JAPAN'S PERFORMANCE IN BIOTECHNOLOGY: WHAT DO PATENT SHARE FIGURES SHOW?

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In my work on government policy towards biotechnology in Japan,[1] I wrote:

> In case after case, high technology sectors of the Japanese economy seem to be globally competitive despite research and development expenditures modest by comparison with efforts in Western Europe and particularly the United States.[2]

I concluded in this discussion that Japanese biotechnology-related research and development expenditures are modest by comparison with the US efforts, but I was in no position to project whether these expenditures would once again yield Japan extraordinary rates of return. Happily for my analysis, Clem Tisdell now reports evidence suggesting that Japanese biotechnology "is leading the world or close to leading the world in the commercial application of many types of bio-technology."[3]

Tisdell's positive characterisation of Japanese performance rests on patent share data. According to this evidence, Japan appears to hold somewhere between 60 and 70 per cent of the biotechnology-related patents issued in the late 1970s and early 1980s. By comparison, the US share of such patents is said to be no more than 10 or 20 per cent. It would be attractive to accept Tisdell's evidence and conclude that biotechnology is yet another instance of a world class Japanese high technology industry riding to global success on the back of externalities-generating American research. Such a conclusion, however, is premature.

Tisdell notes that "patent statistics must be treated warily."[4] In this instance I would go much further. Tisdell's evidence may be positively misleading as to the relative status of the US and Japanese biotechnology industries. For example, in a survey reported in 1984 by the OECD, the chief executives of more than 200 European firms were asked to rank national biotechnology industries. While the Japanese biotechnology industry was ranked second in the world, the US industry was ranked first by a wide margin.[5]

Can this survey data be reconciled with Tisdell's patent evidence? In the first place, it is quite possible that the evidence Tisdell cites comes from sampling the wrong universe. A survey by Japan's Science and Technology Agency of biotechnology patents, completed about the same time as the work Tisdell cites, lists 91 significant biotechnology patents. Of these 91 patents, 34 were registered by Japanese, while 33 were registered by Americans.[6] In the light of this survey, it is possible that Tisdell's sources are using a very expansive definition of biotechnology or very likely including many trivial biotechnology-related patents.

In general, international comparisons of patent data tend to overstate significantly Japanese technological accomplishments. Quantitative indicators reveal very little about the quality of patents. Many Japanese companies, including such giants as Hitachi, Matsushita, Fuji Film, Toshiba, Sony and doubtless many of the firms engaged in biotechnology-related activities, give their employees special bonuses, both when their activities result in the filing of a patent application and when and if the patent application is granted.[7] This may mean the Japanese have applied for and registered more patents than would otherwise be the case because the knowledge they seek to protect tends to be less significant technologically. Larger quantity may reflect lower quality or at least a greater propensity to seek patents for know-how which would be considered too mundane or short-lived for individuals or companies in other countries to bother about.

Such an interpretation is supported by the low rate of success of Japanese patent applications. Nearly half of the patent applications made by the Japanese to their own patent agency are turned down, while only 20 per cent of foreign applications meet the same fate.[8] In the United States, the ratio of approvals to patent applications for Japanese nationals is about 75 per cent of the ratio for Americans and only 60 per cent of that for other foreigners.[9]

While an unusual zeal to protect run-of-the mill products and processes may help explain the recent high ratio of Japanese patents to Japanese research and development expenditures, it is not the whole story. During the past two decades, there has also been a sharp decline in the ratio of American and European patents per unit of research and development expenditure. It is important to remember, however, that patent protection has never been a very important feature of the incentive structure underlying R & D investments in the United States and Western Europe. In many industries, the pace of technological change may be so rapid as to make the lengthy patent approval process an ineffective device for protecting property rights.[10] Moreover, with greater public access to the proprietary information contained in patent applications, American and European companies

may feel that patents simply cannot be obtained without disclosing vital information which may help foreign competitors.

Of course, the risk of leaking information to competitors is not entirely new. What is new is the mounting concern in the United States and Western Europe that the advanced state and orientation of Japanese research and development place it in an advantageous position to derive special benefits from the disclosure of proprietary information which must accompany the patent granting process. Such concerns have made many firms wary about applying for patents and more hesitant about licensing their know-how as liberally as in the past. It is likely that in the early phase of the development of this industry enough American biotechnology firms have substituted secrecy for patents as a strategy for protecting proprietary information to make the Japanese share of even a restricted sample of significant patents a sharply upward biased estimate of its global importance.

NOTES AND REFERENCES

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