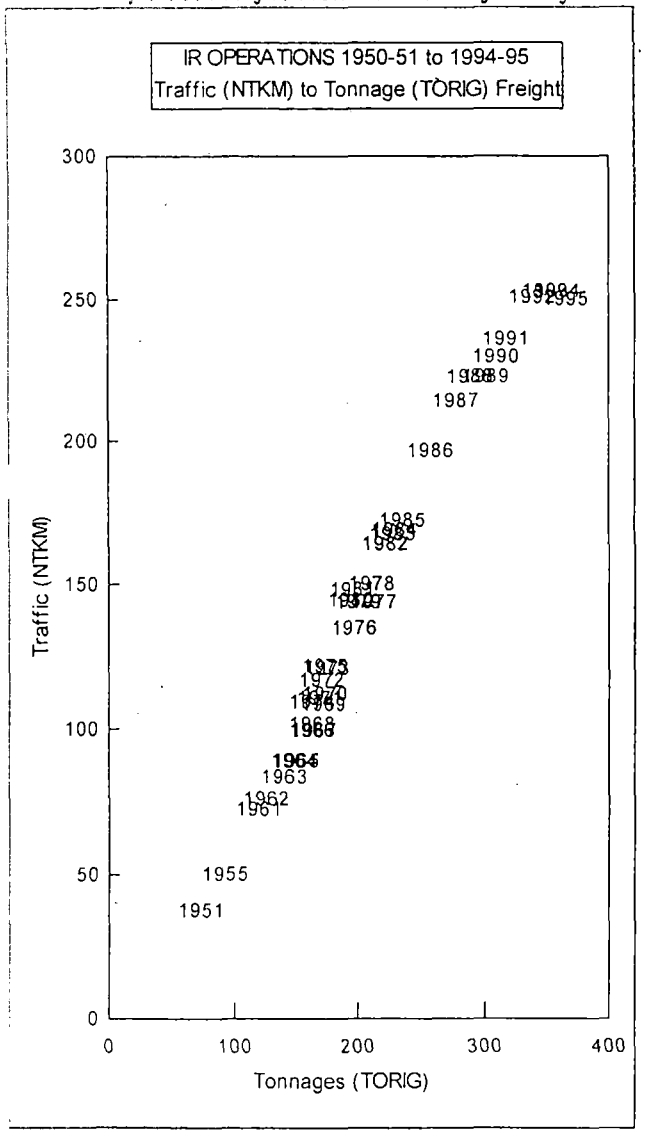


Fig 3.2b: Freight Traffic vs. Freighting Distance

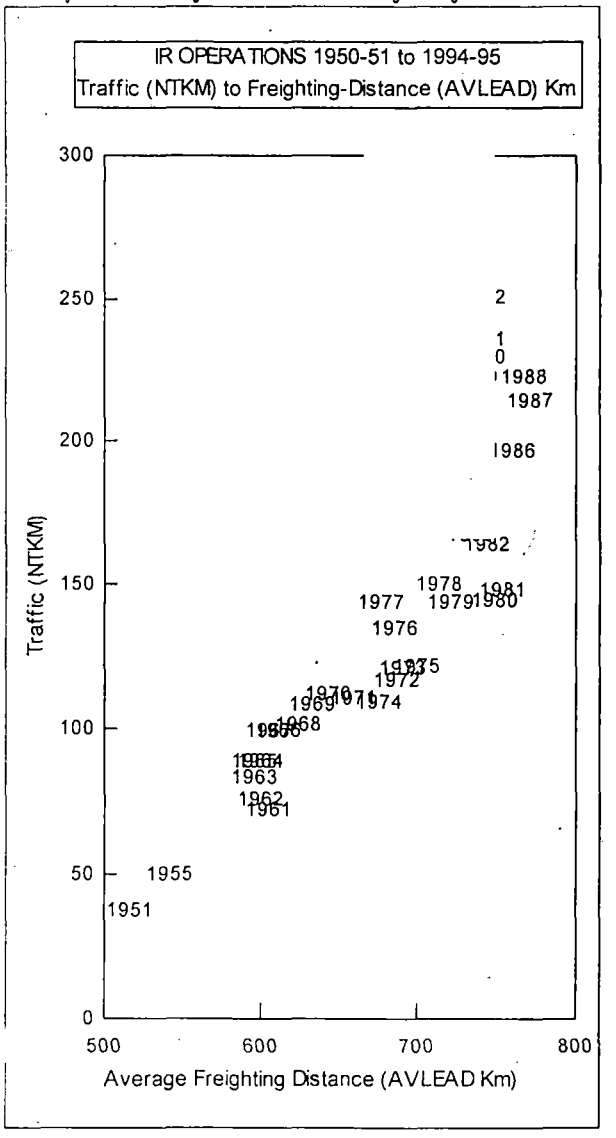
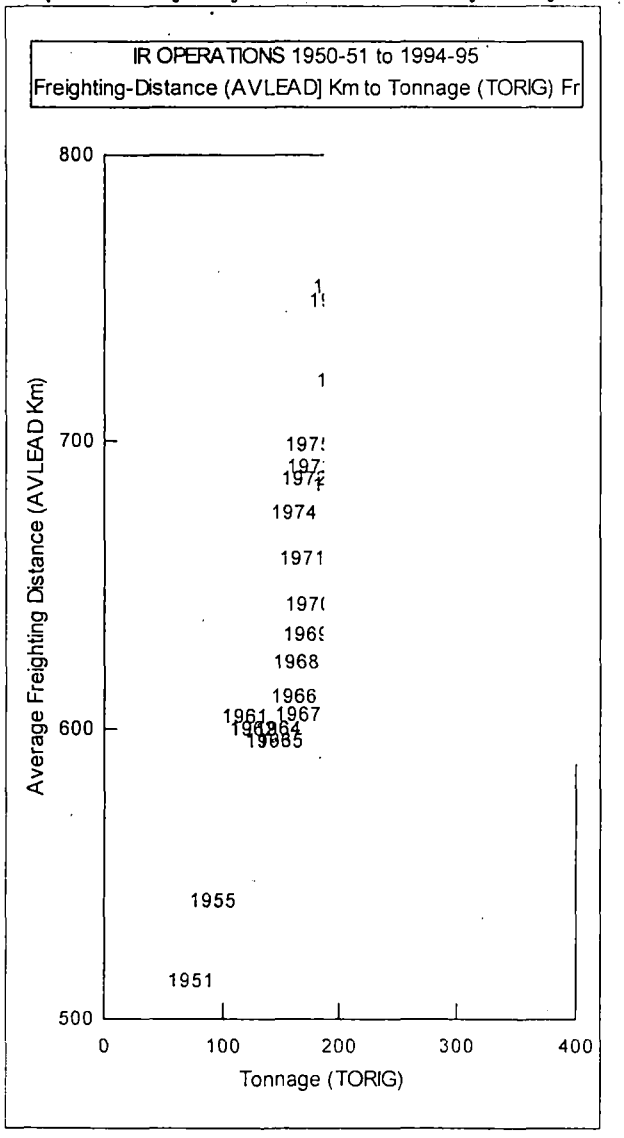


Fig 3.2c: Freighting Distance vs. Tonnage Freight



investigated.

