

# Survey: Did the TFP Growth Rate in Japan Decline in the 1990s?

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## Abstract

This paper compares the estimates of Japanese total factor productivity (TFP) growth rates in several recent studies. In addition, the mark-ups and the returns to scale in each industry are estimated. Finally, this paper examines how mark-ups and return to scale estimates affect estimates of TFP growth rates.

We compare the estimated results of recent TFP growth rates (see Table 2-1) in the Japanese economy. Unfortunately, it was not possible to conduct a strict comparison of all the studies, because we only had limited access to most of the original data used in studies. There are ten studies estimating recent TFP growth rates, and eight of them show a decline in TFP growth in the 1990s when compared with the 1980s. Among these eight studies, two studies (Fukao et al.2003 and Jorgenson & Motohashi 2002) show only a small decline in the TFP growth rate during the 1990s.

Table 4-1 compares the results of three of these studies for the same estimation periods (1975-1990, 1990-1995 and 1995-2000). Of these, the one by Hayashi & Prescott (2002) arrives at a slower growth rate for primary inputs (labor and capital) in the period 1975-1990. However, their study does not take into account improvements in the quality of labor and capital and hence underestimates the growth rates of these inputs, while it overestimates TFP growth rates during this period. In contrast, Jorgenson & Motohashi (2002) use their own estimated price deflator for IT related goods, which explains why their estimate find an acceleration in TFP growth during the late 1990s.

We also compare the results of estimations of recent TFP growth rates (see Table 2-2) in the manufacturing sector and non-manufacturing sector. Nine of the ten studies conduct separate estimations of several industrial sectors, and most of them show that TFP growth rates in both sectors declined in the 1990s. Among these, Fukao et al.(2003), Nishimura et al. (2001) and Miyagawa (2003) show that the decline in the TFP growth rate is larger in the manufacturing sector than in the non-manufacturing sector. On the other hand, Cabinet Office (2002) and Yoshikawa & Matsumoto (2001) suggest that the

slowdown of TFP growth was mainly confined to the non-manufacturing sector.

We estimated the mark-up ratios and economies of scale in 13 manufacturing sectors and nine non-manufacturing sectors in the period between 1970 and 1998. The estimates are based on the methodologies put forward by Hall (1988) and Roeger (1995), extended to include intermediate inputs.

Our results show (see Tables 5-1 and 5-2) that the estimated mark-ups are positive and statistically significant in almost all manufacturing and non-manufacturing industries using both methodologies. This implies that productivity growth rate estimates based on TFP growth rates using revenue shares of inputs costs are biased. The estimated returns to scale (see Table 6-1) are larger than one and significant in almost all manufacturing and non-manufacturing industries. This suggests that TFP growth rates are affected both by technical progress and returns to scale.

We examine how mark-up and returns to scale estimates affect the estimated TFP growth rates using the Japan Industry Productivity database (see Table 7-1). We find that the rate of technical progress is faster in the 1990s than in the 1980s if we take economies of scale into account.

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