Putting Public Investment on Track: The Rail Route to Higher Growth

06 CHAPTER

"*the introduction of the railways has been historically the most powerful single initiator of take-offs"* - W. W. Rostow[1]

6.1 Introduction

Since the new government assumed office, a slew of economic reforms has led to a partial revival of investor sentiment. But increasing financial flows are yet to translate into a durable pick-up of real investment, especially in the private sector. This owes to a number of interrelated factors that stem from what has been identified as the "*balance sheet syndrome with Indian characteristics.*" If the weakness of private investment offers one negative or indirect rationale for increased public investment, there are also more affirmative rationales that are elucidated in chapter 1. As emphasized in the *Mid Year Economic Analysis* 2014-15 there is merit in considering the case for reviving targeted public investment as a key engine of growth in the short run- not to substitute for private investment- but to complement and indeed to crowd it in.

This chapter starts off with simple facts to demonstrate that an increase in public investment would not crowd out private investments in India under in the present circumstances, and then goes on to build the case for targeting public investment to the sector where it can generate the largest spillovers- which could well be the Indian Railways.

6.2 Effects of increasing public investment on overall output and private investments

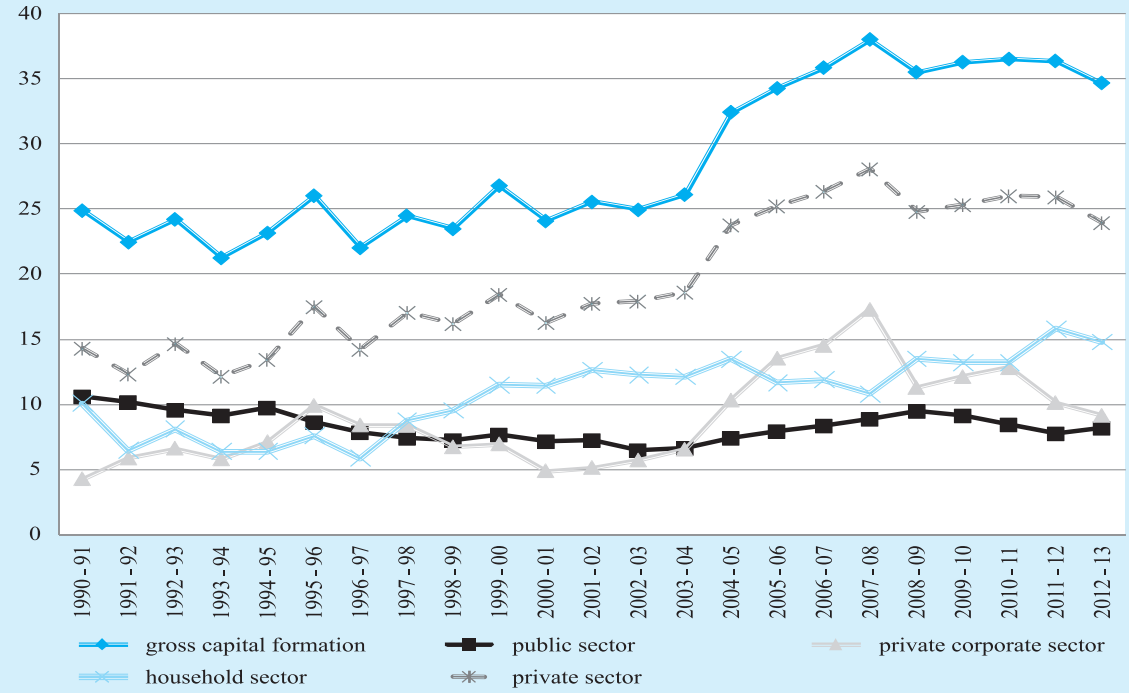
The decline in public as well as private corporate investment has been associated with the growth decline in recent years. Data based on the older series of the Central Statistics Office (CSO) indicates that a boom in private corporate investment in the high growth phase (2004-05 to 2007-08) was accompanied by an increase in public investment by about 1.5 percentage points. A decline in public investment by more than 1 percentage point between 2007-08 and 2012-13, is accompanied by a general decline in private corporate investment by more than 8 percentage points (barring an increase during 2009-10 and 2010-11) (Figure 6.1).

The International Monetary Fund (IMF), in the World Economic Outlook (October 2014)[2], has noted that increases in public infrastructure investment, if efficiently implemented, affects the economy in two ways. In the short run it boosts aggregate demand and crowds in private investment due to the complementary nature of infrastructure services. In the long run, a supply side effect also kicks in as the infrastructure built

[1] Rostow, W. W. "*The process of Economic Growth*" , Oxford, Clarendon Press, 2d ed., 1960, pp. 302-3 cited in Mitchell, B. R. "*The Coming of the Railway and United Kingdom Economic Growth*", The Journal of Economic History, 24(3), September 1964.

[2] IMF, "*Is it Time for an Infrastructure Push? The Macroeconomic Effects of Public Investment*", World Economic Outlook, Chapter 3, October 2014.

Figure 6.1: Gross Capital Formation by Sectors as a ratio of GDP, 1990-91 to 2012-13



Source: **Central Statistics Office.**

feeds into the productive capacity of the economy. Econometric exercises reported by the IMF confirm that public investment increases can have positive effects on output. The medium term public investment multiplier for developing economies is estimated to be between 0.5 and 0.9 - a little lower than that estimated for advanced economies. However, the magnitudes depend on the efficiency of implementation.

Indeed, the two biggest challenges facing increased public investment in India are financial resources and implementation capacity. The former is addressed in Chapter 5 in this volume. As regards the latter, the trick is to find sectors with maximum positive spillovers and institutions with a modicum of proven capacity for investing quickly and efficiently. Two prime candidates are rural roads and railways. The impetus to roads was imparted by the previous NDA government under the then Prime Minister Atal Bihari Vajpayee [The National Highways Development Project (NHDP) and the Pradhan Mantri Gram Sadak Yojana (PMGSY)] and the evidence suggests that the payoffs, especially with regard to rural employment, were large in villages that were not already connected to the road network[3].

