

## **ICT Investment and Economic Growth in India: A Sectoral Perspective**

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Investment in Information and Communication Technology (ICT) is shown to have contributed significantly to economic growth in the United States and in many European countries. In particular, the increased use of ICT equipment has played a dominant role in the US growth resurgence since 1995 (Oliner and Sichel, 2000; Jorgenson, 2001). Similarly, much of the gap between US and European productivity growth has been often attributed to the differences in ICT use (Timmer and van Ark, 2005). A broader analysis of the world economic growth suggests a surge in the ICT investment in the emerging Asian countries also, particularly after 1995 (Jorgenson and Vu, 2005). In particular, this study shows a predominantly increasing ICT wave in China, while India falls substantially behind China. A major challenge in quantifying the role of ICT in enhancing economic growth is the construction of a pertinent database on ICT investment. This paper presents a new series of investment in ICT equipment for Indian industries, which are consistent with official statistics. Since official statistics on ICT investment is still not comprehensive in India, we also rely on alternative sources (which include firm level data sources such as CMIE Prowess, CSO's Annual Survey of Industries, as well as input-output tables) to estimate ICT investment. To our knowledge, this is the first attempt to estimate ICT investment for Indian economy at sectoral level. In the past, Jorgenson and Vu (2005) have estimated ICT investment for aggregate economy in a cross-section of countries, including India. They apply United States' ICT investment to ICT spending ratio to WITSA ICT spending data for India, to obtain aggregate economy ICT investment. However, this approach may produce a severe bias in the estimated investment. For instance, as argued by de Vries et al., (2007) it might overestimate the actual ICT investment, as the investment/spending ratio in developing countries might be lower than that of the United States. On the other hand, it is also possible that most of the ICT spending in developing countries is in the form of investment, as consumption spending on ICT in low income countries would be relatively low compared to the US. Therefore, this approach might underestimate the volume of ICT investment in developing countries. In any case, the use of US investment to spending ratio to impute investment in India does not seem to be appropriate. For estimating aggregate ICT investment series, we use a commodity flow approach, using input-output tables, thus ensuring a complete consistency with official statistics. These aggregates are further broken down to sectoral level estimates using various industry and firm level databases.

The estimated ICT series is then used in the construction of capital services for 31 industries, in order to examine its contribution to labor productivity growth in these sectors. Timmer and van Ark (2005) suggests three channels by which ICT can enhance economic growth: by increasing the contribution of capital input in the production process; by increasing TFPG in ICT producing sectors; and through productivity spillovers, that will improve TFP in ICT-using industries. We use our newly constructed ICT series at sectoral level in order to examine these three channels, and thereby provide a clear understanding of the role of ICT capital in India's aggregate

economic growth. This will help us understand whether India is still missing out the ICT surge, and what are the relevant policy measures that could help firms tap the benefits of ICT use in order to gain productivity.