STRATEGIC INNOVATION ALLIANCES

Nicholas S. Vonortas and **Patrick M. Murphy**
Center for International Science and Technology Policy and Department of Economics, The George Washington University, Washington, USA

Keywords: Research Joint Venture, RJV, strategic alliance, technology policy, collaborative research, research and technology development, RTD

Contents

Summary

Strategic Innovation Alliances (SIAs) are ongoing cooperative agreements between any combination of firms, universities, government labs, government agencies, and other such entities, established to use, diffuse, or generate new processes or products. In an alliance, members retain individual identities and autonomy. As a result, although the alliance originates with cooperation, autonomous members have their own individual interests, and compete to achieve them. Thus in SIAs exist a sometimes tenuous balance between cooperation and competition.

Policy for SIAs must take this balance into account, and as such this paper will present analysis of existing alliances and polices considering where they fall on a cooperative/competitive scale. Alliances at the cooperative end stress the complementary relationships between members. Those on the competitive end of the scale stress the eventual adversarial relationships between the members.

Governments can play a role promoting and inhibiting alliances, and can even take an active role within alliances. Globalization has increased the importance and role of governments as international competition and as cross-border alliances highlight the differences between alliance policy regimes. Supra-governmental organizations have also begun to engage in activities to impact SIAs. The paper will also provide examples and analysis of the governmental and supra-governmental roles in promoting and

contributing to SIAs in the context of where the relationships between the government or supra-government member falls on the cooperative/competitive scale.

1. Introduction

The production, exploitation and dissemination of scientific and technological knowledge and expertise have long been a focus of national policies and corporate strategies. In the knowledge economy, generating, using and diffusing innovations has earned increased importance. Comprehending and keeping up with the accelerating advance of science and technology has generated demands for innovative responses from firms, research labs, universities, nations, and society as a whole. One of these innovative responses is the creation of flexible and dynamic organizations for the purpose of producing, exploiting and disseminating innovation – for the creation of Strategic Innovation Alliances (SIA).

Strategic Innovation Alliances are ongoing cooperative agreements between two or more entities, in which the members retain individual identities and autonomy outside the alliance, which are established to use, diffuse, or generate new processes or products. As SIA members retain their individual identities and autonomy, they continue to develop and pursue individual strategies, unlike mergers or acquisitions, after which only one entity remains. As such, members may decide to continue or discontinue the alliance, or make it more permanent through merger or acquisition. The ongoing nature of SIAs excludes one-off licensing agreements, as they do not call for continuous technology sharing between partners. Types of entities involved in SIAs include firms, universities, foundations, government agencies, and government research labs. Alliances can be between any two or more actors from any of the entity types above, but the most interesting ones from a policy perspective, and those considered in this paper, have at least one firm.

To understand alliances that include firms, we must first understand what makes up a firm. By classic economic definition, a firm is any organization that combines resources to produce goods or services. In general a firm need not be motivated by profit, and any of the previously mentioned entities could be considered by firms, as they generate some form of output (government services, educated students, new science and technology, etc.). For the purposes of this paper, 'firm' will hereafter refer to profit-motivated firms.

SIAs tend to blur the boundaries between the entities. They muddle the lines of what is 'outside' and what is 'inside' an entity. Although members of SIAs retain their external identities, they also generate a new, common identity, as a distinct entity that is part of both firms, yet it is also something apart from each. Also, by allying non-firm entities with firms, they can also blur the definition of a firm. A government lab or university in an SIA with a firm can secure continued funding by successfully meeting the firm's innovative goals, but in doing so have in effect come to be motivated by the same profits that motivate the firm. A similar muddling occurs when policy promotes or allows patenting by publicly funded researchers, or licensing of publicly funded innovation within or apart from SIAs.

The relationships between firms and between firms and the other entities in SIAs are by nature both collaborative and competitive, although the degree and extent to which members collaborate and compete differs in each alliance, and also changes in a given alliance over time. From this, a scale of cooperativeness and competitiveness emerges. On the one end the primary characteristic is cooperation, on the other competition. On the competitive end of the scale, SIAs are relatively short-term, pre-competitive arrangements, and the relationship is, especially over time, mostly adversarial. These relationships are most common in alliances with more than one profit-motivated firm, but they can include zero, one or more of the other types of entities. In alliances on the cooperative end of the scale, the relationship between members is predominantly complementary. These alliances are most common when only one member of the alliance is a profit-motivated firm, but can occur in multi-firm alliances, especially in those between large firms and smaller firms. The distinction between alliances that are more complementary and those that are more adversarial offers an interesting analytical perspective.

That analytical perspective allows us to study why entities join and maintain alliances. Entities that join SIAs do so because they lack the ability to generate desired innovation independently. Innovation is a costly and uncertain endeavor. Often the cost and risk exceed an entity's resources, and the innovative skills exceed its internal capabilities. The growth of industrial research can be viewed as an attempt by firms to become technologically self-sufficient. Since approximately 1970 entities' demands for S&T grew faster than their independent ability to produce them, and they could no longer maintain progress toward technical self-sufficiency. In fact, many firms and organizations saw their S&T self-sufficiency actually begin to decline.