The present government can now do for the neglected railways sector what the previous NDA government did for rural roads. This impetus has the potential to *crowd in* greater private investment and do so without jeopardizing India's public debt dynamics.

What does existing empirical evidence say about the influence of public investment on growth in India? Rodrik and Subramanian (2005)[4] while analysing India's productivity surge around 1980 acknowledge a possible productivity boosting role of public infrastructure investments (in contrast to the demand creating effects). They analyse the effects on overall growth using a framework

[3] Asher, Sam & Paul Novosad, "*The Employment Effects of Road Construction in Rural India*", 2014, Working Paper accessed at http://www.nuffield.ox.ac.uk/users/Asher/research.html.

[4] Rodrik, D. & A. Subramanian, *"From "Hindu Growth" to Productivity Surge: The Mystery of the Indian Growth Transition"* 2005, IMF Staff Papers, 52(2).

developed by Robert Barro ("*Government Spending in a Simple Model of Endogenous Growth",* 1990, Journal of Political Economy, 98(5)) where government infrastructure services are an input into private production. Their results indicate that allowing for the appropriate lag (around five years) between public infrastructure spending and growth, the former can explain around 1.5-2.9 percent of overall growth. A Study by the Reserve Bank of India (RBI) reports the *long run* multiplier (of capital outlays on GDP) to be 2.4[5]. The study also confirms that the effect of revenue expenditure on GDP, though high, fades out after the first year, suggesting gains from re-prioritizing expenditures.

6.3 The Case for Public Investment in Railways

6.3.1 Why railways? Under investment and Lack of Capacity Addition

Conceptually, there is a strong case for channeling resources to transport infrastructure in India given the widely known spillover effects of transport networks to link markets, reduce a variety of costs, boost agglomeration economies, and improve the competitiveness of the economy, especially manufacturing which tends to be logistics-intensive. However, resources need to be *prioritized among sectors* based on assessments of risks, rewards, and capacity for efficient implementation.

The first railway lines in India were built in the 1850s and after by private British companies who were guaranteed, by the colonial government, a return of 5 percent on their capital investment[6]. The establishment of railways led to integration of markets and boosted incomes[7]. Today the 'lifeline of the nation' operates over 19,000 trains carrying 23 million passengers and over 3 million tonnes of freight per day while employing over 13 lakh people.

In contrast to sectors such as civil aviation, the two major land transport sectors— roads and especially railways– are dependent on public investments. While all public investment in the railways is undertaken by the central government, public investment in roads is undertaken by the central government as well as state governments.

How much resources have flowed to railways over the years? Successive plans have allocated less resources to the railways compared to the transport sector as Figure 6.2A shows. The legacy of inadequate allocation is reflected in the fact that

Figure 6.2A: Resource Allocation in Transport Sector and Railways (Per cent)

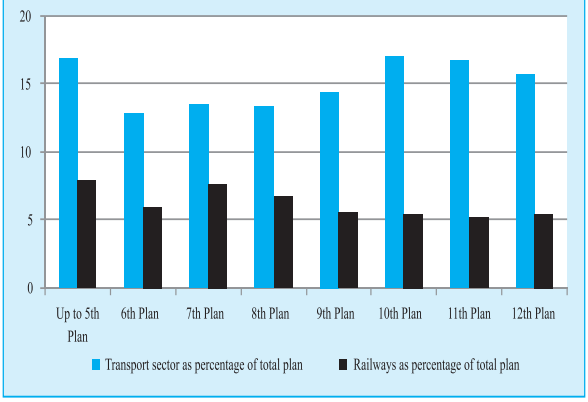
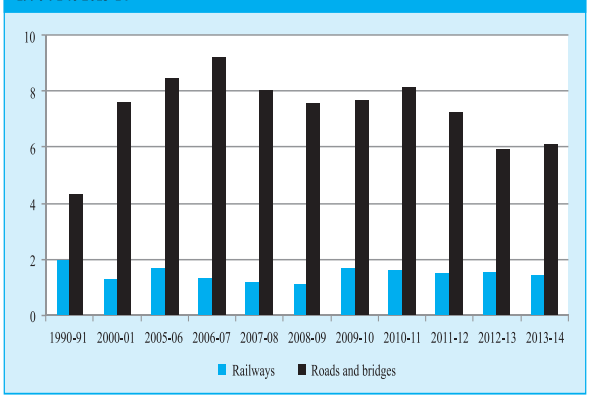


Figure 6.2B: Share of Railways and Roads in Total Developmental Expenditure* (Per cent), 1990-91 to 2013-14



***Source* : Indian Public Finance Statistics, Ministry of Finance.*; Includes both Centre and States.**

[5] Reserve Bank of India, *"Fiscal Multipliers in India"* Box II.16, Annual Report 2011-12.

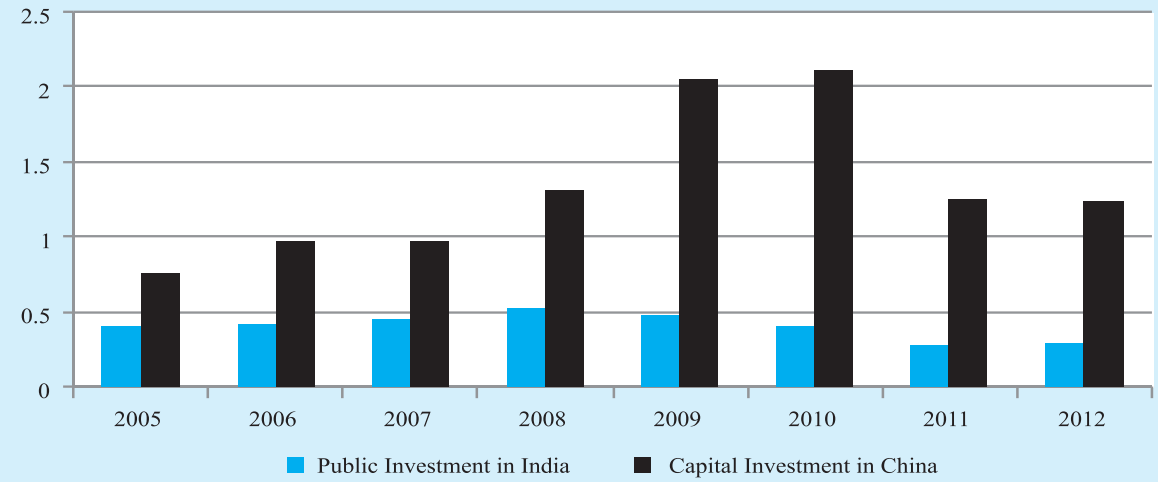
[6] Bogart, Dan & Latika Chaudhary, "*Could railways have done more to aid economic development in India?",* May 2013, accessed at http://www.ideasforindia.in/article.aspx?article_id=142. Expert Group on Indian Railways, "*The Indian Railways Report – 2001: Policy Imperatives for Reinvention and Growth*". New Delhi. NCAER 2001.

