

**INDIAN PHARMACEUTICAL INDUSTRY:
AN ANALYSIS OF RESEARCH & DEVELOPMENT,
FOREIGN DIRECT INVESTMENT, EFFICIENCY
AND GROWTH**

by

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CERTIFICATE

The thesis titled **Indian Pharmaceutical Industry: An Analysis of Research & Development, Foreign Direct Investment, Efficiency and Growth**, being submitted by Ishita G.Tripathy to the Indian Institute of Technology Delhi for the award of the degree of Doctor of Philosophy (Ph.D.) is a record of bona-fide research work carried out by her. She has worked under our guidance and supervision, and has fulfilled the requirements of this thesis, which has attained the standard required for a Ph.D. degree of this Institute. The results presented in this thesis have not been submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

In the backdrop of the recent paradigm shift in the patenting system; from process patents to product patents, this study examines the Research and Development (R&D) behaviour of large firms of Indian pharmaceutical industry (IPI), their Foreign Direct Investment (FDI) inflows, their efficiency, productivity and growth during the last four years of the process patent regime, i.e. 2001-02 to 2004-05, and the first four years of the product patent regime, i.e. 2005-06 to 2008-09. The study analyses primary and secondary data using statistical tools, Data Envelopment Analysis; Probit, Tobit and Fixed Effects models; Cluster Analysis and Factor Analysis.

The study finds that the focus of IPI is shifting towards R&D, with more and more firms spending larger shares of their sales on R&D. The patent regime which is prevalent is found to be an important determinant of the probability of a firm investing in R&D and its R&D intensity.

FDI flows into IPI are found to be higher during the product patent regime as compared to the process patent regime. There are positive and significant spillovers amongst both FDI and non-FDI firms, and also from FDI firms to FDI non-recipients.

Operational efficiency and productivity are observed to have increased in the product patent regime as compared to the process patent regime. The technical operational efficiency of IPI firms depends on their age, R&D intensity, ownership, capital imports and FDI inflows.

R&D-intensive firms and FDI-recipient firms are operationally more efficient than non-R&D-intensive firms and FDI non-recipient firms, respectively.

The technical R&D efficiency of IPI firms is found to be dependent on their age, export intensity and FDI inflows. FDI-recipients are more R&D efficient than FDI non-recipients.

The survey findings indicate that for domestic firms, the process patent regime was the most important factor responsible for their growth. Having identified a low level of R&D investment to be a major constraint in their growth process, the firms considered an increased level of R&D investment to be an important future growth strategy.

The study adds to the limited literature on the firm-specific characteristics which promote R&D investment, draw FDI, lead to efficient utilisation of resources and enhance firms' growth prospects in the context of the introduction of the product patent regime in India. The policy and managerial implications of this study are important for policy-makers, IPI firms, pharmaceutical firms of other emerging economies and for foreign investors.

IPI has traversed a long distance from product patents to process patents and back to product patents within a span of 35 years. The strategies of growth have undergone a change during these years. To maintain their efficiency and productivity in the new regime, it is important for pharmaceutical firms to gear up to meet the challenges of the new order.

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