3.4.3 Increasing Freight Leads

The importance of average freight leads as an indicator in railway operational performance arises *a priori* from the reflection that increasing economic activity has on market expansion and increases in freight traffic. While originating tonnages reflect the spurt in economic activity, the spatial dispersion of growth in the economy is reflected in growing average leads. However, an efficiency concept is also involved here, since average leads would not rise continuously unless the economy were characterised by extreme regional imbalance. The ideal and ultimate development situation might thus be visualised as one where, after the production centres become technologically linked, the domain of individual economic activities gradually becomes geographically compact,[25] so that average leads eventually decline over time after the economy acquires each stage of maturity. Declining average leads also indicate the growth of multiple economic nodes, implying the efficient use of unit geographical space and contiguous development.

It may then be seen in context that growth in average freight leads more or less matched the growth in originating tonnages over the first two FYPs, and is in character with *a priori* expectations about a growing economy which is experiencing simultaneous expansion of raw material hinterlands, widening of its production base, and integration of markets via transportation activity. The strong upstream and downstream linkages of railway infrastructure with growth of the economy make this consistent with the development of the Indian economy in its early planning phase. But this initially sustained phase of spatial growth was first vitiated during the 3FYP when average freight leads suffered a temporary lowering between 1961-65, from which they only recovered after the mid-1960s. From a general perspective, the period of the 3FYP may be seen as an aberration over all IR operational series, since freight setbacks occurred inspite of *pro rata* plan allocations for the railways having been among the best-ever in all the years of planning. Viewed with hindsight, the cause for the setback was overambitious traffic projection made by simply extending the earlier trends without simultaneously qualifying them either by the general productive capacity of the economy, or by the extent of production and availability of programmed traffic from the PSUs set up during the 2FYP.[26] Targeted traffic in the bulk category thus failed to materialise, leading to underutilisation of the new railway capacity added over the 3FYP and a deterioration in the IR freight-mix, and to consequent decline in the average traffic lead.

Analysis of longterm trends in average leads is also assisted by reference to the plots in Figs 3.2*b* & 3.2*c*. Over the ten years commencing with the 2FYP, average lead reached and crossed 600km, and surpassed the 700km level over the next ten years commencing 1965. The spatial increment in traffic by 100km over the period commencing just after the 3FYP till midway through the 5FYP was slightly higher in fact than the increment of 90km achieved during the period of the first three FYPs. Since average lead levels until 1977-78 were still well below the efficient traffic lead of 700km being targeted by IR, the increasing carriage distances of freight implied in the rising figures were in keeping with the general economic objective of expanding the spatial size of the domestic market. Fulfillment of such an objective would however also require that increasing average lead distances be attained without concurrent surrender of the railway share in short-lead traffic. Analysis of whether this was achieved by IR is taken up in a later chapter.

A clustering in average lead figures about a declining trend during the first five years of the 1960s while tonnages rose marginally substantiates the presence of exogenous factors mentioned earlier as being responsible for sluggish economic growth during the 3FYP. Monsoon failures and famine-like conditions hit parts of the country in the mid-1960s and consequent food aid imports through the ports necessitated extensive transportation of foodgrains over long distances to drought-hit regions. Another similar clustering noticed between 1972-77 is also associated with tonnage setbacks that occurred around this period as a consequence of economic adjustments to the first Oil Crisis, with further aggravation during the All-India Railway Strike of 1974 which substantially affected short-haul traffic realisation by IR. Although average freight leads then resumed their rise between 1978 to 1981, it was only during this later period that carrying distances first rose beyond the targeted IR lead of 700km. Unless it can simultaneously be shown that the commodity-mix catered to by railway freight remained invariant while tonnages increased, the inference would be that IR began to lose high-rated low bulk traffic over this period. The apprehension is strengthened from observation that while the second oil crisis brought about a slowdown in tonnages originating, average leads did not register any decline this time, unlike in the aftermath of the first oil crisis. This would provide

sufficient indication that a conscious shift had been towards committed bulk and trainload traffic, fuelling the diversion of smalls carriage to the roadways inspite of the allround increases in traffic costs.

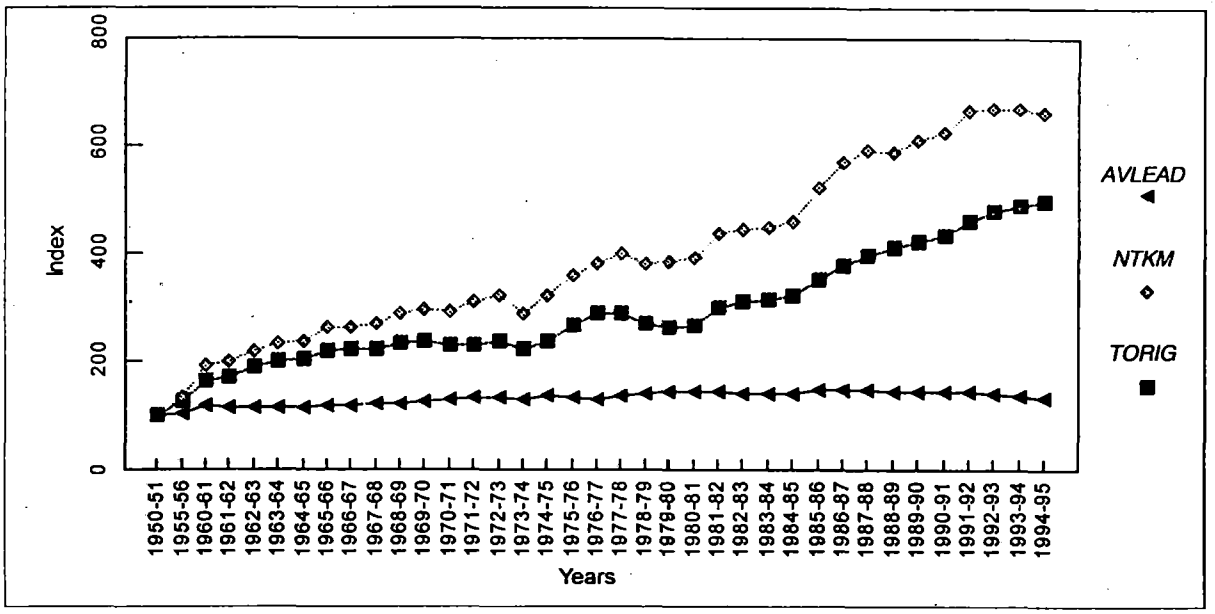
Considering the trend maintained by average freight leads over the 6FYP after their rise during its initial years, a decline is observed to have set in again in 1982 which was maintained through till the end of the 6FYP. That this decline coincided with relatively sluggish growth in tonnage and traffic, and represented a fall from the bulk-traffic influenced high value of 754 km reached in 1980-81, would imply a change in traffic composition that would have been favourable to IR in terms of the recovery of a certain proportion of higher-rated freight traffic. But the first three years of the 7FYP led again to rising freight leads and a sharp rise in tonnage and traffic implying that this growth would have largely comprised bulk tonnages rather than the more rounded composition that had just been restored to IR freight, and that increases in other categories of freight traffic over the 7FYP would have largely accrued to the roadways. The all-time high in IR freight leads was in fact reached in 1986-87 following spurts in tonnage as well as traffic, implying once again that shorter lead traffic was being transferred to the roadways. It was only towards the end of the 7FYP that a decline in traffic leads set in, which then continued into the 8FYP. It remains to be investigated whether the nearly consistent decline in traffic leads ever since commencement of the 8FYP represents a gain of short-lead traffic by IR, or the more disturbing loss of bulk traffic to the roadways.