To overcome the challenge of declining self-sufficiency, entities can establish alliances to:

- pool resources (funds, facilities, scientists and technologists) to achieve a critical mass;
- exploit complementarities in research by combining capabilities;
- maintain the necessary continuity for long term research;
- share, and thus mitigate, risks; and
- create efficiency by reducing research duplication.

But by joining alliances, members may trade one set of risks for another. Each alliance member chances the unwanted transfer of their intellectual capital to other alliance members. Even without unwanted transfer of intellectual capital, firms in pre-competitive alliances risk creating future competition. Alliances may also run-afoul of anti-trust law, which in some countries can result in significant penalties.

Recognizing the potential positive impact of alliances on innovation and the positive effects of innovation on a society and its economy, many governments have initiated efforts to encourage them. This includes creating or modifying policy to promote SIAs, and undoing policy impediments to alliances. Examples of these policies will be analyzed later sections using the complementary – adversarial framework.

2. Strategic Innovation Alliances and Policy Considerations

The two ends of the alliance spectrum offer archetypes for an analytical framework. In addition to the SIA policy that targets either the complementary or the adversarial end of the spectrum, some S&T policy that is not focused on alliances nevertheless impacts SIAs. We can thus analyze SIA policies by placing them into one of three categories: General S&T Policy that Impacts SIAs; Policy for Complementary SIAs; and Policy for Adversarial SIAs. The reader must understand that these categories are analytical only. Just as most alliances are neither purely complementary nor wholly adversarial, neither do the effects of SIA policies impact only one end of the spectrum.

Just as SIAs blur the boundaries between their member entities, SIAs and SIA policy blurs the boundaries between types of SIAs, as later examples will show. This means that policy makers and analysts must consider not simply the type of entity in an alliance, but what role each entity plays – does it behave according to type, or in the alliance does it become a different type.

2.1 General S&T Policy that Impacts Alliances

Responsible governments do not initiate SIA policy for the sake of SIAs, nor for alliance members. Rather, SIA policy, and all S&T policy for that matter, has as its goal the generation of social returns from the advance of science and technology. The social returns from S&T can be direct, indirect or both.

Direct returns to the government come from S&T advances that improve the capability of particular government agencies to accomplish their missions. Policy pursuing direct returns commonly targets technologies for defense, health, energy, transportation and space.

Indirect returns arise from the positive externalities-the knowledge, network and pecuniary spillovers-generated by advancing S&T. Knowledge spillovers occur because it is imperfectly appropriable. The fruits of research, development and design are not necessarily reaped in full by the researchers, developers or designers. Similarly, innovation generates network spillovers as advances in one area flow downstream and enable other innovations. Pecuniary or market spillovers occur when the value of an innovation is greater to the purchaser than the cost charged by the innovator. As a result, the value of the innovation is spilled-over to consumers. All three types of spillovers can improve national economic and technical competitiveness and social welfare.

Any policy that impacts the S&T capabilities of firms, universities, labs and other S&T generators impacts SIAs. Education, availability of venture capital, and communications infrastructure, and the policies that promote or inhibit them all effect independent and allied innovation. But two policy areas have particularly significant impacts on SIAs: intellectual property rights (IPR) regimes and anti-trust policies.

IPR protection offers members legal protection for the knowledge capital they bring to and generate in an alliance. Without IPR protection, firms would be less willing to share the fruits of their individual, pre-alliance R&D with potential alliance partners. Also,

without some guarantee that they will have enforceable rights to the intellectual products of joint research, there is little incentive for alliance. As such, one will see little innovative activity, especially alliances for innovation, where there is weak IPR protection. For example, the United States, by allowing universities to own and profit from intellectual property, has increased university researcher's incentives for innovation, and for forming alliances. Clearly, allowing universities to reap dividends from their research allows for higher pay and more funding for research and researchers thus stimulating innovative efforts. Less obviously, this also stimulates alliances between universities and firms, as universities normally do not have productive capacity and firms want innovation – each can offer the other what they lack. Once again, in such a policy regime, and in such alliances, the university behavior begins to approximate that of a firm rather than a not-for-profit research entity.

In contrast to strong IPR, strong anti-trust policy deters collaborative efforts. The best illustration is the US example. Prior to the 1980s, US policy had a strong anti-trust propensity, with a predisposition against strategic alliances. Beginning in the 1980s, the US shifted towards a 'rule of reason' that required that the possible anti-competitive effects to be balanced against the potential for future benefits, including consumer welfare, and dynamic rather than static pro-competitive effects. This policy change grew from the realization that although alliances can be anti-competitive, many science and technology goals are only achievable through collaboration. In addition, SIAs can have pro-competitive effects as alliances mature and members move from laboratory collaboration to marketplace competition. More relaxed and rational anti-trust policy allows firms to enter multiple strategic alliances, and thus mitigate pressures from increased international competition and help themselves to respond to the demands of rapidly changing technologies.

