

**FRONTIER APPROACH TO THE EVALUATION OF  
EFFICIENCY AND PRODUCTIVITY IN THE INDIAN  
PHARMACEUTICAL INDUSTRY**

*by*

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*Submitted*

*in fulfilment of the requirements of the degree of Doctor of Philosophy*

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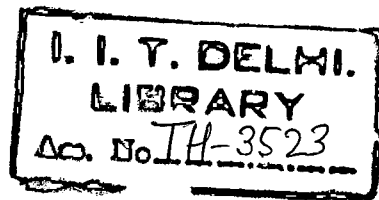
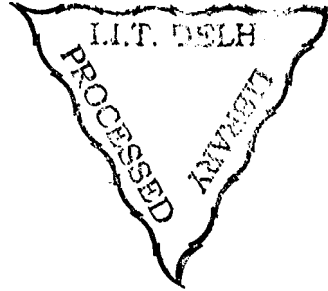


**Indian Institute of Technology, Delhi**

**April 2007**

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2. Indian pharmaceutical industry

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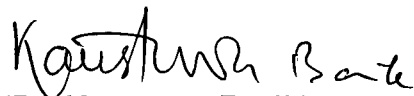


## CERTIFICATE

Certified that Ms. Shagufta Khan was permitted to work for her Ph.D. degree in Economics at IIT Delhi, on the problem entitled "**Frontier Approach to the Evaluation of Efficiency and Productivity in the Indian Pharmaceutical Industry**". She has faithfully carried out her study under our guidance and supervision and the accompanying thesis is her genuine and original work.

The results contained in this thesis have not been submitted, in part or full, to any other university or institute for the award of any degree or diploma.

Ms. Shagufta Khan has completed necessary course work and put in the required attendance in this Department.



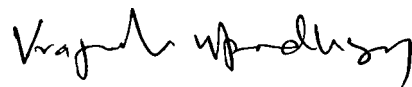
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## **Acknowledgement**

I take immense pleasure in expressing my deep sense of gratitude to my supervisor Prof. Vrajaindra Upadhyay and co-supervisor Dr Kaustuva Barik whose academic excellence and constant encouragement steered me through the work all the way and all the time. Their valuable analysis and criticism instilled immense confidence in me throughout my research work.

I would like to thank Prof. Gautam Appa, London School of Economics for his expert advice and guidance throughout my 14 month stint at the Operational Research Department, London School of Economics. I gratefully acknowledge Dr. Seema Sharma, Department of Management Studies, IIT Delhi for her valuable suggestions and providing access to data.

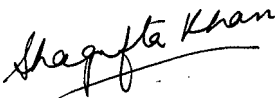
I am grateful to my friend, Jagritee Munshi for egging me on and keeping my morale high during the writing of this thesis. I express my sincere thanks to Shalu Agarwal, Sanyukta Jolly, Poonam Kaushik and Prachi Agrawal, for the love, care and pleasant company throughout. Special thanks to Abhishek, Jagritee and Shabana for proof reading.

It is difficult for me to put into words how thankful I am to my husband Dr. Mayank Gupta for providing me inspiration and constant moral support. My heart-felt thanks to him for keeping all the patience.

Last but not the least I am ever indebted to my parents, sister and brother whose love, support and understanding has seen me through all ups and downs and brought me up to here.

Finally, I acknowledge and thank University Grants Commission and Commonwealth Scholarship Commission for research fellowship and financial aid.

I am solely responsible for remaining errors, if any, in the study.

  
Shagufta Khan

## **ABSTRACT**

The Indian pharmaceutical industry is considered to be a life-line industry because of its importance in providing health security to the country. In its incipient stages the industry was dependent on imports and foreign technical know-how. But with active intervention by the government, it has transformed into a mature industry with export surplus and heightened focus on reverse engineering and new drug discovery. With the passage of product patent regime the industry is at the beginning of a new era. With this background, the present study is mainly concerned with the efficiency and productivity performance in the Indian pharmaceutical industry from 1990-91 to 2004-05.

The study applies the methodology of data envelopment analysis to estimate efficiency and productivity change on a panel of 35 firms between 1990-91 and 2004-05. Our analysis reveals that the average technical efficiency of the industry is moderately high, but declines over 1990-91 to 2004-05. The scale efficiency, however, shows an improvement over the same period. A distinct relation between size of firms and their technical and scale efficiency is observed; while the relatively larger firms experienced higher levels of technical efficiency in the majority of years the smaller firms excelled in scale efficiency over the larger firms during the period of study.

A Malmquist index analysis of TFP change shows that TFP in the Indian pharmaceutical industry has declined by 0.9 per cent over 1990-91 to 2004-05. This has been due to a decline in two of the three components of TFP change, viz. technical change and technical efficiency change. The third component i.e., scale efficiency has shown an improvement of 0.1 per cent during the study period. Small firms have a smaller value of not only TFP change index but also of all its components. The differential between small and large firms is the highest in the case of technical change index. The technical efficiency estimates obtained in our study are found to be quite robust under different model assumptions.

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