

Abstract

The study of science in the context of organizations has been a topic of interest for researchers because scientific research leads to knowledge generation that helps firms gain competitive advantage. This research focuses on 'basic' science, measured by research publications, to study the evolution of science in Indian pharmaceutical industry and evaluates the economic returns obtained by firms through production of science. Research publications were earlier considered the domain of academic institutes and research laboratories, but in recent years firms have also started focusing on basic research because the outputs of basic research are inputs to processes leading to innovation and technological development. Science helps firms build capabilities that enable them to cope with technological and environmental changes. The literature, however, is relatively sparse in using science as a measure of firm capability. One particular industry where it is certainly a key source of capabilities is that of bio-pharmaceuticals, which has historically proven to be one of the most science-intensive sectors of the economy, and has received significant support for research from public institutions globally across various economies. Indian pharmaceutical industry is an even more interesting context because the growth and development of the industry over the years has been shaped by institutional changes. This study aims to explore the role of institutional changes, specifically regulatory changes in the intellectual property environment, in shaping the production and valuation of science.

This dissertation is structured into two essays which seek to explore the production of science and its valuation by a focal firm's rational investors. The first essay adopts a social network perspective to study the effect of institutional changes on the generation of science as previous studies state that firms in a transitional economy adopt network-based growth strategy. This study treats co-authorship of research publications as research networks that offer interactive learning opportunities to the partner organizations. Previous studies on co-authorship networks are generally conducted on an individual scientist level where network positions of the individual authors influence the output of the individual. Author disambiguation using secondary data is however a key problem in these past works. Departing from that, the focus of this study is on networks at the organization level. This study adopts ego-network (study of nodes which are directly connected to an ego node) as well as a whole-network (study of the entire network) perspective to analyze interorganizational networks from 1990 to 2010 in the Indian biopharmaceutical industry. The evolution of these networks is understood in the light of institutional changes, and the influence of the network positions of the firms on their scientific output is also studied. The results of the ego-network analysis show that in Indian pharmaceutical industry, firms that collaborate with a large number of partners produce greater and better quality science. Firms that span structural holes gain access to novel resources and produce a greater amount of scientific knowledge. However, brokerage ties do not significantly influence the quality of science produced. Firms with low closeness are better positioned to access novel information and that reflects in the production of science, but not in the quality of science. In the Indian pharma industry, it is important to occupy a more central position in the global network, as opposed to partnering with a firm that has a central location. Analysis of whole-networks from 1990 to 2010 shows increased clustering over the years and emergence of structures called Small Worlds. These structures could explain the increase in scientific production across the industry.

The second essay studies the evolution of science in an industry faced with institutional changes and offers evidence on the consequences of shifts in intellectual property rights for science done within firm boundaries. The study borrows from literature on economics of innovation to calculate stock of 'basic' science, measured by scientific publications, and analyzes the influence of institutional changes on the production and private valuation of science following Griliches (1981). It explores exogenous shifts in IP environment in the Indian pharmaceutical industry and studies how it conditions the private returns to science, conditional on heterogeneity across firms

coming from variation in their locations and choice of collaborating partner. The study shows that shifts in IP regimes prompted firms to increase R&D expenditure, which led to an increase in quantity and quality of science produced. Even though firms are showing an increased focus on production of science, there is no conclusive evidence that the market values the science produced. The valuation of science is influenced by heterogeneity arising from the location of a firm and the choice of collaborating partner.