[7] Bogart, Dan & Latika Chaudhary, "*Railways in Colonial India: An Economic Achievement?*", May 2012 , accessed at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2073256.

the share of railways in total plan outlay is currently only 5.5 per cent vis-à-vis about 11 per cent for the other transport sectors and its share in overall development expenditure has remained low at below 2 percent over the past decade (Figure 6.2B).

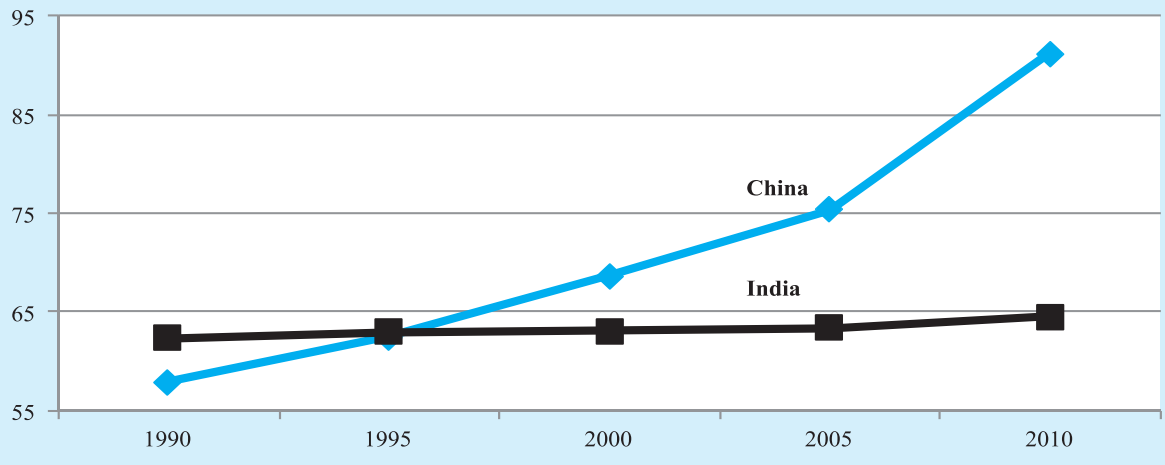
That these numbers are low is indicated by a comparison with China. In absolute terms and as a share of GDP, Chinese investment in railways dwarfs that in India. As a share of GDP, China has invested around three times as much as India on average over the period 2005-2012 (Figure 6.3). In per-capita terms, China has invested on average eleven times as much over the same period even though both countries have similar populations[8]. Even allowing for China's size, these numbers are telling.

Figure 6.3: Investment in Railways-India and China (Per cent of GDP), 2005 to 2012



Source **: World Bank and MoF calculations.**

Figure 6.4: Addition to Capacity (route kilometres, '000) , 1990 to 2010



Source **: World Bank.**

[8] It is important to note that a significant portion of investment in the Chinese Railways is via joint ventures of the government with provincial authorities and, for some freight railways, major users such as coal mines are also a party. A part of the freight tariff is earmarked as a Railway Construction Fund (RCF) which is used only for infrastructure capital spending. This eases strain on the budget and facilitates capacity creation. Since the Chinese Railways has been corporatized, it is also allowed to issue debt and borrow from the market to meet funding requirements.

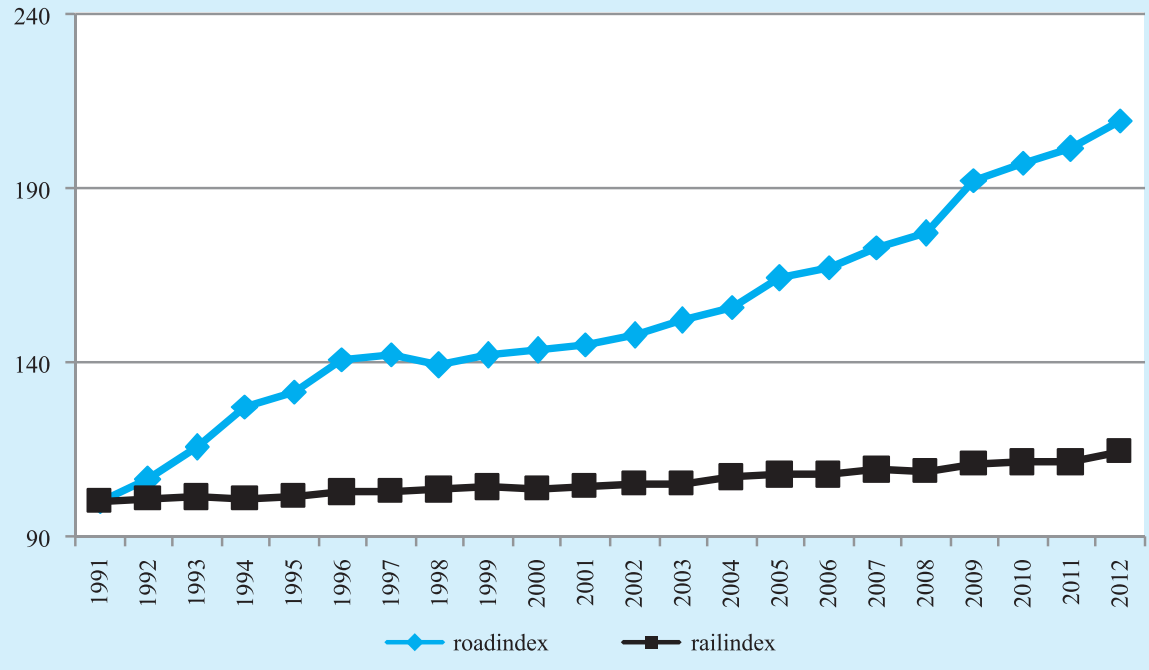
What have been the consequences of such underinvestment for the Indian Railways? The first casualty has been capacity expansion. Figure 6.4 indicates that in 1990 the Chinese rail network of about 57,900 route kilometers lagged behind India's 62,211 route kilometers. By 2010, the situation was reversed in favour of China with the country's network expanding to over 90,000 route kilometers while India's grew marginally to 64000 route kilometers. With lack of capacity addition, the share of railways in the GDP has declined to stand at around 1 per cent in recent years.