The declining trend in journey leads which set in with the closing phase of the 7FYP and continued into the 1990s has in any case been a marked departure from past trends observed over the 45-year series. The decline that has taken place even as freight tonnages have risen is clearly discerned in the associated diagram tin terms of a steady fall after initial clustering at the beginning of the decade. The steepened fall after 1993 would support the inference that the major hikes in railway tariffs in 1992-93 induced a traffic setback extending even into bulk-freight, and that proportionately greater losses of long-lead bulk traffic were the principal cause in declining average leads. Although this declining trend could also be viewed in a positive perspective as implying geographical compaction of economic activities and multiplication of nodes as mentioned earlier, in the present context and with the evidence of tariff hikes, the same logical inference will be too far drawn, since average leads had already touched a high mark close to 800km before they started to fall. IR has over the recent FYPs sought to maintain minimum average leads of 700km on the grounds of economy in haulage, and has accordingly been deliberate in discouraging traffic smalls, less than full-wagonload traffic and short-haul freight. But it nevertheless becomes uneconomical for the railways to sustain the rise in average leads to levels well beyond the 700km mark, because of unsustainable losses of profitable high-rated short-haul traffic that this would imply. Of course, the optimum lead depends also on which cost factors in haulage can be lowered by increasing efficiency. Whether 700km is the minimum viable lead or not for railway freight operations is a matter of controversy, when viewed relative to developed railway systems such as the SNCF in France which target a breakeven lead of around 500km *[see ch.2]*. The implication of setting a higher minimum average lead is that several short-haul traffic segments considered a railway preserve on other railway systems are deliberately excluded from the IR's system and tell both on revenue shortfalls and on traffic losses to the roadways. This point will again be addressed in a later chapter.

Reviewing the comparative features of time trends in the main operational parameters of IR as depicted in the plots in Fig 3.2, against the contexts of the preceding discussion, it is thus established that while railway operations have had a definite infrastructural impact on the Indian economy since Independence, which has in turn been characterised by the rather complex process of alternate market expansion and spatial consolidation of activities, the pace generated has not been smooth or sustained over the different FYPs. Not all the discontinuities observed can be attributed to exogenous factors. Instead, the spasmodic growth of railway operations since 1964-65 would imply that the quality of transportation planning has played a deciding role. With India resorting to the planning model of five-year development plans from 1951, transport targets and outlays for the plan period are decided in the commencement year, while achievements against these targets are staggered over the next five years. A cyclic character was thus imparted to the operational and investment processes of IR freight operations. This is also revealed by the sequence of waves coinciding with the planning periods, that have been visible ever since 3FYP. If, nevertheless, the traffic targets of the FYPs had always been attained, the railways would have been insulated from revenue shocks. This however did not occur in practice.

Instead, the patterns observed in tonnage and traffic and further corroborated in average traffic leads establish that IR had hit traffic bottlenecks by the mid-1970s, which were only mitigated partially in the 1990s. Since

Figure 3.3: Indexed Growth of Tonnages, Traffic & Freighting Distances on IR 1950-51 to 1994-95



the cost at which railway tonnages have grown over the planning horizon has been a lengthening of average leads, assessment of traffic trends would prove ambiguous without recourse to further information on the commodity-composition of railway freight. Rising average leads indicate that while there has been market expansion, railway freight operations have not progressed apace with this. In consequence, the roadways have be come the principal gainers and have in fact spirited away the more profitable freight segments, leaving IR the lion's share of bulk traffic.

Bulk traffic in India has accounted principally for the increase in originating tonnages since the inception of planning. This trend became marked since the adoption of the Nehru-Mahalanobis model of capital-led growth since 2FYP, which led increasingly to the public-enterprise structuring of the Indian capital goods sector. In the thinking that has characterised Indian planning ever since then, the Railways as a public undertaking share a special symbiotic relationship with the PSUs. Thus the principal clients of IR since Independence have been the mining sector, the power plants, the steelworks and so on. Since the traffic they supply to IR has a bulk character, and is moreover available in full trainloads which can be handled and loaded at captive sidings, a preferential arrangement has developed whereby the freight-mix catered to by IR has become increasingly specialised towards PSU-traffic. It is this arrangement that is the dominant factor uniting trends in tonnages, traffic and freight leads. But this feature of the evolving IR freight operations cannot be trapped in aggregate operational statistics, and a disaggregated look has to be taken into the commodity composition of railway freight.

3.5 The Commodity Freight-Mix

Because of the natural advantages that railways offer to the carriage of bulk traffic, traffic development on railway systems is greatly stimulated by expansion in aggregate production, especially in the industrial and mining sectors, and also by movement of materials and equipment for large construction projects. Forward and backward transport linkages with these sectors had provided the principal impetus to the growth of railways in the presently advanced countries. India however, as stated earlier, had to wait for the institution of planning to give a stimulus to the industrialisation process and thus the headstart that had been provided by the early development of railways in the country did not have any markedly obvious industrial impact until large-scale industrial enterprises were created by the plans. It might thus be stated of colonial railway development that its forward linkages were deferred into the future.

Thus the commodity freight-mix catered to by the Indian railways over nearly 100 years of their initial existence largely comprised primary produce of agricultural origin and imported goods of industrial

manufacture intended for consumption, rather than the normal freight-mix of bulk industrials that characterise a modern economy. However commodities like coal from the Eastern coalfields and iron ore and processed steel from private plants like the Tata steelworks (presently TISCO) and Indian Iron & Steel Company [IISCO] in the eastern region provided the first basis for bulk-freight operations by the railways in the pre-Independence period. The steelworks moreover, besides depending on the railways for the supply of ore and coal, were also the major supplier of steel rails and other structurals to the railway sector.[27] Nevertheless the scale of bulk-freight operations existing before 1947 might at best be described as having been limited. But the stimulus to growth emanating from the Five-Year Plans in the later period greatly raised the core demand for the production and transportation of bulk industrials, while additions of large amounts of producing capacity in the public sector multiplied the sources and quantum of traffic flows.

3.5.1 Importance of Bulk-Commodities in IR Freight

Over the period of planning presently under review, freightage of coal became the core operation of IR, with multiple demands rising from the electricity boards and the new PSU steelworks. Over 50 years this position has not changed and coal traffic today contributes half the originating tonnages transported by IR.[28] Similarly, the importance of cement as a commodity of bulk transportation has grown progressively because of the high pace of construction in an urbanising and industrialising economy. Mining and the heavy industrial sector have emerged as other major clients for IR following the growth of core industry.

The character of the traffic in bulk commodities that these sectors offer to the railways is such that it would prove uneconomical and therefore would not move on other competing transport modes. Inasmuch as they cater to this exclusive traffic, the IR serve as prime movers to the economy. Nevertheless the movement of bulk commodities stimulates the further flow of outputs from downstream industries which also have to be moved via the transportation network. IR thus receive commodity traffic from multiple points and diverse locations within the industrial process.

Operating as they do in a country with a large economic space, freight operations of IR could thus well be expected to show an intrinsic bias towards longer-lead traffic. But adequacy of transport infrastructure would require also that sufficient capacity be reserved by the railways for movement of downstream freight, both because of the necessity of maintaining efficiency and low costs in freight operations, and because of the simple operational necessity of ensuring that adequate new freight originates from downstream destinations so that freight hauls are not unidirectional and incidence of empty haulage on return journeys is kept low. Whether IR has been able to adequately maintain such freighting principles with the expansion in its freight operations in recent times is the point that will be considered next.

