INFRASTRUCTURE NOTES

**TRANSPORTATION, WATER AND URBAN DEVELOPMENT DEPARTMENT**
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# WORLD BANK'S RAILWAY DATABASE

**Louis S. Thompson and Julie M. Fraser**

*The railway database provides information on scale, output and performance for over 90 railways worldwide permitting comparisons of performance and facilitating target setting by individual railways.*

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All railways aim to improve management and operational efficiency and effectiveness. One of the dilemmas faced by railway managers in doing so is to set fair and realistic targets. The Transport Division of the Bank's Transportation, Water and Urban Development Department began developing a railway database (RDB) in 1987 to outline the range of performance obtained around the world by region and by railway, and to stimulate discussion about how individual railways can set useful and attainable targets. The database provides comparative railway statistics on scale, output and performance for many of the world's railways. Over the years, the database has been expanded and improved and now contains data files on over 90 railways, representing more than 80 countries and covering the years 1980 to 1991/92.



## CONCENTRATION OF TRAFFIC

As Figure 1 shows, one of the more important characteristics of the world's railways is extreme traffic concentration. While the top 5 national railway systems (US, Canada, Former Soviet Union, India and China) account for 53 percent of total route-kilometers, they carry over 90 percent of world tonne-kilometers (t-km) and 56 percent of passenger-kilometers (p-km) (based on 1991 figures). By comparison, railways in Latin America together carry just over 1 percent of both t-km and p-km. If South Africa is excluded, Sub-Saharan African railways carry only 0.2 percent of t-km and 0.4 percent of p-km. While approximately 1 million route-km of railway exist in the world, spread over some 120 countries, the vast majority of operating activity is to be found in only a few nations.

## THE IMPACT OF THE RAILWAY'S ROLE

Perhaps the most significant distinguishing characteristic of the typical railway is the type of traffic it carries. This is important in several dimensions. First, the mix of freight carried determines the ability of the railway to capture a number of production economies which have emerged over the last two decades: railways carrying large amounts of bulk traffic between a limited number of origins and destinations (especially coal and grain) can operate unit trains which permit extremely high productivity of both labor and equipment, whereas railways carrying mostly wagonload (or smaller) amounts of merchandise traffic are highly constrained. More critical, certain railways (e.g., the US, FSU, China, and Mexico) carry mostly freight which permits higher productivity and which, at least in principle, permits a "commercial" approach to prices and services. Other railways (e.g., Sri Lanka, India, and most of the Western European railways) carry much more passenger service than freight, which constrains productivity, raises cost, and invites political interference in operations and pricing. Finally, the passenger problem is aggravated where, as in the case of India and the Western European railways (and Russia), a significant part of the passenger activity is suburban commuting which is both the most costly and the least remunerative of all.

**DESCRIPTION OF THE DATA**

Tables I (Page 1), (Page 2)and II give a comprehensive look at each railway in the database and detail the latest statistics on scale, output and performance measures. Table III lists all the variables maintained in the database, including some not mentioned in the previous tables. Scale and output measures enumerated in Table I include: line kilometers, rolling stock (locomotives, MUs, freight wagons, passenger coaches), freight activity (tonnes and tonne-kilometers), passenger service (passengers and passenger-kilometers), and employees. Most of these measures are obvious and require no explanation. However, note that tonnes refer to metric tonnes of 1,000 kg. MU denotes electric or diesel multiple-unit cars. Where we are able to disaggregate the total, employees are defined as rail staff and do not include construction, medical, education, or other non-transport workers. This distinction is critical when examining labor productivity in planned economies, especially China and the Former Soviet Union, where only about 50 percent of the "railway" workers are designated rail staff, with the remaining employed in clearly non-rail activities.

Table II (Page 1), (Page 2)provides standard industry performance indicators which attempt to measure the productivity, effectiveness and asset utilization of the railway. Average length of passenger trip is defined as total p-km divided by total passengers; average length of freight haul, total t-km divided by total tonnes.

Asset utilization measures include traffic units (TU-the sum of p-km plus t-km) per line kilometer, TU per locomotive, t-km per freight wagon, and p-km per passenger coach. When calculating total passenger handling capacity, both locomotive-hauled and MU coaches are included to adjust for railways where most passenger trains are formed of EMU or DMU stock- Japan, for example. Similarly, we have estimated the productivity of tractive equipment by dividing traffic units by the sum of locomotives plus MUs divided by eight-eight being roughly the average length of MU trains. Some countries have a sufficiently large proportion of their fleet as MU equipment that dividing traffic units by locomotives alone significantly distorts output per locomotive.

Labor productivity is typically measured in traffic units per rail staff. Examining staff costs (wages plus benefits) as a percent of total operating revenue reveals that in a number of railways, staff costs alone exceed total revenues from users and are often the largest single cost category. Employee effectiveness provides a useful illustration to highlight the danger in relying on a single measure to support any particular judgement. As an example, China railways has a labor output of 806,000 traffic units per rail employee which is only 10 percent of the 8 million TU per US railway worker. But wage rates in China are so much lower that the overall ratio of wages to revenues is only 12 percent in China compared with 27 percent in the US. For any individual railway, local circumstances may often explain an apparent discrepancy.

Diesel locomotive availability is one of the better measures of technical and managerial capability. While there are reasons why locomotive availability should be somewhat lower in developing than in developed countries (spare parts pipelines are longer), there is little excuse for availability lower than 50-60 percent. At or below this level, something is clearly amiss, either in the way the railway is managed or in the government's willingness to make foreign exchange available to the railway, or both.

The ratio of passenger fares to freight rates is a rough measure of the likely extent of cross-subsidy of passenger losses from freight income. Average passenger fare (or freight rate) is estimated by dividing total passenger (freight) revenue by total p-km (t-km). Another indicator included in the database, but not in this table, is the operating ratio which measures whether the railway is covering its costs of operation (including depreciation). Operating ratio with normalization includes government transfers (subsidies) as part of total revenue.

**CAVEATS**

The RDB, like all large databases, has inevitable errors; data are missing, sometimes in ways which can have a noticeable impact on results; not all railways define the same terms the same way, "availability" being a notable example; and, probably most important, railways are inherently non-comparable for many reasons which are not easily compressed into any set of statistics. These differences include topography, traffic mix, industrial location, access to modern technology, international flow disruptions, civil unrest, and many others. Basic measures such as tonne-kilometers and passenger-kilometers are, more often than not, survey estimates based on tonnes or passengers multiplied by average length of haul or trip. This difficulty in calculating passenger-kilometers is exacerbated on railways with large numbers of urban commuters. Particular caution should be used with all financial measures as accounting definitions and procedures vary from country to country.

Users of the database should be wary of using a single indicator to make specific comparisons across individual railways for reasons stated above which are compounded by inconsistent secondary sources. However, the database can be very useful in drawing broad-based comparisons, especially when all indicators consistently support the same conclusion. In addition, time series data, which are also available in the database, can be used to strengthen single-year, cross-section comparisons between railways or conclusions about a specific railway through trend analysis over time.

***TO LEARN MORE***

The entire database is available on floppy disk. If you would like more information or have information or comments, please contact Julie Fraser (x33973) or Lou Thompson (x33785).

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