As figure 6.5 shows, track expansion in the Indian railways (as measured by an index of running track kilometers over the period 1991 to 2012 with base 1991) has miserably lagged behind capacity addition in the domestic roads sector (measured by an index of length of roads in kilometers inclusive of national and state highways, urban and rural roads**).**

This has effectively led to railways ceding significant share in passenger and especially freight traffic to the road sector. The *Total Transport System Study on Traffic Flows & Modal Costs (Highways, Railways, Airways & Coastal Shipping*) by RITES Ltd. had estimated that the share of the railways in originating tonnage has fallen from 65 per cent in the late 1970s to 30 per cent in 2007-08. McKinsey's *Building India: Transforming the Nations' Logistic Infrastructure* (2010) study has estimated that the modal share in freight traffic stands at 36 per cent for the railways vis-à-vis 57 per cent for roads. According to the Report of the National Transport Development Policy Committee (NTDPC, 2014) this share is estimated to decline further to 33 per cent in 2011-12. The share of railways in freight traffic in some other countries as of 2011 is reported in figure 6.6. The cross-country numbers need to be interpreted with care. For example, the US has a 44 per cent share despite having extensive networks of coastal shipping links and elaborate inland waterways that carry significant freight (Amos, 2011).

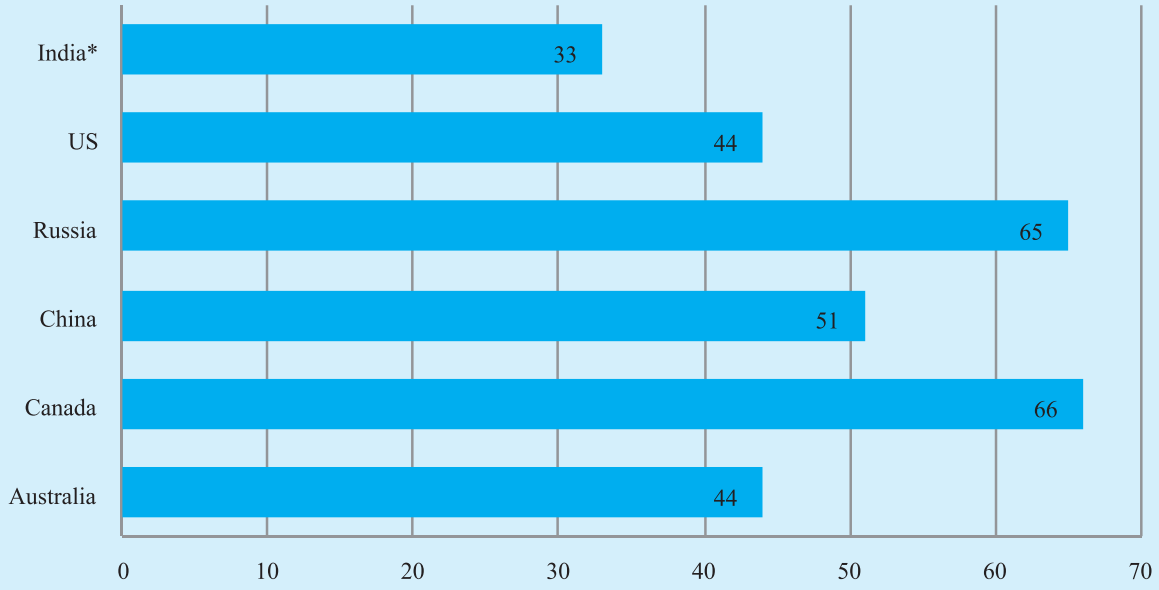
According to the McKinsey Study (2010) continuation of the current state of affairs in India would imply the share of railways in freight traffic declining further to 25 percent by 2020. As Amos

Figure 6.5: Indian Railways; *The Road Less Traveled* (1991=100)



Source: **CEIC database.**

Figure 6.6: Modal Share of Railways in Domestic Freight (Per cent)



Source: **Amos, Paul "*Freight Railways Governance, Organization and Management: An International Round-up*", July 2011, World Bank Paper submitted to NTDPC (2014). *Data for India is an estimate for 2011-12 reported in the Report of the NTDPC (2014).**

(2011) observed "International experience is unequivocal. The more efficiently that freight railways are managed, the greater will be their role in the markets they serve, the fuller will be their contribution to economic development and the higher will be their external benefits." An efficient rail freight network can help industry to transport raw materials at lower costs and also with associated lower green house gas emissions, comparatively better energy efficiency, and reduced congestion. As compared to road, railways consume 75 to 90 per cent less energy for freight and 5 to 21 per cent less energy for passenger traffic and, typically, the unit cost of rail transport for freight was lower vis-à-vis road transport by about ₹ 2 per net tonne-kilometer (NTKM) and for passenger by ₹ 1.6 per passenger-kilometre (PKM) (in the base year 2000)[9].

Consequently just as the previous NDA government transformed the Indian road sector through initiation of the NHDP and PMGSY, the current need is for a bold accelerated programme of investment in dedicated freight corridors (DFCs) that can parallel the golden quadrilateral, along with associated industrial corridors. Such an initiative will transform Indian manufacturing industry with "Make in India" becoming a reality. With the separation of freight traffic passenger trains can then be speeded up substantially with marginal investments.