Table 3.4 below provides indication of the recent tonnage trends after the 1980s in prime bulk-commodities moved by IR. The table also reveals how bulk traffic has come to dominate railway freight operations in India, having risen proportionately from 85.6 percent of total freight traffic in 1980-81 to 96.2 percent in 1994-95, with actual tonnage increase by 183.2MT over the space of 15 years. Although earlier operational review had shown that the 6FYP and 7FYP spanning the first decade of this period were characterised by remarkable growth in IR freight operations, it can be seen now that such improvements were largely confined to the bulk-freight sector. The major improvement derived from the increased handling of coal which while raising its share in total IR freight, also increased tonnages by more than two-and-a-half times over the period, with marked acceleration over the 7FYP and 8FYP. Coming next in terms of its importance to IR was tonnage handling in iron ore, which however showed more fluctuation over the 6FYP years, while rising by 16.9MT over the period considered. In percentage terms on the other hand, even as the share of iron ore in IR shipments declined marginally over the period, the combined shares of coal and iron ore in total IR freight on IR rose from 47 percent to 59.5 percent.

Movements of foodgrains which formed the third-largest component of IR tonnage freight uptil the mid-7FYP years were subject to oscillation between a range of 18.33MT at the commencement of the period under review and 20.7MT at its end, with three alternate peak movements of 24.7MT, 30.1MT and 27.4MT occurring respectively in 1982-83, 1987-88 and 1991-92. Although foodgrains are not strictly a bulk commodity in the same sense as mining materials, their presence as an important constituent of IR bulk-freight derives from preferential tariffs hitherto offered to them as essential commodities, under the social obligations that govern IR freight operations. Most foodgrains traffic comprises shipments of procurement

grain and/or food imports for public distribution by the state-sector Food Corporation of India [FCI] to deficit states and thus cannot be refused by IR. Peaks noticed in foodgrains tonnages would therefore bear upon the agricultural situation prevailing within the country in given years, which is substantiated also by the fact that the largest foodgrains shipments over the period occurred in 1987-88, a year of countrywide drought.

Table 3.4: Originating Tonnages of Bulk-freight Traffic on Indian Railways 1980-81 to 1994-95

[Freight figures in MT; italics %]

	Coal	Food-grains	Iron & Steel	Iron Ore	Cement	POL	Fertiliser	Limestone & Dolomite	Other Stones	Salt	Sugar	Total Bulk	Other Freight	Total Tonnage
1980-81	64.1	18.3	10.8	28.0	9.6	15.0	8.1	9.0	4.8	na	na	167.7	28.2	195.9
	32.7	*9.4*	*5.5*	*14.3*	*4.9*	*7.6*	*4.2*	*4.9*	*2.5*	*na*	*na*	*85.6*	*14.4*	*100.0*
1981-82	75.8	21.5	12.0	30.8	10.8	16.6	9.6	10.2	4.8	na	na	192.0	29.3	221.2
	34.3	*9.7*	*5.4*	*13.9*	*4.9*	*7.5*	*4.3*	*4.6*	*2.2*	*na*	*na*	*86.8*	*13.2*	*100.0*
1982-83	82.4	24.7	11.5	29.4	12.8	17.3	8.5	9.8	4.6	na	na	201.0	27.8	228.8
	36.0	*10.8*	*5.0*	*12.8*	*5.6*	*7.6*	*3.7*	*4.3*	*2.0*	*na*	*na*	*87.9*	*12.2*	*100.0*
1983-84	89.0	24.6	10.2	27.3	15.6	18.0	8.2	9.1	3.7	2.7	2.1	205.5	24.7	230.1
	38.7	*10.7*	*4.4*	*11.9*	*6.8*	*7.8*	*3.5*	*3.9*	*1.6*	*1.2*	*0.9*	*89.3*	*10.7*	*100.0*
1984-85	91.6	20.8	10.5	29.9	16.9	18.2	12.2	8.9	3.7	3.1	1.8	212.6	23.9	236.4
	38.7	*8.8*	*4.5*	*12.6*	*7.1*	*7.7*	*5.2*	*3.8*	*1.6*	*1.3*	*0.8*	*89.9*	*10.1*	*100.0*
1985-86	101.6	24.1	11.5	32.0	18.0	18.6	13.6	9.9	4.3	3.3	3.0	233.6	25.0	258.6
	39.3	*9.3*	*4.4*	*12.4*	*7.0*	*7.2*	*5.3*	*3.8*	*1.7*	*1.3*	*1.2*	*90.3*	*9.7*	*100.0*
1986-87	109.5	29.0	12.3	34.2	19.8	19.9	14.5	9.9	4.5	3.2	2.4	259.1	18.6	277.8
	39.4	*10.4*	*4.4*	*12.3*	*7.1*	*7.2*	*5.2*	*3.6*	*1.6*	*1.2*	*0.9*	*93.3*	*6.7*	*100.0*
1987-88	119.8	30.1	12.3	33.9	22.3	21.7	13.1	9.1	4.8	3.0	2.7	272.9	17.3	290.2
	41.3	*10.4*	*4.2*	*11.7*	*7.7*	*7.5*	*4.5*	*3.2*	*1.7*	*1.1*	*0.9*	*94.1*	*6.0*	*100.0*
1988-89	128.0	24.9	12.1	35.6	26.0	22.6	16.1	9.2	4.8	3.3	2.0	284.4	17.7	302.1
	42.4	*8.2*	*4.0*	*11.8*	*8.6*	*7.5*	*5.3*	*3.0*	*1.9*	*1.1*	*0.7*	*94.2*	*5.8*	*100.0*
1989-90	130.2	23.7	11.9	38.6	27.5	24.3	17.0	8.8	4.5	3.3	2.1	291.9	18.1	310.0
	42.0	*7.6*	*3.8*	*12.5*	*8.9*	*7.8*	*5.5*	*2.9*	*1.5*	*1.1*	*0.7*	*94.2*	*5.9*	*100.0*
1990-91	135.0	25.0	12.0	41.0	29.0	25.0	18.0	9.0	na	na	na	na	na	na
	na	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*
1991-92	146.4	27.4	13.4	40.9	30.8	25.6	18.6	9.3	4.8	3.4	2.0	322.6	15.3	338.0
	43.3	*8.1*	*4.0*	*12.1*	*9.1*	*7.6*	*5.5*	*2.8*	*1.4*	*1.0*	*0.6*	*95.5*	*4.5*	*100.0*
1992-93	157.7	27.3	13.5	41.4	30.4	26.4	19.0	9.6	4.2	3.5	2.3	335.2	14.9	350.1
	45.1	*7.8*	*3.9*	*11.8*	*8.7*	*7.5*	*5.4*	*2.7*	*1.2*	*1.0*	*0.6*	*95.7*	*4.3*	*100.0*
1993-94	167.0	26.7	13.0	41.2	32.5	26.0	19.5	9.3	3.6	3.6	1.9	344.3	14.4	358.7
	46.6	7.4	3.6	11.5	9.1	7.2	5.4	2.6	1.0	1.0	0.5	96.0	4.0	100.0
1994-95	172.4	20.7	13.3	44.9	31.5	27.7	21.5	10.3	3.5	3.2	2.0	350.9	14.2	365.0
	47.2	*5.7*	*3.6*	*12.3*	*8.6*	*7.6*	*5.9*	*2.8*	*1.0*	*0.9*	*0.5*	*96.2*	*3.8*	*100.0*

Note: Other Stones exclude Marble but include Gypsum

Source: Compiled from *IRYB*, various years, Directorate of Statistics & Economics, Railway Board, Ministry of Railways, Government of India, New Delhi

Of the other bulk commodities included in the table, the relative constancy of tonnage shares of POL and fertilisers over the period may be noted, even as their actual tonnages have either nearly or more than doubled. Against the steadiness of these freight shipments, the remarkable increase of 21.9MT in cement tonnages transported implies that while in percentage terms their share has doubled, the physical order of the increase over the period is by more than three times, enabling them to occupy the third position in IR bulk shipments after 1987-88.