-
-
-

Bibliography

Branscomb L. M., ed. (1993). *Empowering Technology*, 315 pp. Cambridge, MA. [Presents observations and recommendations on US policies.]

Branscomb L. M., and Keller J. H. (1998). *Investing in Innovation: Creating Research and Innovation Policy that Works*, 516 pp. Cambridge, MA: MIT Press.

European Commission (1997). *Second European Report on S&T Indicators 1997*, 729 pp. Luxemburg: Office for Official Publications of the European Communities. [Alliance police data and analysis, especially regarding pre-competitive, quasi-concentration alliances and European Union Framework Programs.]

Fusfeld H. I. (1994). *Industry's Future: Changing Patterns of Industrial Research*, 369 pp. Washington, DC: American Chemical Society. [The growth of industrial research, and the limits of technological self-sufficiency.]

Hemphill T. A. (1997). US technology policy, intraindustry joint ventures, and the National Cooperative Research and Production Act of 1993. *Business Economics,* **32**(4).

Kang N-H., and Sakai K. (2000). International Strategic Alliances: Their Role in Industrial Globalization, *STI Working Paper 2000/5,* 48 pp. OECD Directorate for Science, Technology and Industry, Paris: OECD.

Kemp R., Demandt I., and Dankbar B. (1996). *Monitoring Technology Policy in Europe: The Role of Public Research Institutes, Report*, 168 pp. Maastricht: Maastricht Economic Research Institute on Innovation and Technology (MERIT). [European country policy studies.]

National Science Board (1998). *Science and Engineering Indicators 1998,* 284 pp. Arlington, VA. [Details of US Policy and effects.]

Nelson R. R., ed. (1993). *National Systems of Innovation: A Comparative Study*, New York: Oxford University Press. [Policy data and observation, especially on France, Germany, Italy, Sweden and the UK.]

Vonortas N. S. (1997). Research joint ventures in the US. *Research Policy,* **26**, 577-595.

Vonortas N. S. (1997). *Cooperation in Research and Development*, 288 pp. Norwell, MA.

Vonortas N. S. (1998). Strategic Alliances in Information Technology and Developing Country Firms: Policy Perspectives. *Science, Technology and Society*, **3**, 181-205.

Vonortas N. S. (2000a). Technology policy in the United States and the European Union: shifting orientation towards technology users. *Science and Public Policy*, **27**(2), 97-108.

Vonortas N. S. (2000b). *US Policy towards Research Joint Ventures*, Paper 14.2000, 25 pp. Note Di Lavoro, Fondazione Eni Enrico Mattei (FEEM), Milano, Italy.

Wolters A. and Hendriks M. (1997). *Monitoring Science and Technology Policy III*, 280 pp. Report, Maastricht Economic Research Institute on Innovation and Technology (MERIT), Maastricht. [European country policy studies.]

Biographical Sketches

Nicholas S. Vonortas is currently the director of the Science, Technology and Public Policy graduate program and the deputy director of the Center for International Science and Technology Policy of George Washington University's Elliott School of International Affairs. He is also an Associate Professor of the Department of Economics at the same University. Nick Vonortas holds a Ph.D. and an M.Phil. in Economics from New York University (US), an M.A. in Economic Development from Leicester University (UK), and a BA in Economics from the University of Athens (Greece). Professor Vonortas' teaching and research interests are in industrial organization, in the economics of technological change, and in science and technology policy. He specializes on strategic partnerships, technology transfer, technology and competition policy, and the appraisal of the economic returns of R&D programs. He has published extensively on these topics. Dr Vonortas is currently working on projects relating to intellectual property rights protection mechanisms in research joint ventures, the performance of research partnerships, the optimal exploitation of technology options through strategic industry networks, the knowledge based economy, and mechanisms of and policy for innovation-related knowledge flows affecting European industry. Professor Vonortas has been a visiting professor at the University of Maastricht (Netherlands), and the National Technical University of Athens (Greece). In addition, he has served as a consultant to many government agencies in the United States and the European Union and to several international organizations.

Patrick Murphy recently graduated with an MA in International Affairs from the George Washington University's (Washington, DC, US) Master of Arts Program in Science, Technology and International Affairs. He also holds a B in Government and a BS in Electrical Engineering, both from the University of Notre Dame (South Bend, IN, US). Mr. Murphy is currently an Operations Research Analyst for Booz,

Allen and Hamilton in Arlington, Virginia, where he performs decision modeling for the US military and Defense Advanced Research Projects Agency (DARPA). He has designed decision support models to aid in selecting army ground combat systems and supporting technologies. He has planned, designed and implemented computer and computer networks. He has used simulation tools for performance and capacity planning, and designed custom simulations when off the shelf tools were not available. In addition, Mr. Murphy served in the US Army, in a range of capacities from Signals Intelligence Platoon Leader to Brigade Intelligence Officer. During deployment to Bosnia, he planned and executed intelligence and security operations for the Task Force Support Command.