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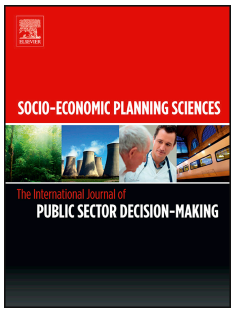

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Regional Technical Efficiency of Chinese Iron and Steel Industry Based on Bootstrap Network Data Envelopment Analysis

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Abstract:

This paper analyses the regional technical efficiency of Chinese iron and steel industry from 1996 to 2010 by a network DEA procedure, and provides the smoothed bootstrap network DEA strategy for the sensitivity analysis of the efficiency measure to sampling variation of the estimated frontier. Furthermore, the evolution and convergence characteristics of regional technical efficiency are examined by a dynamic regression model based on different regional divisions of China. The empirical results show that there exist significant geographical differences in the technical efficiency of Chinese iron and steel industry. On the one hand, the technical efficiency of the eastern area, the central area and the western area is unbalanced, with a lower efficiency in the west and a higher one in the east. On the other hand, technical efficiency of Central Bohai, Yangtze River Delta and Pearl River Delta economic zones is higher than that of the other economic zones. In addition, the technical efficiency has a significant improvement during the period of the Eleventh Five-Year Plan. Following the convergence notation in economic growth theory, this paper also gives some convergence evidence of the technical efficiency towards the efficient frontier due to the catching-up effect. Finally, this paper explores the determinants of the technical efficiency, and discusses policy implications for Chinese iron and steel industry.

Keywords: Technical efficiency, Network DEA, Bootstrap, Convergence

1. Introduction

Since China adopted the policy of economic reform and opening up to the outside world in the late 1970s, China's economy has been rapidly increasing, in which the iron and steel industry (also referred to as steel industry) plays a fundamental role. Steel products are mostly used in the construction and industrial manufacturing sectors, which are the main driving forces of the Chinese economy (Zhang et al. [1], Ma et al. [2]). China’s crude steel production grew at an average annual growth rate of 13% from 101 million tons in 1996 to 779 million tons in 2013, which accounts for 48% of the world's crude steel production (CISA [3], MIIT [4], WSA [5]). However, the excess capacity phenomenon in Chinese steel industry has emerged since the period of Tenth Five-Year Plan[1]. For example, during the Ninth Five-Year Plan, the country's GDP and

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[1] For the details on the Five Year Plans, we can refer to National economic and social development in the 9th, 10th, 11th, 12th Five Year Plan, the Cnetral People’s Government of the People’s Republic of China, http://www.gov.cn/.