



# Evaluating impacts of institutional reforms on port efficiency changes: Ownership, corporate structure, and total factor productivity changes of world container ports

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## ABSTRACT

This paper evaluates how port institutional reforms influenced efficiency gains between 1991 and 2004. We constructed a panel data for port ownership, corporate structure, and port inputs and outputs for 98 major world ports, and we implemented the Malmquist Productivity Index (MPI) model. The MPI provides efficiency measures for input combinations that allow for obtaining the outputs in the presence of institutional reforms, ownership changes, main agent problems, technological progress, efficient scale growth, and many other reasons for efficiency and the lack of it. The results illustrate that ownership restructuring contributed to total factor productivity gains. The restructuring induced optimized operation of container terminals, especially for large ports, as it allowed specialized private entities to concentrate on terminal operation and cargo handling services.

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## 1. Introduction

Ports are the backbone of international trade, providing direct linkages from international to regional or local transport systems and trade chains. The current expansion of global trade calls for higher efficiency within seaports (UNCTAD, 2003). Realizing that seaports are critical nodes in the fundamental trade and supply chains, port authorities and managers have shown strong interest in efficient port management. Seaports face intense competition with neighboring ports in the globalized port industry. Thus, they are continually searching for strategies to meet growing demands for throughputs and services from liner companies, while also reducing costs.

Since the late 1980s, many national- and state-level governments have adopted institutional reforms in the port sector, such as privatization, corporatization, and disintegration of terminal operation functions from the government's hands (World Bank, 2001). These reforms intended to increase port efficiency, enhance service qualities through more responsiveness to the needs of port users, and cope with the global market pressures more effectively. The reformers have also implemented changes, with the expectation that the private sector will diversify financing sources for port investments and take portions of commercial risks of port operation, while the public sector will retain regulatory control and risk in many parts of the world.

In this context, it is important to understand significant determinants of port efficiency gains over the medium to long term. In particular, this understanding begins from an evaluation of dynamism in which institutional reforms influence port

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efficiency, given the current phase of globalized port competition. Therefore, this paper examines the efficiency changes of major container ports throughout the world during the last decade. In particular, this paper investigates the question, “How did reforms in port institutions, based on private sector participation and corporatization, allow ports to gain port efficiency between 1991 and 2004?”

The structure of this paper is as follows: Firstly, Section 2 briefly delineates how major world container ports have been institutionally reformed over the last decade, in order to achieve better efficiency and management. Secondly, Section 3 comprehensively reviews previous studies and theories regarding the roles of institutions in port efficiency. Section 4 describes the hypotheses tested in this study and the concepts and methods used to measure temporal efficiency changes of ports, i.e., the Malmquist Total Factor Productivity Index. This section also discusses the dataset used for this study. Section 5 presents analysis results. Finally, Section 6 concludes with policy implications, mainly focusing on what specific strategies major world ports have adopted to gain efficiency during the last decade.

## 2. Institutional reforms in the world port sector

Since the late 1980s and early 1990s, many countries have gradually adopted port policy reforms. The momentum for these reforms was the rise of a new age of globalization and the resulting global competition in the port sector. Although the practices and processes are not uniform throughout the world, the reform policies have focused on the restructuring of port ownership and management models. The private sector has participated in the development of port infrastructure through institutional mechanisms such as leasing and concessions. Some port authorities have also restructured themselves as corporatized entities (Asian Development Bank, 2000; Everett, 2005; World Bank, 2001). During the 1990s, the private sector invested a total of \$12 billion in numerous port projects, leading a substantial investment increase from \$10 million in 1991 to \$4.3 billion in 1997 (World Bank, 2001).

Table 1 illustrates how decentralized corporate and management structures became increasingly more popular in the global port sector. The management of major world ports has been transferred from national or state governments to local governments, or even to the level of an individual entity. In 1991, 42% of the world's major hub and gateway ports were managed by national or state governmental bodies; by 2004, the percentage dropped to a mere 32%. Corporatized ports (including statutory corporations) accounted for less than one-third of the world ports in 1991, but by 2004, 45% of the ports were corporatized in one way or another. In particular, the corporatized port model has been more popular in Asia and Oceania, and more recently in Northern Europe (Cheon et al., 2007).

Contracting, leasing, and concessions have become more popular for new development, for the renewal of container terminal facilities, and for other cargo and vessel services. Table 2 illustrates a notable trend: the increasing level of transfer of

**Table 1**  
Corporate structure of major world container ports<sup>b</sup>, 1991–2004.<sup>a</sup>

Corporate structure categories <sup>c</sup>	1991		2004	
	No.	%	No.	%
1. National level	31	<b>32</b>	25	26
2. State or provincial level	10	10	6	6
3. Local government department	28	29	22	23
4. Statutory authority or corporation	20	21	28	<b>29</b>
5. Government-owned corporation	7	7	12	12
6. Private enterprise	1	1	4	4
Total	97	100	97	100

<sup>a</sup> Source: dissertation research by Cheon (2007, p. 101).

<sup>b</sup> The definition of major world container ports is discussed in the first paragraph of Section 4.4.1, Analytical and temporal scope.

<sup>c</sup> The definitions of each category are described in Cheon (2007, pp. 85–93).

**Table 2**  
Ownership structure of major world container ports, 1991–2004<sup>a</sup>.

Ownership categories <sup>b</sup>	1991		2004 <sup>c</sup>	
	No.	%	No.	%
Public Operating Port	59	<b>61</b>	25	26
Mixed Ownership Port	14	14	18	19
Public Landlord Port	22	23	47	<b>48</b>
Non-government port	2	2	7	7
Total	97	100	97	100

<sup>a</sup> Source: dissertation research by Cheon (2007, p. 102).

<sup>b</sup> The definition of major world container ports is discussed in the first paragraph of Section 4.4.1, Analytical and temporal scope.

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