Railway tonnage trends in foodgrains relate in a curious manner to those in fertilisers and iron ore, and peak foodgrain movements are observed to coincide with dips in freight tonnages of the latter commodities. While fertiliser movements would logically tend to decline when incidences of drought and crop-failure in particular years caused foodgrains shipments to increase, and would thus provide partial justification to one of these related freight patterns, no such obvious argument will explain the relativity of freight trends for iron ore and foodgrains. What is actually being witnessed therefore is freight substitution either rising out of shortages of railway freight capacity or from running constraints, which will be more thoroughly considered in the subsequent chapter. A more alarming feature that can be observed vis-a-vis tonnage trends in foodgrains and fertilisers is the lateral displacement between these, implying a general tendency for drops in fertiliser

movement over the 1980s to laterally precede rising foodgrains movements. Thus short supply of fertilisers might well have been the cause of lowering in local crop-yields that would necessitate shipment of foodgrains from elsewhere to meet the resulting deficits. This pattern seems to have disappeared during the 1990s, following a sharp rise in freight tonnages in fertilisers.

More insight into the role of IR vis-a-vis the economy might be gained by evaluating dips and peaks in the originating tonnages in Table 3.4 of the principal bulk commodities carried by IR, against the annual output of these commodities. Table 3.5 provides relative indication of this while showing the shares of IR in the transportation of major commodity outputs in the economy. Although coal freight has been seen to be the main constituent of IR bulk tonnages and has been increasing in importance, originating railway tonnages in coal average just under two-thirds of total coal output in the country, rising to around 68 percent by 1994-95. It is seen therefore that while railway freight in coal has increased both in relative and absolute magnitudes over the period between the 6FYP and the 8FYP [*see Table 3.4*], this has accompanied a substantial rise in coal output within the country, a third of which is not freighted by IR. As will be shown later in the IR commodity-freight analysis, the inability of IR to move adequate coal shipments to thermal power stations which precipitated the power crises of the 1970s led to an eventual shift in locational policy resulting in the establishment of pithead super-thermal power plants [STPP]. Therefore, since coal is not a commodity amenable to other modes of transportation, IR's increasing bulk-freight and technology orientation has been at least partially caused by this single circumstance. IR share in iron ore output have also generally tended to rise, although with occasional dips in absolute tonnages as seen in the mid-plan years in the previous table. In contrast, tonnage freight in POL, the other fuel commodity declined from above 60 percent to under 50 percent of total POL output over the decade, indicating that an increasing proportion of POL is now being transported by non-railway means.

Table 3.5: Shares of Major Commodity Outputs carried by Railway in India

Year	% Coal Output	% Iron Ore Output	% Cement Output	% Foodgrains Output	% Fertilisers Output	% POL Output
1980-81	56.2	60.0	51.8	14.1	54.5	62.0
1981-82	61.0	69.1	51.7	16.1	61.4	58.7
1982-83	63.1	64.2	55.0	19.3	60.7	55.8
1983-84	64.4	63.6	58.2	16.1	54.6	54.6
1984-85	62.1	63.7	57.1	14.2	54.0	54.7
1985-86	65.9	65.9	54.2	16.0	58.0	46.7
1986-87	66.0	62.2	54.1	20.2	68.1	46.4
1987-88	66.7	66.0	56.4	21.5	69.0	48.5
1988-89	65.8	66.3	58.5	14.6	66.7	49.4
1989-90	64.8	65.2	60.0	13.8	65.5	49.9
1990-91	63.8	62.8	59.2	14.4	68.7	51.5
1991-92	63.9	66.1	57.0	16.4	66.6	52.9
1992-93	66.2	70.6	56.2	15.2	67.8	51.1
1993-94	67.9	65.3*p*	56.1	14.5	71.7	50.7
1994-95*p*	67.9	69.1	50.4	10.8	71.9	52.4

Source: Compiled from *IRYB*, various years, Directorate of Statistics & Economics, Railway Board, Ministry of Railways, Government of India, New Delhi; figures for the year 1994-95 and for iron ore in 1993-94 are provisional

A commodity whose tonnages and commercial importance to IR has sharply increased since the 6FYP is cement, with tonnage freight increasing almost four-fold over the period earlier reviewed. It is seen from Table 3.5 however that while railway loadings of the commodity as a proportion of its total output tended, despite fluctuations, to rise in the mid-1980s and again towards the end of the decade, they have since undergone a definite decline. Since the increasing tonnages are not reflected in an equivalent increase in the output share, the inference would be that although IR handles considerably more cement traffic than before, cement production in the country has increased even more strongly, of which a larger and larger share travels today by road. Unlike coal or iron ore for which specific railway wagons are committed, transport of cement requires general-purpose wagons on which there are competing demands. The wagon constraints that determine this pattern will therefore need to be explored in a subsequent chapter.

With reference to foodgrains and fertiliser outputs, it may be noted that while IR freight shares in the former have tended overall to decline to relative insignificance, there has been a pronounced pickup in freight shares of the latter. Quite evidently, since fertiliser tonnages have also expanded strongly, the role of IR in

stabilising food supply in the country has declined correspondingly. Among the reasons which might be ascribed here are the improvements in agriculture in previously deficit states, which have reduced the need for balancing movements in foodgrains to ensure food security for a growing population. The part of foodgrains traffic which travels on other transport modes is short-lead in nature and therefore sustains the hypothesis.

3.5.2 General Commodity Freight Trends

Despite the preponderance of bulk commodities in IR freight, it has been seen in Table 3.4 that other commodity freight continues to occupy a visible position in freight operations. Thus analysis centering around bulk commodities alone would be too limiting in securing a proper understanding of commodity freight patterns on IR. In Tables 3.6 & 3.7, analysis is extended into the set of 30 principal commodities carried by IR. Further, to add depth to the study, changes in commodity tonnages and traffic are considered over an extended 21-year period between 1973-74 and 1994-95, and evaluated against changes in computed traffic-rates. Although the data are not considered here in longitudinal form in order to limit the size of the dataset, the principal trends are clearly visible even in the gap-year analysis.