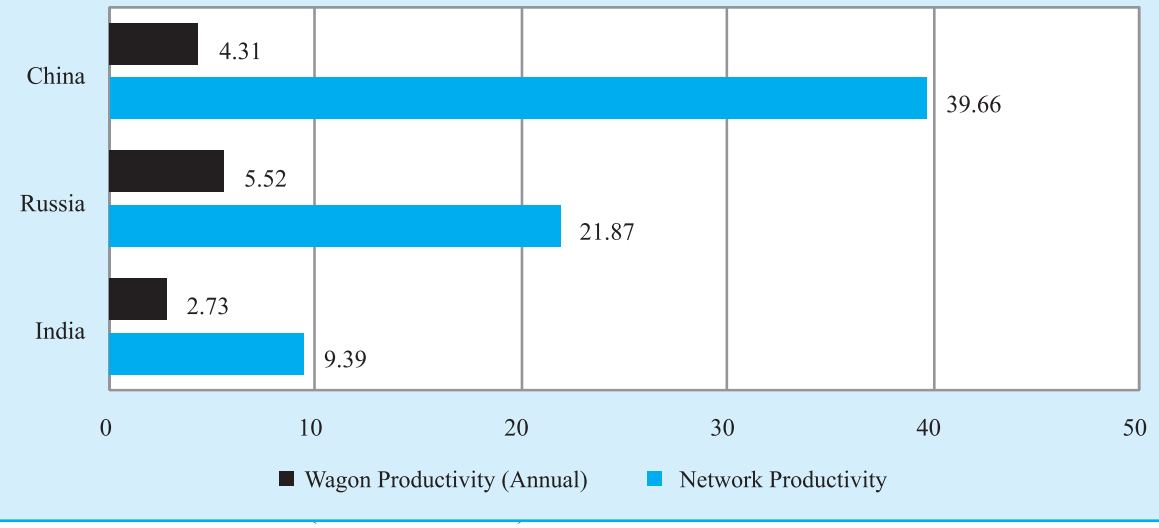
6.3.2 Congestion

A second and related consequence has been congestion and stretching of capacity. The increasing load on railway infrastructure and lower speeds are a logical consequence of lack of capacity addition. For example, the speed of the average freight train has remained virtually constant between 2000-01 and 2012-13 at around 24-25 km/hour. In contrast, in China, the maximum speed of freight trains was 80 km/h around 2008-09, and the maximum train speed that was around 80 - 100 km/h in 1991 was raised in stages to 160 and 200 km/h on the most popular passenger corridors by 2008[10] and is above 300 km/h at present.

[9] Report of the NTDPC (2014), Table 1.4, p.6.

[10] World Bank, "*Tracks from the Past, Transport for the Future: China's Railway Industry 1990-2008 and its Future Plans and Possibilities*" China Country Office, Beijing, May 2009.

Figure 6.7: Benchmarking Efficiency: India vis-a-vis China and Russia



How congested are the Indian Railways vis-à-vis the two other comparable countries-China and Russia? Given that the Chinese Railways also faces congestion and has embarked on huge capacity expansion, network productivity (as measured by NTKM (million) /network length) turns out to be much greater in China vis-à-vis both Russia and India. Wagon productivity (as measured by NTKM (million)/wagon holding) is the lowest in India among the three (Figure 6.7).

The same track network is shared by both passenger and freight trains in India. The extent of congestion can be gauged from map 6.1 below where the black lines represent the rail network and grey lines indicate those that are operating at above 100 percent capacity. Congestion exists irrespective of the railways network being thick or thin. On high density network (HDN) routes, over 65 per cent of total sections (161 out of 247) are running at a capacity of 100 percent or above[11]. This percentage is higher for specific zones. For example, in the north central railways 96 percent of sections and in the south eastern railway about 75 percent of sections are operating at above full capacity. The NTDPC (2014) report argues that capacity utilisation of 80 per cent is the optimum as some slack in line capacity is necessary to absorb and recover from unforeseen disruptions in operations of trains.

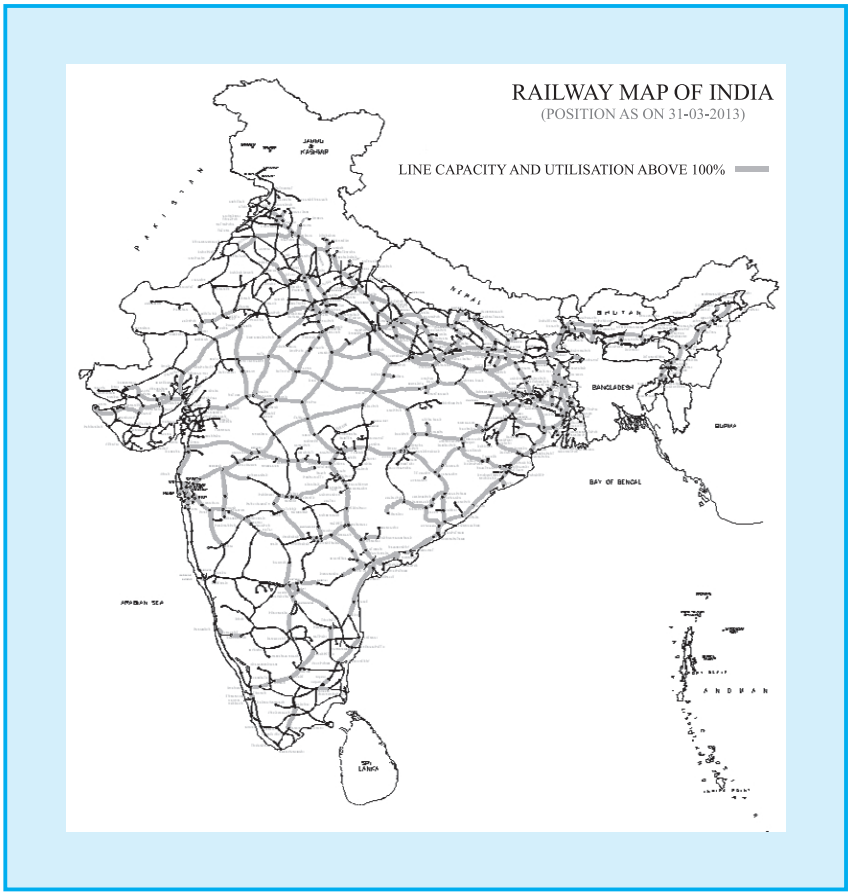
With passenger trains utilizing around 65 percent of the network capacity, the above situation imposes constraints on the running of heavy freight trains (that hampers the ability of the railways to carry bulk commodities from mines to power and steel plants) and high speed passenger trains[12]as passenger traffic is generally accorded priority. Over these years, data indicates that the load carried and distance travelled by a wagon per day and the turnaround time has almost stagnated.

