

## **Abstract for “Role of Capital in India's Economic Growth: Capital Stock versus Capital Services”**

**Abdul Erumban (The Conference Board, Belgium)**

**Deb Das (University of Delhi, India)**

Measurement of total factor productivity (TFP) is an important aspect of economic analysis and policy making. Appropriate measures of inputs and output are essential for better understanding of TFP and the measurement of capital input for productivity analysis is perhaps the most difficult of all input measurement. This is particularly true in developing countries, where lack of data hinders researchers and statisticians in using theoretically relevant measures of capital input for productivity analysis.

This paper is an attempt to measure capital services in India, both for aggregate economy and its 26 sub-sectors following the famous Jorgenson's methodology. To our knowledge, this is the first attempt to construct a consistent series of capital service taking asset heterogeneity into account. There have been many studies on productivity in India, with particular focus on organized manufacturing. The measurement of capital input in most studies is however, far from satisfactory (Goldar, 1986). There are many issues ranging from not giving allowance for depreciation, leading to overestimation of capital stock, to simply aggregating across assets without taking account of the possible effects of changing composition of investment.

A country's capital stock is characterized by the co-existence of various assets and vintages at the same time. These assets and vintages vary in terms of their marginal productivities, and therefore the services delivered by these assets of various vintages also differ. For productivity analysis, it is essential to aggregate across these various assets of different vintages and efficiency. In India, measures of aggregate capital stock constructed using data on aggregate fixed capital have been the widely used concept in most of the productivity studies (Goldar 1986, Ahluwalia 1991, Rao 1994, Balakrishnan and Pushpangadan 1994 and Das 2004). This approach, as against capital service measures, ignores asset composition of capital and thereby raises serious concerns about the actual role of capital input as a source of growth. It might underestimate the actual contribution of capital input to output growth and thereby overestimate the measured Total Factor Productivity growth (TFPG). This is particularly true when the share of fast depreciating assets in aggregate capital stock is increasing. Since economic liberalization in 1991, Indian economy has witnessed substantial increase in the import of capital goods, which has affected the capital composition in Indian economy, favoring an increasing share of equipment capital. More importantly, this compositional change has been substantially different across industries. Also, as many recent studies have shown the role of ICT capital in nurturing economic growth can be better understood only if distinction is made between ICT and non-ICT assets (e.g. Jorgenson, 2009).

In this paper we use detailed investment data since 1950 to construct a series of capital services, using a methodology advocated by Jorgenson (1963), for 26 industrial sectors for the period 1980-2008. In order to ensure international comparability both in construction and presentation of data, we follow the outline of capital input measurement in EU KLEMS database. We also examine the sensitivity of our measured capital services and productivity to various assumptions such as external and internal rate of return in the measurement of capital services. Our estimates of capital service show a faster growth in capital services compared to the conventional measures of aggregate capital stock. In particular, the

number of industries showing larger capital service growth rate is higher in the post 1990 period. This has been mainly due to an increasing share of equipment capital in most of the sectors, which leads to a faster pace of aggregate capital service growth rates. The ICT investments, though still small in magnitude, show an increasing trend, particularly during the later part of the 1990s.

The paper is structured as follows. Following the introduction in section 1, we detail a review of measurement of capital input in Indian context. The methodology and database for constructing capital services is discussed in section 3. Section 4 provides estimates of capital services and capital stock in accounting for India's economic growth. The final section concludes the study.

### References

- Ahluwalia, I.J. (1985), *Industrial Growth in India. Stagnation since the Mid-Sixties*, Oxford University Press, Delhi.
- Ahluwalia, I.J. (1991), *Productivity and Growth in Indian Manufacturing*, Oxford University Press, Delhi.
- Balakrishnan, P. and K. Pushpangadan (1994), 'Total Factor Productivity Growth in Manufacturing Industry: A Fresh Look', *Economic and Political Weekly*, July 30, 2028-2035.
- Das, D.K. (2004), *Manufacturing Productivity under Varying Trade regimes, 1980-2000*, *Economic and Political Weekly*, January 31.
- Goldar, B.N. (1986), *Productivity Growth in Indian Industry*, Allied Publishers, New Delhi.
- Jorgenson, D.W. (1963), 'Capital Theory and Investment Behavior' *American Economic Review*, 53, no. 2 (May): 247-259.
- Jorgenson, D.W. (2009), 'A New Architecture for the U.S. national Accounts', *Review of Income and Wealth*, Volume 55, Issue 1, pages 1–42, March 2009.
- J Mohan Rao (1996), 'Manufacturing Productivity Growth - Method and Measurement', *Economic and Political Weekly*, November.