Table 3.6: IR Freight Tonnage & Traffic Trends for Thirty Selected Commodities 1973-74 to 1994-95

	TONNAGES [million metric tonnes]								*TRAFFIC [billion net tonne-km]*							
Freight Commodity	1973-1974 *MT*	%	1976-1977 *MT*	1983-1984 *MT*	1986-1987 *MT*	1989-1990 *MT*	1994-1995 *MT*	%	1973-1974 *TKm*	%	1976-1977 *TKm*	1983-1984 *TKm*	1986-1987 *TKm*	1989-1990 *TKm*	1994-1995 *TKm*	%
Coal & Coke	47.2	*29.1*	67.4	89.0	109.5	130.2	172.4	*47.2*	26.6	*24.3*	38.8	54.7	71.6	85.1	105.3	*42.2*
Iron Ore	20.1	*12.4*	26.7	24.8	31.6	35.8	42.0	*11.5*	6.2	*5.7*	9.5	8.4	11.7	13.3	15.8	*6.3*
Foodgrains	14.7	*9.0*	20.0	24.6	29.0	23.7	20.7	*5.7*	16.3	*14.9*	18.8	30.3	39.8	31.7	27.1	*10.8*
Cement	10.0	*6.2*	13.7	15.6	19.8	27.5	31.4	*8.6*	6.4	*5.8*	9.2	10.6	12.9	17.7	19.1	*7.6*
POL	10.0	*6.2*	12.4	18.0	19.9	24.3	27.7	*7.6*	6.4	*5.8*	7.6	10.7	11.7	15.7	18.2	*7.3*
Iron & Steel	9.3	*5.7*	12.7	10.2	12.3	11.9	13.3	*3.6*	9.4	*8.6*	12.7	11.7	13.4	13.3	13.6	*5.5*
Limestone & Dolomite	7.4	*4.6*	9.5	9.1	9.9	8.8	10.3	*2.8*	1.8	*1.6*	2.6	3.0	3.7	4.2	5.5	*2.2*
Fertilisers	5.3	*3.3*	7.8	8.2	14.5	17.0	21.5	*5.9*	4.0	*3.7*	7.2	8.3	15.6	17.4	19.3	*7.7*
Other Stones	4.6	*2.8*	4.7	2.7	3.5	3.3	2.9	*0.8*	1.5	*1.4*	1.5	1.0	1.2	1.1	0.9	*0.4*
Salt	2.3	*1.4*	3.0	2.7	3.2	3.3	3.2	*0.9*	2.8	*2.6*	4.0	4.1	5.4	5.2	5.0	*2.0*
Unwrought Wood	2.2	*1.4*	2.2	1.0	0.7	0.6	0.1	*0.04*	2.1	*1.9*	2.2	1.3	0.9	0.7	0.2	*0.1*
Sugarcane	1.8	*1.1*	1.4	1.4	1.1	1.3	0.7	*0.2*	0.1	*0.1*	0.1	0.1	0.1	0.1	0.1	*0.03*
Oilcake Fodder	1.6	*1.0*	2.1	1.5	1.6	2.1	2.3	*0.6*	1.3	*1.2*	1.6	1.5	1.7	2.2	2.2	*0.9*
Sugar	1.4	*0.9*	1.8	2.1	2.4	2.1	2.0	*0.5*	1.3	*1.2*	1.8	2.2	3.2	3.0	3.3	*1.3*
Manganese Ore	1.1	*0.7*	1.3	0.9	1.1	1.1	1.2	*0.3*	0.4	*0.4*	0.5	0.3	0.4	0.4	0.5	*0.2*
Tar & Bitumen	1.0	*0.6*	0.9	-	-	-	-	-	0.9	*0.8*	1.0	-	-	-	-	-
Oil Seeds	1.0	*0.6*	1.2	0.6	0.6	0.4	-	-	1.1	*1.0*	1.3	0.8	0.8	0.6	-	-
Other Metal Ores	1.0	*0.6*	1.6	1.6	1.6	1.7	1.7	*0.5*	0.7	*0.6*	1.1	0.9	0.8	0.8	0.7	*0.3*
Gypsum	0.9	*0.6*	0.8	1.0	1.0	1.3	0.6	*0.2*	1.2	*1.1*	0.9	0.9	1.2	1.2	0.6	*0.2*
Paper	0.8	*0.5*	1.0	0.7	0.6	0.5	0.2	*0.05*	1.0	*0.9*	1.2	0.9	0.9	0.7	0.3	*0.1*
Non-Oilcake Fodder	0.8	*0.5*	1.1	0.8	0.7	0.5	0.2	*0.05*	0.5	*0.4*	0.7	0.6	0.6	0.4	0.2	*0.1*
Firewood & Fuel	0.8	*0.5*	0.8	0.6	0.3	-	-	-	0.3	*0.3*	0.5	0.5	0.3	-	-	-
Gur & Jaggery	0.7	*0.5*	0.9	0.4	-	-	-	-	0.9	*0.8*	1.1	0.5	-	-	-	-
Sand	0.7	*0.4*	0.6	-	0.4	0.3	0.1	*0.03*	0.3	*0.3*	0.3	-	0.2	0.1	0.04	*0.02*
Provisions	0.6	*0.4*	0.6	0.4	0.3	0.2	-	-	0.8	*0.7*	0.7	0.5	0.5	0.4	-	-
Raw Jute	0.6	*0.4*	0.6	-	-	-	-	-	0.4	*0.4*	0.4	-	-	-	-	-
Bricks & Tiles	0.6	*0.3*	0.6	0.4	0.3	-	-	-	0.4	*0.4*	0.4	0.3	0.2	-	-	-
Bamboos	0.5	*0.3*	0.8	0.4	0.4	0.4	0.3	*0.1*	0.3	*0.3*	0.6	0.3	0.4	0.4	0.4	*0.1*
Fruit & Vegetables	0.5	*0.3*	0.8	0.4	-	-	0.2	*0.05*	0.6	*0.5*	1.2	0.6	-	-	0.3	*0.1*
Raw Cotton	0.5	*0.3*	-	-	-	-	-	-	0.6	*0.6*	-	-	-	-	-	-
Compressed Gases	-	-	-	-	-	-	0.1	*0.03*	-	-	-	-	-	-	0.04	*0.02*
Acids	-	-	-	-	-	-	0.3	*0.1*	-	-	-	-	-	-	0.1	*0.02*
Non-Ferrous Metals	-	-	-	-	-	1.0	0.9	*0.2*	-	-	-	-	-	0.7	0.6	*0.2*
Soda Ash	-	-	-	0.4	0.5	0.6	0.4	*0.1*	-	-	-	0.8	0.7	1.0	0.7	*0.3*
Caustic Soda	-	-	-	-	-	0.2	0.2	*0.1*	-	-	-	-	-	0.1	0.1	*0.03*
Wrought Timber	-	-	-	0.3	0.4	0.4	0.3	*0.1*	-			0.7	0.8	0.9	0.7	*0.3*
Edible Oils	-	-	0.6	0.5	0.5	0.2					0.8	0.9	0.8	0.4	-	-
Cement Manufactures	-	-	-	-	-	-	0.1	*0.03*	-	-	-	-	-	-	0.1	*0.02*
Electricals	-	-	-	-	0.3	0.3	-	-	-	-	-	-	0.4	0.3	-	-
Jute Manufactures	-	-	-	0.4	0.4	0.2	0.3	*0.1*	-	-	-	0.6	0.6	0.3	0.5	*0.2*
Other Freight	12.1	*7.5*	13.1	9.7	9.8	9.1	7.3	*2.0*	12.7	*11.6*	14.2	11.2	12.0	10.1	8.5	*3.4*
Total Traffic	**162.1**	***100***	**212.6**	**230.1**	**277.8**	**310.0**	**365.0**	***100***	**109.4**	***100***	**144.0**	**166.6**	**214.1**	**229.6**	**249.6**	***100***

Source: Compiled from *IRYB*, various years, Directorate of Statistics & Economics, Railway Board, Ministry of Railways, GOI, Delhi

It is noticed first of all that while commodities from the bulk group retain their place (if not their position) among the principal freight commodities, considerable change occurs lower down the scale because of several low-bulk commodities that had earlier been important having lost their erstwhile position since. While to an extent, these have been replaced by newer freight commodities, leading to inclusion of 41 commodities in the table, the tendency of IR freight traffic towards polarisation around a narrow commodity-group is clearly visible within the table. It is also noticed that traffic-polarisation is generally stronger than tonnage-polarisation, except for a distinct group of commodities relating either to the iron & steel-making industry or else to non-bulk freight. With the trend patterns noted here offering a disaggregated reflection of the trends earlier observed in Table 3.3, the first set of conclusions that emerge are that while average freighting distances for bulk-commodity loadings of coal, cement, fertilisers, POL, etc. have tended to lengthen over time, the lead of iron & steel-sector inputs such as limestone & dolomite, gypsum etc. have declined because of relatively greater dispersal in the location of steel plants. Against such trends, average leads for railway traffic in the non-bulk commodities have tended to decline much more sharply than tonnages. Since non-bulk freight has increasingly become the domain of the roadways, the overall analysis implies a progressive switch of the long-haul traffic in these high-rated commodities to the road sector.