The preceding paragraphs provide an overview of the 'route to nowhere' that the Indian Railways find themselves in: underinvestment resulting in lack of capacity addition and congestion; below-potential contribution to economic growth; neglect of commercial objectives, poor service provision, and consequent financial weakness (to which we revert later). Greater public investments, once utilized efficiently, can help the railways to overcome some of these problems. But even if it received an investment boost what would be the economy-wide impact?

[11] Source: Ministry of Railways data.

[12] Report of the NTDPC (2014), p. 40.

Map 6.1 : Capacity Utilization in Indian Railways*



***Source*: Ministry of Railways. * Grey lines indicate capacity utilization above 100 percent.**

6.3.3 How much boost can vibrant railways provide to the economy?

i. Forward and Backward Linkages of the Railways

Transport, and especially railways infrastructure, are critical for manufacturing and services. How much impetus would the fiscal boost provided to the railways generate for the economy? One way to estimate this is to draw upon Albert Hirschman's idea of backward and forward linkages. The former measures the effect on other sectors that provide inputs consequent upon a big push for railways. The latter measures the effects of the big push on other sectors that use railways as an input. The input output tables published by the CSO provide data on the value of output of a sector that is used by other sectors as input for their production as well as for consumption purposes. Backward and forward linkages can be calculated from this data[13].

[13] To capture backward and forward linkages, it is important to capture direct as well as indirect linkages. For this, the inverse of the input-output matrix (Leontief inverse) needs to be calculated. The inverse matrix shows the value of input (direct and indirect both) required to produce 1 unit of output of any sector. Increasing the output of railway service by Re 1 would not only increase the demand for output from other industries that are used as inputs by the railways, but also increase the input available for other sectors that use railway services for production. To find the backward linkage of railways, sum of value of output used from all input sectors is calculated (column sum of the matrix) and to find the forward linkage of railways, sum of value of output of railways used as an input by all other sectors is calculated. The methodology is outlined in: Guo, J & A. Planting "*Using Input-Output Analysis to Measure US Economic Structural Change Over a 24 Year Period"*, 2000 accessed at http://www.bea.gov/papers/pdf/strucv7all.pdf.

Railways are found to posses strong *backward* linkages (demand pull from other sectors) with manufacturing and services (Table 6.1). Based on 2007-08 data (the latest year for which the input-output tables are available), it appears that increasing the railway output by ₹ 1 would increase output in the economy by ₹ 3.3. This large multiplier has been increasing over time, and the effect is greatest on the manufacturing sector. Investing in Railways could thus be good for "Make in India."

Further, there are sectors where railway services are an input to production (*forward* linkages). A ₹ 1 push in railways will increase the output of other sectors by about ₹ 2.5. This forward linkage effect has declined over time but this is largely endogenous to capacity constraints in the railways sector which has led to reliance on other modes of transport.

Combining forward and backward linkage effects suggests a very large multiplier (over 5) of investments in Railways.

ii. Effects of public investment in railways on overall output and private investment: An econometric analysis

We can supplement the backward-forward linkage estimates with more formal econometric analysis which we show in figure 6.8. The impulse responses from the vector error-correction model (VECM)[14] indicate that increases in railway investment have positive and durable effects on levels of manufacturing and aggregate output. They confirm the results derived from the input-output tables.

The figure shows that an unanticipated shock to public investment in railways has a strong positive effect on both manufacturing and aggregate output and the effects are permanent. In order to convert the statistical representation in figure 6.8 to a standard interpretation of a multiplier, (i.e. the unit change in manufacturing and aggregate output for a unit change in public investment in railways) we follow the procedure outlined in Ramey[15] (2008).

Table 6.1 : Railways; Backward and Forward Linkages

Sector	1993-94	1998-99	2003-04	2007-08
	Backward Linkage			
AGRICULTURE	0.01	0.01	0.01	0.02
INDUSTRY	0.63	0.76	0.93	2.04
SERVICES	1.28	1.32	1.24	1.23
Total Backward Linkage	**1.92**	**2.08**	**2.19**	**3.29**
	Forward Linkage			
AGRICULTURE	0.13	0.12	0.16	0.07
INDUSTRY	2.15	2.03	2.11	1.18
SERVICES	1.13	1.13	1.16	1.19
Total Forward Linkage	**3.41**	**3.28**	**3.44**	**2.45**

***Source* : Calculations based on CSO input-output tables.**

[14] Typically for such analyses a vector auto-regression (VAR) model is used to assess the impact of a shock to one variable on the others. We use a variant of this, the vector error-correction model (VECM), as the data on public investment in railways as well as manufacturing and aggregate output are non-stationary in levels. These variables are, however, co-integrated and we are interested in their relationships both over the short as well as the long run.

[15] Ramey, Valerie A., "*Identifying Government Spending Shocks: It's All in the Timing*", 2009, National Bureau of Economic Research. http://www.nber.org/papers/w15464. In order to convert the 1 standard deviation (s.d.) shock to public investment in the railways to a standard multiplier we divide the elasticity coefficient (obtained from VECM) by the average ratio of railway public investments to manufacturing and aggregate output.

