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# Transition in R&D management control system: Case study of a biotechnology research institute in China

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## Abstract

China's transition from a command economy to a market economy calls for a transformation from a centralized to a decentralized model in research and development (R&D) management control system. Virtually all scientific research was funded and monitored by the state under the centralized economy, thus creating an incentive structure for individuals and institutes to get state research grants to carry out scientific research without being able to commercially exploit its final results. This study investigates a biotechnology research institute's commercialization effort in response to economic reform. The findings show that market demand is not sufficient in bridging the gap between technological potential and commercial exploitation. Management control system based on clearly defined property rights is of critical importance to successful R&D commercialization, and market-based financing is key to an effective control system.

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*Keywords:* R&D management control system; Biotechnology research institute; Command economy; Market economy

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## 1. Introduction

Research and development (R&D) is a deliberate economic investment activity that drives growth, invention, and technological advances (Hall, 1993). Previous research on R&D management, mostly based on developed economies, has generally presumed the same

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institutional environment, attitude to work, and choices of motivation incentives by profit-maximizing firms, therefore, any R&D decisions actually made would be efficient (Goel, 1999). Such an assumption of rationality and efficiency is not true of R&D management in a transition economy as China, where fundamental changes are taking place in property rights, ownership structure, and business organization. State-ownership and regulation have created a nonmarket R&D system with great innovative potential under central planning, but it has not been able to interface easily with the business sector. As a result, R&D institutes were unable to find interested investors or producers and might miss the commercial potential of their innovations.

R&D management requires an appropriate form of business organization to nurture innovation while controlling for risks. The form of business organization is a major factor (X-factor) accounting for Pareto-efficiency in firms' productivity. When the X-factor affects the production of conventional goods only, the firm is statically X-inefficient; but when it is of consequence for the rate of innovation process, the firm is dynamically X-inefficient (Leibenstein, 1966). A firm's capability for R&D commercialization is an important measure of its dynamic X-efficiency. International evidence has shown the positive impact of privatization on reducing static X-inefficiency of formerly state-owned enterprises (SOEs) (for a review, see Megginson & Netter, 2000). However, little is known of the effect of marketization on the dynamic X-inefficiency of R&D institutes in a transition economy.

This paper examines the impact of institutional changes on the operating performance of Shanghai Biotechnology Engineering Center (SBEC), a unit of the Chinese Academy of Science (CAS). SBEC was chosen as the case object for several reasons. First, as a litmus test of a CAS unit, the findings are potentially generalizable to the CAS system, which controls the majority of (civilian) R&D resources in China. Second, biotechnology R&D involves a much higher degree of technological and market risks than R&D in other disciplines, therefore, the investigation of a biotechnology institute would bring the issues under discussion into sharper focus. Third, R&D management is a sophisticated process involving various gestation and application lags. SBEC, which was specifically established to commercialize biotechnology R&D results, allows for a more objective evaluation of its operating results in financial terms.

The data were derived from three sources: site visits, review of internal documents, and meetings with management, which covers the period of 1991–1997. The research method differs from other case studies in that no structured interview or formal questionnaire was used to avoid potential miscommunication caused by the complexity of the topic, highly fluid environment, and discrepancy between interviewer's and interviewees' assumptions and conceptions about R&D management. Instead, an interactive approach was adopted to study the management practice over a 1-year period (1998–1999). In addition, the author has given a series of presentations to introduce R&D management as is practiced in developed economies to the management to serve as background for discussion. The author has also shared the findings with the management to seek their response. As a result of this reciprocal information-sharing process, the management was able to identify several structural problems in the control system and proposed new operating policies to address them (see footnote 6).

Chinese R&D institutes have developed a bureaucratic management system under the centralized economy. Their operating procedure was mainly established to meet policy and/or

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