

**9th International Conference on
Agricultural Biotechnology: Ten Years After**

organized by the:

**International Consortium on Agricultural Biotechnology
Research (ICABR)**

and the:

Catholic University of Leuven

CEIS - University of Rome "Tor Vergata"

Centre of Sustainable Resource Development, University of California at Berkeley

Economic Growth Centre, Yale University

Ravello (Italy), July 6-10, 2005

**“The Relationship between Public and Private Investment in
Early-stage Biotechnology Firms: Is there a Certification
Effect?”**

TOPIC AREAS: Impact of Science, Industrial Organization

AUTHORS:

Andrew A. Toole

Rutgers University

Dept. of Ag, Food and Resource Economics

55 Dudley Road

New Brunswick, NJ 08901

toole@Aesop.rutgers.edu

Calum Turvey

Chair, Dept. of Ag, Food and Resource Economics

Director, Food Policy Institute

Rutgers University

55 Dudley Road

New Brunswick, NJ

08901-8520

ABSTRACT

The promise of biotechnology to improve agricultural productivity and human health is widely discussed in the academic literature. To motivate research in biotechnology, governments, the private sector and universities often form development

relationships, business relationships or both. An emerging economic problem is to understand how public research dollars expended on university-based R&D are capitalized into commercial applications. Related to this commercialization goal is the notion of academic entrepreneurship, which can be broadly defined by the principal-agent relationship between university researchers and venture capitalists. Of particular interest are small start-up firms that attempt to build on university research to develop the newest innovations in agriculture and health. However, for these small firms to have any chance to commercialize their products, they must have sufficient financial capital to support product development.

While various public financing programs exist in the United States and European Union to fund small innovative biotechnology firms, there is little understanding of how these financing programs interact with alternative private sources of investment like venture capital. In this paper we use a real options approach to investment as described by Dixit (1992) and others to lay out the various ways in which a public financing program can fruitfully contribute. One mechanism to emerge from this framework is the potential for public agencies to “certify” small firms (Lerner 1999). Public investment may allow the firm the opportunity to reduce technical and market uncertainties surrounding their product ideas. If public programs have this function, then we should observe follow-on private funding by investors like venture capitalists.

The purpose of this research is to empirically investigate the relationships between government funding of Biotech R&D and follow-on venture capital funding. Our empirical work will test the certification hypothesis. We draw on detailed data from the U.S. Small Business Innovation Research (SBIR) program and data on venture capital investment to develop a database on biotechnology firms. Included are university-based firms which received some venture capital before SBIR funds, firms that received SBIR funds first and firms with a successful IPO. By correlating attributes of firms with the timing of an IPO we will be able to identify, at least heuristically, what attributes might be considered risky by capital markets. Finally our data are disaggregated to the extent that we can include as independent variables the rank of the faculty and university involved, the technology product being commercialized (e.g. biotechnology, molecular pharmacology, or nutraceuticals) and whether it is being developed for purposes of food and nutrition or human health. We hypothesize that academic entrepreneurship is related to age, and some universities promote entrepreneurship more than others. We also hypothesize that some biotechnology products have more investment appeal than others. To examine these issues we will employ a Probit model to look at the probability of venture capital funding *after* participation in the SBIR program.