Figure 6.8: Impact of Railway Investment on Output

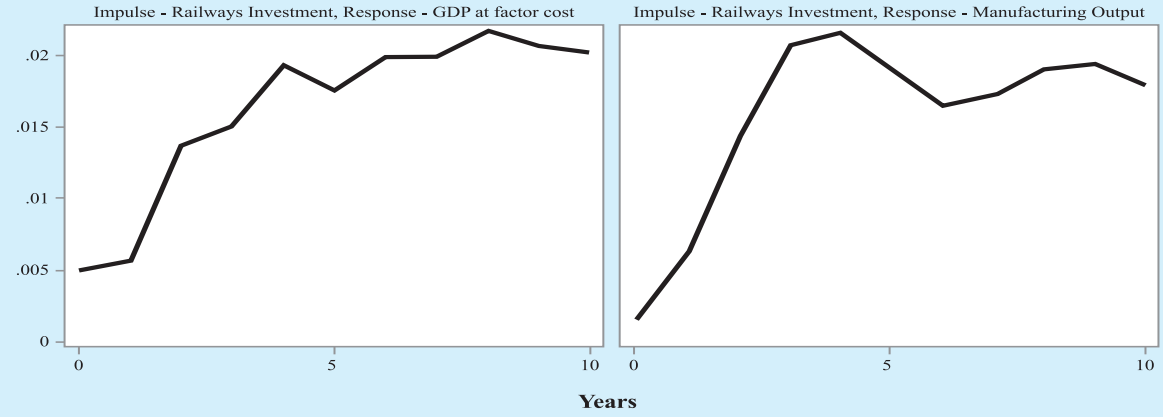


Table 6.2: Railway Public Investment: Output Multipliers

Years	Cholesky Impulse-Response (1-S.D.)		Rescaled Multipliers	
	Manufacturing Output	*Aggregate Output*	*Manufacturing Output*	*Aggregate Output*
0	0.00	0.01	0.04	0.94
1	0.01	0.01	0.17	1.05
2	0.01	0.01	0.40	2.56
3	0.02	0.02	0.58	2.80
4	0.02	0.02	0.60	3.58
5	0.02	0.02	0.53	3.27
6	0.02	0.02	0.47	3.71
7	0.02	0.02	0.48	3.70
8	0.02	0.02	0.53	4.04
9	0.02	0.02	0.54	3.86
10	0.02	0.02	0.50	3.76

Table 6.2 above underlines the large positive multiplier effect of railways. For instance, a ₹ 1 increase in railway investment has a cumulative multiplier effect of ₹ 7.4 and ₹ 1.2 on aggregate and manufacturing output respectively, within three years of investment. This effect intensifies over the subsequent years. Taking the econometric results and those from the I-O analysis together, it seems safe to infer that the railways multiplier effect is around 5 or more: that is a ₹ 1 increase in railways investment would increase economy-wide output by 5 rupees. These numbers are consistent with results of the linkages analysis.

6.3.4 Price Distortions

Ultimately, the railways has to be a viable commercial organization that is less dependent on state support and able to generate enough resources on its own to not only provide world-class passenger amenities but also by providing freight services at reasonable rates. In the long-run, state support should be largely restricted to the universal service obligations that the railways fulfill. Passenger tariffs have registered negligible increases over the past several years as indicated by a persistent larger gap between the index of consumer prices and that of passenger rates (Figure 6.9A). In contrast, the freight rate index tracks the wholesale price index more closely (Figure 6.9B). The profits generated via freight services have cross-subsidized passenger services and Indian (PPP adjusted) freight rates remain among the highest in the world as indicated in table 6.3.

Figure 6.9A: Index of Consumer Prices and Passenger Rates (1993-94 = 100)

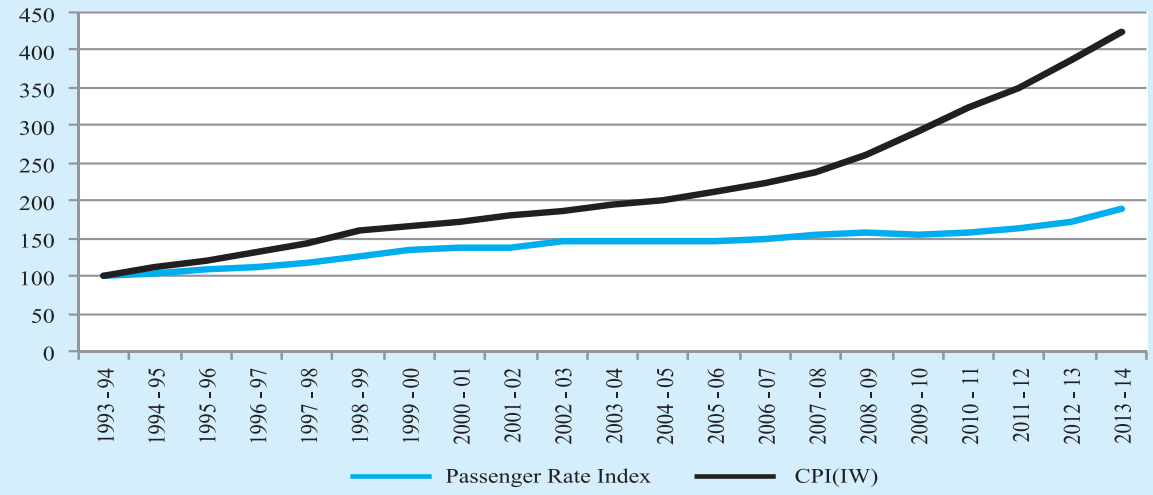


Figure 6.9B: Index of Wholesale Prices and Freight Rates (1993-94 = 100)