It would be interesting to examine the possible causes of this switch. While the next four chapters will make a detailed examination of the ultimate determining role of railway freight capacity, the tariff-related causes might be ascertained from Table 3.7. The table shows average IR rates per tonne-km of commodity-freight computed as a ratio of commodity-revenues to commodity-traffic for the given years. The overall tendency for IR freight-rates to increase sharply over the 21-year period is visible clearly. However, it also becomes apparent that the proportion of rate-increase varies according to commodity, sometimes even changing the railway pricing-ratio between different commodity-pairs over the period reviewed. Three commodity subsets might be separately considered from among the commodities included in the table. These are, namely, *bulk* commodities for which IR constitutes a monopoly freight-provider; *bulk* commodities for which the freight market is at least partially contestable; and *non-bulk* commodities where the freight market is generally well contested.

It is observed that the increase in traffic-rates has been fairly substantial over the period of 21 years (at between 4-12 times, with the solitary exception of sugarcane) for most commodities included in the table. It is also seen however that the order of rate increase is generally high in the case of the first group of bulk commodities for which traffic has also increased over the period, pointing to a tendency towards monopoly pricing by IR, particularly for commodities like coal & coke, POL, iron & steel, etc., and cement to a lesser extent. Considering that base-rates for POL and iron & steel were already high, the burden of revenue carried by railway traffic in these becomes extremely significant to IR. Conversely, for a large group of commodities of the low-bulk type, the rate order of increase remains substantial, but is accompanied by a definite decrease in traffic realised, to the extent that these cease to be important freight commodities for IR towards the end of the period. It is also noticed that several among such commodities, *e.g.* raw cotton, raw jute, general provisions, etc., were once the mainstay of railway freight operations in India and gradual decline in their traffic is a pointer to the overall nature of change in the IR freight-mix.

A middle group is defined by commodities such as oilseeds, tar & bitumen products, unwrought wood, gypsum and other stones, etc., which have a bulk character, but for which traffic has declined over the interregnum. For such commodities, both base-rates and the order of rate increase have been high, leading to a migration of traffic to other transportation modes. It needs to be noted contextually that the computed traffic rates of the table average the telescopic rate structure actually offered by IR. As such, it would generally benefit the consignor to move long-lead traffic in these commodities by railway so long as the rate-telescope remained favourable. The fact that considerable traffic-loss has taken place instead indicates otherwise.

The foregoing analysis remains an approximation, in the sense that several other non-tariff factors may enter the determination of commodity-traffic levels, among which the character of the commodity, the relative distances between sources of supply and demand and so on will be extremely relevant. Considering however, the degree of polarisation in IR freight operations, another very important factor which will form the base for analysis in the next four chapters is the disaggregated (*i.e.* specialised as well as spatial) freight capacity on IR, which determines both the ability and inability of IR to cater to various classes of commodity freight. This factor, when combined with the changing tariff structure noted above, has invested the emerging roadways

sector in India with the ability to successfully contest the freight market in certain commodities and to acquire substantial traffic share in these.

Table 3.7: Changes in Average IR Freight Tariff Rates per TKM for Selected Commodities 1973-74 to 1994-95

Freight Commodity	Average Rate/TKm 1973-74	Average Rate/TKm 1976-77	Average Rate/TKm 1983-84	Average Rate/TKm 1986-87	Average Rate/TKm 1989-90	Average Rate/TKm 1994-95	Total Increase in IR Tariff	*Proportion of Increase*
Coal & Coke	0.04	0.07	0.18	0.23	0.33	0.53	0.49	*12*
Iron Ore	0.07	0.09	0.19	0.22	0.26	0.50	0.43	*6*
Foodgrains	0.04	0.06	0.10	0.13	0.19	0.32	0.28	*8*
Cement	0.06	0.10	0.22	0.26	0.34	0.59	0.52	*8*
POL	0.09	0.14	0.38	0.46	0.58	0.99	0.90	*10*
Iron & Steel	0.08	0.13	0.32	0.39	0.52	0.87	0.79	*10*
Limestone & Dolomite	0.07	0.10	0.23	0.24	0.31	0.52	0.45	*6*
Fertilisers	0.06	0.08	0.18	0.20	0.27	0.35	0.29	*5*
Other Stones	0.07	0.11	0.22	0.23	0.32	0.53	0.47	*7*
Salt	0.05	0.06	0.11	0.14	0.18	0.25	0.20	*4*
Unwrought Wood	0.06	0.10	0.18	0.21	0.31	0.50	0.44	*7*
Sugarcane	0.11	0.17	0.30	0.22	0.22	0.26	0.16	*1*
Oilcake Fodder	0.04	0.07	0.13	0.17	0.23	0.45	0.41	*10*
Sugar	0.08	0.10	0.19	0.21	0.31	0.48	0.41	*5*
Manganese Ore	0.06	0.10	0.21	0.24	0.32	0.55	0.49	*8*
Tar & Bitumen	0.07	0.10	-	-	-	-	-	-
Oil Seeds	0.06	0.08	0.18	0.20	0.26	-	-	-
Other Metal Ores	0.05	0.09	0.19	0.22	0.29	0.51	0.46	*9*
Gypsum	0.05	0.07	0.16	0.19	0.28	0.50	0.45	*10*
Paper	0.07	0.11	0.20	0.24	0.34	0.51	0.44	*6*
Non-Oilcake Fodder	0.06	0.08	0.15	0.19	0.25	0.40	0.34	*6*
Firewood & Fuel	0.06	0.07	0.12	0.16	-	-	-	-
Gur & Jaggery	0.06	0.07	0.17	-	-	-	-	-
Sand	0.06	0.09	-	0.22	0.31	0.56	0.50	*8*
Provisions	0.08	0.10	0.17	0.20	0.27	-	-	-
Raw Jute	0.12	0.16	-	-	-	-	-	-
Bricks & Tiles	0.06	0.09	0.19	0.24	-	-	-	-
Bamboos	0.06	0.11	0.22	0.23	0.29	0.48	0.42	*7*
Fruit & Vegetables	0.06	0.08	0.13	-	-	0.29	0.23	*4*
Raw Cotton	0.10	-	-	-	-	-	-	-
Compressed Gases	-	-	-	-	-	0.82	0.82	-
Acids	-	-	-	-	-	0.90	0.90	-
Non-Ferrous Metals	-	-	-	-	0.35	0.54	0.54	-
Soda Ash	-	-	0.17	0.22	0.30	0.49	0.49	-
Caustic Soda	-	-	-	-	0.34	0.52	0.52	-
Wrought Timber	-	-	0.15	0.17	0.26	0.43	0.43	-
Edible Oils	-	0.10	0.21	0.24	0.31	-	-	-
Cement Manufactures	-	-	-	-	-	0.72	0.72	-
Electrical Goods	-	-	-	0.43	0.63	-	-	-
Jute Manufactures	-	-	0.26	0.31	0.41	0.63	0.63	-
Other Freight	0.08	0.11	0.22	0.25	0.33	1.61	1.53	*19*
Total Traffic	**0.06**	**0.09**	**0.19**	**0.23**	**0.32**	**0.54**	**0.48**	***8***

