TECHNICAL NOTE

Vertical Rail Mergers: Welfare Effects and Regulation Issues

Michael Braulke, Universität Osnabrück, Germany
Jörg Schimmelpfennig, Ruhr-Universität Bochum, Germany

ABSTRACT

The vertical merger of railroads involves the integration of several suppliers offering perfectly complementary services into one single market for a service bundle. In this paper, the authors analyse the welfare consequences of such a merger and present a simple Pareto-superior regulation policy. The purpose of this paper is to investigate the economics of a merger of two vertical rail monopolies.

Keywords: Mergers, Perfectly Complementary Markets, Railroads, Regulation, Service Bundle

INTRODUCTION

In the wake of the dramatic decline of passenger rail travel starting in the late 1940s when the share in intercity travel dropped from 8 percent in 1949 to 3.7 percent in 1957, the US rail industry has seen an almost continuous series of mergers. Most of these, especially the earlier ones, were head-to-head, i.e. horizontal, like the creation of Penn Central in 1968 and Conrail in 1976, following the collapse of Northeastern railroading. However, after the 1980 Staggers Rail Act, which brought deregulation on a larger scale and both clarified and simplified the merger process, mergers became mainly end-to-end affairs. More recent examples include the take-over of Chicago & Northwestern Railway by Union Pacific 1995 and the proposed creation of North American Railways by merging Burlington Northern Santa Fe and Canadian National. It was abandoned, though, at least for the time being, following the 15-months merger moratorium imposed by the Surface Transportation Board (STB), the US rail regulator, on March 17, 2000.

Conventionally, vertical industries are imagined to consist of upstream and downstream industries, creating a chain of intermediate, successive markets, with each firm’s supply being used as input in the next downstream stage, just like a string of pearls. Theoretical models follow this line. Results are ambiguous. Most research suggests that, leaving transaction cost aspects aside, vertical mergers across a one-sided monopoly or oligopolies increase output and, thus, welfare (Cf., e.g., Greenhut & Ohta, 1986).
1979). However, this seems to depend critically on a fixed-input-coefficient assumption (see Warren-Boulton, 1984; Westfield, 1981). Bilateral monopolies cannot be modelled on the basis of a price equilibrium approach but are typically considered to evolve from negotiations along the lines of the Coase Theorem. While the negotiated quantities would be efficient in that they maximise joint profit, the division of profits between the two participants would remain indeterminate (see Machlup & Taber, 1960). Then, as long as transaction costs are negligible, a merger would be allocatively neutral, leaving the pre-merger equilibrium and welfare unchanged.

Vertical rail industries are different altogether. Consider two adjacent regional carriers serving both their respective intra-regional demand as well as the combined market for inter-regional shipping. Obviously, if traffic were exclusively intra-regional, a merger would, in the absence of synergy effects, bring no change. While one railroad may act as an agent for inter-regional services, either carrier may, unlike the “string of pearls”-image, just as well sell directly to the public. However, any prospective inter-regional shipper would have to buy simultaneously from both carriers, or none at all. A merger would thus replace two perfectly complementary markets by one market offering a service bundle.

This paper is organized as follows: the next section presents a simple model featuring two railroads serving both inter-regional and intra-regional shipping, and compares the pre-merger equilibrium with the post-merger solution. Regulation aspects are addressed and the final section summarises the findings and addresses briefly the consequences for rail regulation in general and the STB’s merger policy in particular.

A Model of Inter- and Intra-Regional Shipping

Consider two adjacent, profit-maximising monopoly rail firms \( i = 1, 2 \) serving both their intra-regional clientele as well as inter-regional shippers.

Denoting the inter-regional shipping volume – identical, of course, for both carriers – by \( x \) and the respective rates charged by \( p_i \) and the intra-regional shipping volumes and rates by \( y_1 \) and \( q_1 \), respectively, we will write \( C_i = C_i(x, y_i) \) for the cost functions. Thus we assume that the railroads are able to discriminate between intra-regional and inter-regional traffic and that they may set the rate for intra-regional shipping, \( q_i \), independently of the through rate, \( p_i \). In reality, price discrimination goes even further as US rail freight rates differ according to routes, direction of travel, and commodity groups, rather than distance only. Ever since the late 19th century, this has been known in the English railway literature as “charging what the traffic will bear”. However, this image may be traced further back to Adam Smith (See, e.g., Acworth, 1897).

The properties of the cost functions, most notably its mixed derivatives, \( \partial^2 C_i / \partial x \partial y_i \), and thus the way intra-regional shipping volumes affect marginal costs of inter-regional shipping, \( et \) vice versa, will play a key role in the analysis below. It is not obvious beforehand what sign these derivatives should have. However, we will rely essentially on the case of rising marginal cost cross effects, \( \partial^2 C_i / \partial x \partial y_i > 0 \), which can be interpreted to reflect a situation where intra-regional and inter-regional traffic compete for limited track capacity.

Denoting demand for inter-regional traffic by \( x = x(p) \), where \( p \) is, of course, the combined through rate \( p_1 + p_2 \), and demands for inter-regional shipping by \( y_i(q_i) \), and writing \( \pi_i = p_i x(p) + q_i y_i(q_i) - C_i(x(p), y_i(q_i)) \) for profits, a Cournot-type Nash equilibrium at prices \( (p^C_1, p^C_2, q^C_1, q^C_2) \) implies the first order conditions

\[
\frac{\partial \pi_i(p_i^C, p^C_2, q^C_i)}{\partial p_i} = x + \left( \frac{\partial C_i}{\partial x} \right) \frac{dx}{dp} = 0, \tag{1}
\]
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