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Cost structure and productivity growth of the Taiwan Railway

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Abstract

This paper studies the multi-product cost structure and productivity growth of the Taiwan Railway through the period 1991–2000. A short-run translog cost function is estimated using monthly time-series data in which pension/compensation expenses are regarded as a quasi-fixed factor, and the variables of operating characteristics for freight and passenger services are incorporated. Our results show technological change in the Taiwan Railway is not Hick's neutral, and both economies of scale and scope are present. Further, TFP growth has improved in recent years and is mainly driven by technological progress and scale economies.

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1. Introduction

Founded a century ago, Taiwan's existing railroad system is a government-owned monopoly comprising a total length of 1103.7 km. Fundamental changes in the market structure of domestic

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transport have occurred since the completion of Chung-san Highway in 1978. As a result, the monopolistic position of the Taiwan Railway has been challenged by fierce competition from other transport modes (such as auto vehicles, highway express buses, and air transport). In the past 10 years, its market share of inter-city passenger transport in the island has dropped to 13% (if auto vehicles are included). Moreover, it currently serves only 5.96% (down from 13.87%) of freight transport. Further, the Labor Basic Law in 1988 increased overtime expenses three-fold and the number of retired employees with monthly pensions has also increased by 14% per year. All these factors have contributed to the Taiwan Railway's financial losses.

In addition, the Taiwan Railway's operational environment is rigid and its operational costs continue to rise rapidly. In particular, up to the end of 2001, personnel expenses were 87% of its total revenue and total accumulated losses had risen to 3 billion US\$. Clearly, personnel expenses are a major financial burden for the Taiwan Railway, among which pension/compensation expenses accounted for just under half (41.12%) in 2000. The 1995 Pension/Compensation Act requires the Taiwan Railway to be responsible for its pension/compensation expenses.¹ The number of retired employees with monthly pensions at the end of 2000 was 14,386 compared with 15,980 employees working for the company in 2000. Moreover, investments in hardware facilities have been insufficient for a long time. As a consequence, mechanical equipments and electronic components are old and outdated. The percentage of car equipment over 30 years old was 21.6% in 1991 and rose to 36.2% in 2000. Maintenance costs thus increase yearly. Due to increasing financial losses, the Taiwan Railway has not been able to replace aging pieces of equipment, and can only try to maintain them. This leads to serious safety concerns. The Taiwan Railway also faces strong potential competition from the brand-new "High Speed Railway" system in the near future.² It is commonly believed that a considerable number of long-distance travelers will inevitably switch to the High Speed Railway.

As a result of the problems described above, the most crucial issue for the Taiwan Railway is how to optimize its operating efficiency and improve its productivity. Unfortunately, few studies to-date have focused on the Taiwan Railway. In this paper, we establish a short-run translog cost function based on monthly data over the time period January 1991 to December 2000. Since pension/compensation expenses refer to retirees only, we treat pension/compensation expenses as a quasi-fixed cost which cannot be adjusted in the short-run.³ The operating characteristics of passenger and freight services (such as average travel length, seat utilization, average length of haul) are incorporated in the cost function to fully reflect the operating characteristics of the Taiwan Railway.

The purpose of this paper is to study the multi-product cost structure and productivity growth of the Taiwan Railway in the 1990s. First, we analyze the influential factors of productivity

¹ The Taiwan Railway made a profit per year before 1978. As a state-owned enterprise, its past economic profits (including pension/compensation reserves) became part of governmental fiscal revenues.

² The High Speed Railway is planned to operate at the end of 2005, and the trip between Taipei and Kaohsiung (more than 350 km) will take less than 90 minutes.

³ Clearly, early pension/compensation expenses are not part of the Taiwan Railway's operational costs. If such expenses are included as part of the Taiwan Railway's short-run variable cost, then we may conceal its true productivity growth. The government has also promised to pay off the accumulated pension/compensation expenses before Taiwan Railway goes down the path of corporatization and/or privatization.

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