Source: Computed on revenue & traffic data for Thirty Principal Freight Commodities, *IRYB*, various years, Directorate of Statistics & Economics, Railway Board, Ministry of Railways, Government of India, New Delhi

Besides the rate-analysis that has just been conducted, several other features of tonnage versus traffic changes in IR commodity-freight become apparent on detailed examination of Table 3.6. It is noticed, for instance, that increasing tonnage-polarisation in major bulk commodities like coal & coke, iron ore, POL and so on is almost matched by traffic-polarisation in these categories so that average traffic leads have increased only marginally over the 21-year period. Traffic leads for other heavy commodities such as non-ferrous metal ores, gypsum, etc., as well as construction material such as sand and unwrought wood have on the other hand declined, indicating greater increase in tonnages than in traffic. To a lesser extent, this is also true for cement. Decreasing traffic leads in these commodities would point firstly to closer location of metallurgical industry to mining pitheads, and secondly to greater regional dispersal in project and other construction activity. Conversely, in the high-rated, low-bulk traffic segment, average commodity leads appear to have increased since greater polarisation is visible in terms of traffic rather than tonnages. It is also to be noted that in addition to the commodities which form this segment, traffic-polarisation in bulk movements in foodgrains, sugar, oilseeds, etc., has also been higher than tonnage-polarisation. The implication of rising

leads for all such commodities is that traffic with relatively shorter freighting distance has been gradually surrendered to other modes, leaving only long to very long hauls with IR. Since railway rating of the commodities mentioned by name is subsidised on account of their essential nature, retention by IR of the long-haul traffic in these is supported both by lower average rates and by the rate-telescope. It is also noticed from both tables that IR traffic in commodities other than those listed by names has become increasingly long-lead in nature over the review period. The impetus for such polarisation evidently comes from the high base-rate and the 19-fold increase in average traffic-rate that has occurred over the period, rendering the short-haul segment of this freight market most open to contest from the roadways.

3.6 Critical Operational Constraints

The IR freight situation over the 6FYP and 7FYP periods during the 1980s has been characterised by increases in both originating tonnages as well as railway freight traffic. However, while traffic increases had been more moderate over the first five FYPs, and had thus maintained greater parity with the increase in IR freight tonnages, the gap between the two has begun to widen since the 6FYP. As has been mentioned earlier , in order to maintain the public utility nature of its operations, IR cannot refuse certain commodities that assume the position of necessity, either for consumption or production, since "under Section 27-A of the Indian Railways Act, the Central Government may direct the railways, in the public interest, to give preference to transport of such goods as may be specified and such directions are generally given in respect of low-rated commodities like coal, foodgrains, mineral ore for export, raw materials for iron and steel industries, manure, etc.[29] Thus the shift of emphasis in IR freight operations towards bulk traffic noticed through the preceding analysis has been more policy-determined than commercially-directed. Even with major tariff hikes over several recent Railway Budgets, a major portion of the range of bulk commodities freighted by IR still remain low-rated when compared to the low-bulk categories of general freight which are often highly-rated. The overall consequence of this has been disadvantageous for IR, entailing low traffic earnings compared to the increasing traffic costs it has been incurring over recent decades.

Public investment policy towards railway freight transportation in India for more than three decades has been directed more towards the management of freight demand, rather than towards the building of freighting capacity in advance of the materialisation of transportation demands. Thus the addition of railway freighting capacity stayed a step ahead of demand only uptil the end of the 3FYP. The subsequent FYPs have allowed considerable shortages to build up in freighting capacity, as a result of which the foci of infrastructure planning have shifted towards providing transportation as and when necessary. Nevertheless, an increasing tonnage trend has been maintained most major commodities hauled by the IR freight network. Without the adequate planning provisions for rolling stock acquisition, such trends have led to considerable congestion on the IR freight system, a logical consequence of which has been the diversion of commodity traffic towards other modes of transportation like the roadways. The commodity-freight mix catered to be IR has also consequently undergone a change, with more pressure coming to bear on the railways to transport preferred commodities at relatively low tariff rates, in order to cater to the needs of core PSUs and of the state-regulated public distribution system [PDS]. Consequently, the commodities which display the longest freighting leads today include core industrials like iron & steel, as well as critical inputs and essential PDS commodities like coal & coke, fertilisers, foodgrains, salt and sugar.

Freight in coal & coke has now come to occupy singular importance for IR freight operations, with strongly increasing trends in both traffic and originating tonnages. Presently, coal & coke shipments account for over 50 percent of all traffic freighted by IR, while their contribution to total IR freight earnings hover around 40 percent. However, a major part of the increase in coal-generated railway freight revenues since the 1980s has originated from frequent upward revision in tariff rates, rather than in sharp increases in the transportation of coal tonnages. On the other hand, commodity shipments of limestone and dolomite which are required in bulk by the steel plants as well as the cement industry show decreasing longterm tonnage trends as well as decreasing freight leads, indicating a shift in traffic from the IR freight network. Traditionally important freight commodities like mineral oils [POL] show irregular traffic trends, mainly owing to a slowdown in the growth of their railway freighting leads, which works to the disadvantage of IR revenues as POL freight shipments have had the highest average tariff yields. Similar irregularity in traffic trends are also being increasingly noticed now for iron & steel, which had hitherto been among the principal revenue-generating freight commodities for IR Cement and fertiliser shipments have come to occupy prominent positions in the

IR commodity-freight mix, because of the widespread demand for these commodities across the whole country. IR freight tonnages and traffic in both these commodities have consequently been increasing, showing evidence of vast expansion in freighting leads. Yet, while most of these commodities have hitherto constituted captive traffic for IR, material evidence has accumulated that IR tariffs in the highly-rated segments among these have begun to surpass the limits of what the traffic can bear, leading to the diversion of short-lead shipments wherever possible to the roadways. Trends like these are disturbing for longterm IR freight and revenue projections, and account for the consistent failure of the railways to match freight targets set by the FYPs.

Accompanied by the public-service obligation of IR to transport subsidised freight in essential PDS commodities, traffic diversions like these have imparted increasing tariff-inelasticity to IR's freight revenues. Since the principal earnings on any railway system originate from freight rather than passenger operations, operational and financial performance has consequently suffered at a time when IR has come under increasing pressure to finance its capital needs through internal resource generation and external borrowing. It would thus appear that the key to the restoration of IR freight operations to commercial health lies in the maintenance of adequate freighting capacity on the system. An examination of the constitution and technical composition of IR freighting capacity is thus made in the next chapter in terms of its principal constitutent units, namely the railway wagon and the railway wagonfleet.

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27. M.R.Kulkarni [1991] *op.cit.* p49
28. *cf.*Union Railway Minister's speech to Parliament while presenting the Railway Budget for 1998-99, Text reprint, *The Economic Times* daily, Calcutta edn., 30 May 1998
29. *IRYB 1973-74*, p64