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Research Alliances and Collaborations: Introduction to the Special Issue

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Cooperative Research and Development (R&D) strategies, or R&D alliances, have become a normal and yet strategically important part of business decision making in many industries in recent years. Broadly defined, R&D alliances include any agreed-upon cooperative R&D arrangement between firms, such as joint ventures, consortia, technology partnerships and informal networking arrangements. These days, R&D collaboration is often viewed as essential for creating industry-standard platforms and technological innovations on which new knowledge work can be developed. Important issues for R&D alliances include measurement of the output from R&D alliances and where and how, if at all, government should be involved. Government is typically interested in identifying the important areas of R&D in which firms tend to under-invest and then in taking policy measures to correct the perceived under-investment.

Government plays an essential role in R&D alliances in a number of ways. First of all, government research agencies do their own joint research involving universities, private-sector firms and other organizations. They also provide funding to certain types of research projects, joint or otherwise, in both the private and public sectors. How these government funds are allocated and who gets involved in these research projects may have some impact on a nation's economic performance. Of even greater importance perhaps, government determines the legal settings in which private-sector firms operate: for example, government usually determines the conditions under which competing firms can engage in joint R&D projects, the policies for the taxation and financing of R&D investment, and regulations such as allowable levels of auto exhaust gas emissions. The nature of R&D alliances varies significantly from one country to another. For example, there are differences among countries in how competition or anti-trust policies are applied to R&D alliances. The papers in this Special Issue discuss economic and managerial issues associated with R&D alliances and collaborations. Four broad topics on R&D collaborations that are discussed by the papers in this Special Issue are: the implications of R&D collaborations for firm performance; the role of government; models for R&D collaborations; and measurement and accounting issues. The papers in each of these four topical groupings are briefly summarized below.

The first four papers discuss the implications of R&D alliances for firm performance (e.g. patent production) and other aspects of firm behavior. The paper by Sakakibara and Branstetter empirically evaluates the impacts of the research consortia sponsored by the US Department of Commerce's Advanced Technology Program (ATP) on production of patents by the participating firms. They find that firms' involvement in ATP consortia contributes positively to their production of patents. Such positive contributions are more likely to occur where the technological proximity of the participating firms is high. The paper by Hagedoorn, van Kranenburg and Osborn estimates the determinants of the number of patents owned jointly by at least two distinct firms.

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Using a sample of US and European firms, they find that firms' experience in joint patenting in the past is an important determinant of the numbers of joint patents the firms subsequently obtain. The paper by Caloghirou, Hondroyiannis and Vonortas analyzes research partnership performance as perceived by the partner members. Using a newly constructed survey data set for firms in seven European Union member countries they find that perceived research partnership performance depends significantly on the degree of fit between the cooperative and partner firm research orientations, the partner firms' efforts to learn from the partnership and the other individual partner firms, and the absence of knowledge appropriation problems among the partner firms. The paper by Li and Zhong analyzes the determinants of a firm's choice between research and development as the objective of international R&D alliances located in China. They find that a firm's decision to choose to set up research-oriented versus development-oriented alliances depends on factors such as the proposed location, the number of partners, the nature of the local partner(s) and the national origins of foreign partners.

The next three papers discuss joint R&D activities in which government and universities play an important role. The paper by Sakakibara examines the effects of knowledge sharing, also referred to as endogenous spillovers, among the participants of R&D consortia on R&D competition when R&D enhances a firm's absorptive capacity. In the context of the absorption framework, Sakakibara finds that R&D consortia whose members possess complementary knowledge are welfare enhancing so that government participation may be warranted, and that the kinds of consortia to be promoted by governments should depend on certain organizational characteristics of the R&D consortia. The paper by Mohnen and Hoareau considers the mechanisms by which firms get into collaborative arrangements with university and government labs and appropriate knowledge developed in universities and government labs. Using data from the Second European Community Innovation Survey they estimate factors that affect these mechanisms. One of their findings is that only firms that perform in-house R&D are able to extract knowledge from basic research institutions, which is consistent with the absorption hypothesis. The paper by Nakamura, Nelson and Vertinsky presents case study of industry wide R&D consortia in the Canadian forest products industry. Such R&D consortia, which were originally established with significant government input, are used to correct market failures in R&D investment for this industry. They find that the share of government funding to maintain the cooperation reflects the degree to which the consortia can appropriate the full value of their knowledge products (i.e. prevent spillover of innovations to non-members in Canada and elsewhere) and that the prime role of these nationwide consortia is the provision of potential access to R&D expertise, technological intelligence, and technology transfer services.

The next two papers consider alternative theoretical models of research alliances in the context of empirical and other evidence. The paper by Dalpé considers both network and transaction cost economics models as possible explanations for the prominent role that research organizations have played in the science and health areas in the development of the US biotechnology industry and in the formation of regional concentrations for this industry. He concludes that, given the apparent stability of the industry's alliance behavior over time, the network-based explanations are more suitable than the transaction-cost economics-based explanations for explaining the joint research interactions among private firms, academic researchers, government research organizations and universities in the US biotechnology industry. He also concludes that the dynamic of the US biotechnology industry is unlikely to be transplanted to other US industries or abroad. The paper by Odagiri discusses joint research behavior for the Japanese pharmaceutical industry. Based on empirical estimates obtained using data on research alliances for 10 major Japanese pharmaceutical companies Odagiri concludes that Japanese pharmaceutical companies' joint research behavior is better explained by a model which is based on the capability theory than on the transaction cost economics theory.

The last two papers are concerned with certain measurement issues of R&D, with international dimensions. Recent global environmental issues provide significant room for joint international R&D activities involving a number of countries. The paper by Hayami, Nakamura and Yoshioka presents a case study of an on-going Japan–China joint research project in which government organizations in China and universities and firms in

Japan cooperate to develop and measure the effectiveness of bio-coal briquette, a new product to replace coal in some regions of China, as a possible Clean Development Mechanism (CDM) proposed by the 1997 Kyoto Protocol. If certified under the Kyoto protocol, such a CDM would give Japan credits for emissions of CO_2 and other global warming gases. Hayami, Nakamura and Yoshioka describe how the production cost, the amounts of reduction in CO_2 emissions and other quantities required for a potential CDM certification may be calculated in a joint research framework with the Chinese government institutions. The last paper by A. Nakamura, Tiessen and Diewert is concerned with accounting measurement issues associated with firms' expenditures on R&D. They point out that currently available accounting information on firms' R&D expenditures—the usual source of R&D data economic research on R&D—is not suitable for measuring the returns to firms' investment in R&D, and hence information failure exists for firm and government decision makers in their R&D decision making. This is in part because of the reluctance on the part of professional accountants to capitalize certain types of R&D expenditures, despite the fact that many economic studies presume the presence of such capitalized measures as 'R&D stock.' They also discuss the difference that exists between the requirements of the Financial Standards Accounting Board of the US and the International Financial Accounting Board Standards in the treatment of R&D expenditures. They discuss the implications of these information failure problems from the perspectives of the underlying objectives of R&D consortia and the likely impacts of the research associations on these information failure problems.

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