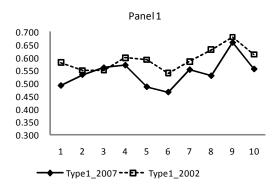Title : Productive Efficiency and Production Factors Redundancy on
       Manufacturing Industries in Japan
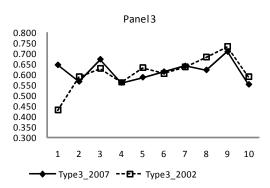
Author: Motonori Yoshida: Graduate School of Economics, Osaka Prefecture
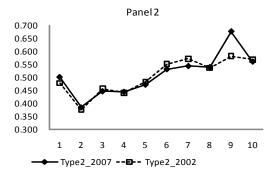       University

## Abstract

We investigated the efficiency on 24 manufacturing industries and the actual condition of the recent redundancy on production factors in Japan. First, we estimated the production function by industry with prefectural data and determined a "Data Envelopment Analysis (DEA)" model from the Returns-to-scale estimated by industry. Then, we implemented DEA to evaluate the production efficiency by industry and prefecture. The empirical results show the following facts: 1) Increasing returns-to-scale are confirmed on 20 industries, 2) Western Japan displays better performance than Eastern Japan on productive efficiency (especially, Shikoku, Kyusyu, Okinawa, and Kinki regions are outstanding: see the figure below), 3) Large amounts of redundancy on productive factors exist in key industries (including various processing and assembly ones) and Kanto, Tokai, and Kinki regions (whose economic scale is large), 4) The redundancy of 2.5 million persons or more on employed persons and that of 13 trillion yen or more on capital equipment amount are, respectively, observed in total.

JEL Classification Numbers: P47, R11, R30; Keywords: Manufacturing, Production Function, Data Envelopment Analysis, Productive Efficiency, Redundancy of Production Factors

Note: (1) Type 1, 2, and 3 denote Primary materials, Processing and assembly industry, and Livelihood industry, respectively. (2) Each number of 1 - 10 (in ascending order) on the horizontal axe denotes each region: from Hokkaido thorough Kyusyu & Okinawa, respectively.

Figure: Changes in Productive Efficiency of
       Each Industry Type (2002-2007)