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THE MARKET FOR TECHNOLOGY IN BIOPHARMACEUTICALS

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Technological collaborations, R&D agreements, licensing and the exchange of technology among independent parties have become common phenomena in recent years. Are there systematic differences in the nature of R&D projects pursued in the alliances and internal R&D? How productive are these alliances? Exploiting an unusually rich and comprehensive database on pharmaceutical R&D projects, this paper provides empirical evidence on these and a range of related questions. More than 2,000 drug R&D projects all over the world during the 1990s were analyzed. This enabled us to characterize several features of the innovation process in pharmaceuticals, particularly the different role and comparative R&D performance of the large established drug companies *vis-à-vis* smaller high-tech specialist firms the so-called New Biotechnology Firms (NBFs). Our results can be summarized as follows:

1. The NBFs are still largely an American phenomenon. More than half of the drug R&D projects originated in the United States are by NBFs, while almost 90% of the drug R&D projects originated in Europe are from established pharmaceutical firms
2. Collaborative R&D projects are consistently more likely to occur in the United States than in Europe. However, in-house projects are a significant majority of the drug R&D projects that entered the clinical stages.
3. The established pharmaceutical companies have comparative advantages with respect to the NBFs in drug development (clinical trials). In drug discovery there is no advantage related to scale. Unlike clinical developments, where the large firms seem to have superior capabilities when compared to the NBFs, in discovery there is no inherent superiority (in terms of ultimate probability of success of the compounds) of either the NBFs or the large firms.
4. The NBFs are not specialized in more risky R&D projects. In fact, more risky drug projects (*i.e.* drugs for which there is no or there are few existing remedies) are more likely to be undertaken by the larger pharmaceutical companies. This suggests that scale, market power, and the ability to mobilise large amounts of resources are key factors in enabling the firms to sustain such higher risks.
5. Other things being equal, the projects originated by the NBFs are more likely to fail in the earlier clinical stages. This suggests that the NBFs perform a good deal of exploration without incurring the higher costs of failing at later stages.