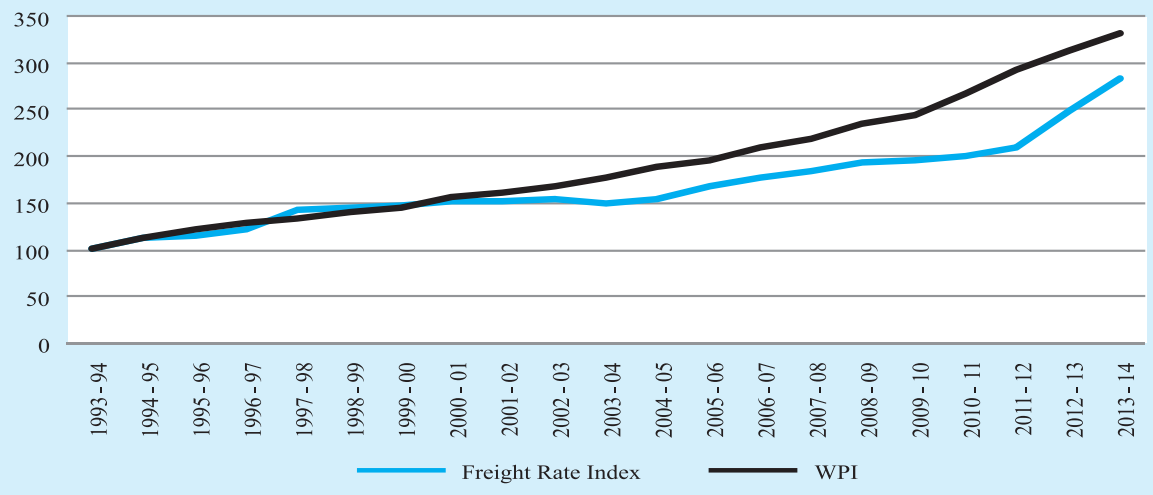


Table 6.3 : Passenger and Freight Yields in some Major Economies

Country	Passenger Service Yield US Cents/ Passenger-km adjusted for PPP (India=1)	Freight Yield US Cents/Total Tonne-km adjusted for PPP (India=1)
India	1.0	1.00
China	2.7	0.58
Russia	6.7	0.75

Source: **World Bank (2012): Railways International Overview: Issues for India (12th Plan document).**

Table 6.3 captures the heart of the price distortions in the Indian Railways. The objective of keeping fares low for consumers has forced high freight tariffs – high even by cross-country standards. The political economy of price setting and railway operations over the years has also meant that new investments are often directed at populist projects at the cost of those that help to ease congestion and enhance productivity. Apart from the problems discussed in the earlier sections this tendency has undermined the commercial viability of railways, including the inability to generate enough internal resources to finance capital investments. More importantly, the cross-subsidization and consequently high freight charges, along with inefficiency and stressed capacity, has undermined the competitiveness of Indian industry.

Table 6.4 : Freight Carried; The Case of Coal in India and China

		India	China	Ratio (India/China)
1.	Average distance (km)	639*	653#	0.98
2.	Cost ($)	0.021*	0.016^	1.31
3.	Cost(PPP terms) ($ per ton-km)	0.064	0.029	2.21
4.	Load carried by avg. freight train (ton)	1700*	3500#	0.49
5.	Avg. freight train speed (km/hr)	25	34^	0.74
		Indicators		
6.	Time inefficiency (hours) (1/5)	25.6	19.2	**1.33**
7.	Capacity (ton/hour)(4/6)	67	182	**0.37**
8.	Cost inefficiency($/ton)in PPP terms (1x3)	40.89	19.23	**2.13**

***Note* *: Ministry of Railways, India. #: Statistical Yearbook, China 2013. ^: World Bank. Data on the load carried by the average freight train is for 2011.**

To illustrate the impact on *competitiveness*, we compare selected indicators of Indian railways vis-a-vis China, for coal, as it accounts for over 40 per cent of freight carried in both countries. Competitiveness, among other things, crucially depends on the cost of transporting coal (to, say, steel and power plants), the amount transported and the time taken to do so. The cost of transportation of a ton of coal, for each country, is derived by multiplying the average distance (in kilometers) travelled by the coal with the average cost (PPP adjusted $) of transportation per ton kilometer. The average distance over which the coal is transported divided by the average speed yields the time taken. Load carried by the average freight train divided by the time taken yields capacity (tons carried per hour). As the ratios reported in table 6.4 indicates, China carries about thrice as much coal freight per hour vis-à-vis India. Coal is transported in India at more than twice the cost vis-à-vis China, and it takes 1.3 times longer to do so.

There is some, albeit limited, scope for adjusting rates to correct these anomalies. In what follows, a few simple observations on passenger and freight prices are made based on estimate of new price elasticities for different types of passenger and freight traffic.[16] There is potential for price discrimination among different passenger and freight types because of varying price elasticities (Table 6.5).

Table 6.5 : Price Elasticity of Demand

	Per cent
Total passengers	**14.4**
Overall suburban passengers	23.2
Overall non-suburban passengers	13.4
Upper class passengers	9.8
Mail and express class passengers	13.0
Ordinary passengers	14.5
Total Freight	**55.4**
Cement	37.4
Coal	47.9
Fertilizer	44.1
Iron ore	17.9
Petroleum and petro products	91.4
Pig iron ore	33.3

***Source:* MoF estimates.**

It is clear from the table that freight traffic is more price sensitive than passenger traffic. Within passenger traffic categories, upper-class passengers are less price sensitive and may be

[16] The elasticities are arrived at by regressing passenger kilometers on average passenger prices (downloaded from MOSPI's infrastructure statistics report) and NTKMs on average tariff rates (identical source). They should be treated as indicative because the analysis is based on few observations and does not control for other factors that influence the choice of mode of transport.

better placed to internalize prices hikes vis-à-vis other passenger classes. We also calculate the cross-elasticity of civil aviation traffic to changes in railways prices to be 5.7 percent which indicates that upper class passengers do not easily switch to airlines as a response to hikes in railway prices. Similarly, in freight categories, petroleum products are observed to be very price sensitive. Iron ore on the other hand does not easily respond to price changes.

6.4 Policy Recommendations-Key Takeaways

- Greater public investment in the railways would boost aggregate growth and the competitiveness of Indian manufacturing substantially.
- In part, these large gains derive from the current massive under-investment in the railways. China invests eleven times as much in per-capita terms and underinvestment in the Indian Railways is also indicated by congestion, strained capacity, poor services, and weak financial health.
- In the long run, the railways must be commercially viable and public support for the railways should be restricted to (i) equity support for investment by the corporatized railways entities and (ii) for funding the universal service obligations that it provides. In the interim, there is scope for public support of railways, including through assistance via the general budget.
- However, any public support should be clearly linked to serious reform: of the structure of the railways; of their adoption of commercial practices; of rationalizing tariff policies; and through an overhaul of technology.