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The determinants of success of R&D projects: evidence from American–Israeli research alliances

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Abstract

Until 1997, a basic premise of Israeli R&D support programs had been the principle of neutrality—all eligible projects were funded. With a binding budget constraint, the government had to select the projects it funded and thus to depart from neutrality. An optimal departure would favor those projects that have less of a chance to succeed without support. In this paper, I examine the performance of government supported collaborative research projects. I find that size and organizational form affect the probability of technical success and duration to commercialization in a way that suggests departing from neutrality by preferring less established firms.

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1. Introduction

A basic premise of Israeli R&D support programs has been the principle of neutrality (Trajtenberg, 2001). According to this principle, projects were selected not according to any discriminating criteria but solely on eligibility considerations such as technical feasibility. In particular, firms or projects were not distinguished by characteristics such as size or type of ownership.

In 1997, for the first time, the demand for government funds for R&D exceeded the budget allocated by the Israeli Government. The recent crisis in high-technology industries and the resulting decline in venture capital financing have exacerbated the problem, increasing the demand for government funding even further. In the presence of a binding budget constraint, government agencies are forced to select the

projects they fund. Any selection criterion imposed on the set of eligible projects represents a departure from neutrality. Since 1997, however, ad hoc solutions have been the only response to this fundamental shift in market conditions. While public and academic discussions are on-going (Teubal, 1999; Trajtenberg, 2001), a change in policy is still pending.

A natural question that arises is what would be the most efficient way to depart from neutrality? More generally, what would be the best criteria for project selection?

This paper addresses these questions and contributes to the discussion about the design of government R&D policy by studying the performance of government supported research projects. I also develop and test propositions regarding the determinants of technical success and the timing of commercialization.

I employ a unique dataset that includes detailed information about 142 joint research projects conducted

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by American and Israeli high-technology firms, and supported financially by the BIRD Foundation—the Israel–US Binational Industrial Research and Development Foundation. The BIRD Foundation is a binational government agency that supports research alliances between American and Israeli firms in several high-technology industries, including electronics, software, medical equipment, communications, machinery and semiconductors. Typically, these projects involve a small Israeli firm with a technological edge and a larger American firm with well-developed marketing capabilities that is a potential user of the technology. BIRD provides each partner with financial support proportional to its share in the project's cost.¹

I estimate two models to test alternative hypotheses. The first model identifies the determinants of technical success, taking into account sample selection bias caused by BIRD's project approval decisions. The second model identifies the determinants of duration to commercialization of technically successful projects, taking into account sample selection bias due to technical success and right truncation due to sampling procedures.

I find that the probability of technical success increases when (1) duration of the project increases, (2) firms are related through ownership, and (3) firms possess complementary abilities. I also find that, given technical success, the time to commercialization decreases when (1) project budget increases, (2) revenue of the larger firm in the alliance increases, and (3) firms are related through ownership. These findings link size of the project and size of the participating firms to the probability of project success, and indicate a relationship between how R&D is organized and its effectiveness.

Thus, these findings favor departing from neutrality by discriminating against established firms since these firms are more likely to succeed without support.

These findings may benefit both designers of government R&D policy and policy evaluators. A policy designer may use the criteria identified as influencing success to direct funds more effectively. In addition, the methods I use below illustrate how existing

data may be utilized to assess the performance of government programs without extensive efforts to collect supplemental data. It is also suggested that on-going data collection procedures will be implemented for any such program.

The remainder of the paper is organized as follows. Section 2 contains a description of the BIRD Foundation. Section 3 describes the dataset. In Section 4, three types of success are defined and applied to the dataset. In Section 5, I develop eight propositions regarding the determinants of technical success and the timing of commercialization. BIRD's project selection process, which potentially shapes the structure of the sample, is analyzed in Section 6. Finally, in Section 7, the two models are estimated; I define independent variables, and describe estimation procedures and results. I conclude in Section 8.

2. The BIRD Foundation

The BIRD Foundation was established in 1977 to stimulate mutually profitable cooperation between American and Israeli high-tech companies. It derives its income from a US\$ 110 million endowment, provided equally by the two governments, as well as from repayments from successful projects. BIRD cost-shares with each partner in Israeli–US company teams that seek to develop and commercialize any innovative (non-defense) technical products or processes.

BIRD supports joint projects up to the point of commercialization. Its investments in such projects do not entitle BIRD to equity or technology rights. Project awards are BIRD's main business. There are two types of awards: full-scale and mini projects, depending on the total cost and duration of the proposed project.

2.1. Full-scale projects

A full-scale project is currently defined as one in which the total cost to the two companies ranges from US\$ 200,000 to 2,500,000 over a 1- to 3-year period. Grants are either US\$ 1,250,000 or 50% of actual project costs, whichever is less.

BIRD's Board of Governors (BOG) meets semi-annually to act on proposals for full-scale projects. Members of the BOG include US representatives

¹ Government support can, in principle, affect the partners' behavior. In the data, however, there is no variation in the form or scale of support given to projects. Hence, the effect of government support is not identified and will be ignored hereafter.

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