COMMENTARY

BIOTECHNOLOGY DEVELOPMENTS IN JAPAN: COMMENTS ON SAXONHOUSE'S PERSPECTIVE*

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The thesis and evidence of Gary Saxonhouse are an antidote to the widespread view that Japan's position in the international economic system is due to its illiberal institutions and practices, collusive arrangements by large business and government, and 'underhand' trade practices. Saxonhouse has stated his views on a number of occasions and recently in *Prometheus*.[1] He argues that Japanese trade and industrial patterns can be explained without reference to distinctive Japanese (industrial) policies. He claims that "when Japanese experience is properly normalised for capital stock, labour force, geographic position and material resource endowment there is little variance left to be explained by industrial policy."[2] He suggests that Japan's relatively low import of manufactured goods can be largely explained by its high quality labour force, the poverty of its natural resources and its great distance from its major trading partners.[3] The main sector in which illiberal trade practices are of much consequence is agriculture. The main implication of Saxonhouse's thesis is that if market processes should be liberalised in Japan, the economic performance of the Japanese economy would be little changed. Agriculture would be diminished in importance, but the manufacturing sector would strengthen its performance slightly and so provide greater competition for the USA. He claims that "if fully undertaken, liberalisation's primary impact will be in enhancing the legitimacy of Japanese participation in the international economic order".[4]

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Saxonhouse indicates that the degree of market imperfection and government assistance to the Japanese biotechnology industry is less favourable for the Japanese industry than are similar factors for the biotechnology industry in the United States and Europe. He concludes that "Japan gives less formal aid and comfort to its high technology sectors and to biotechnology in particular than do the governments of most other advanced industrialised economies".[5] Japanese government funding of biotechnology research is less than 7 per cent of US government funding, and less than either West German or French funding; Japanese tax rates are less favourable to industry than in major market-oriented industrialised countries; price controls in the pharmaceutical area do not permit Japanese firms to exploit monopolies that may come from biotechnological advances in this important field; and the nature of the Japanese capital market has not been favourable to the growth of Japanese biotechnology firms. It is, therefore, very much to the credit of the Japanese industry that it has developed so much in these circumstances.

It is now widely believed that the Japanese biotechnology industry is leading the world, or close to leading the world, in the commercial *application* of many types of biotechnology. A number of contributions in the *Revue d'Économie Industrielle* suggest this. For instance, Cantley and Sargeant point out that in the important area of enzyme immobilisation, Japan held 64 per cent of patents in developed industrial countries and the USA 20 per cent.[6] The worldwide importance of the Japanese biotechnology industry is also stressed in other contributions, such as those by Gellf and Liouville.[7] While patents statistics must by interpreted warily (since, for example, some countries are more inclined to patent petty inventions), a study by Marstrand confirms the important position of Japan in the commercial development of biotechnology.[8] Marstrand concluded from an analysis of 2400 biotechnology-related patents issued between 1977 and 1981, that 60 per cent were issued to Japanese applicants, 10 per cent were accounted for by the USA and 2-4 per cent by such countries as the Federal Republic of Germany, the United Kingdom, France, Poland, Czechoslovakia and the German Democratic Republic.[9] Japanese biotechnology patents appear to be concentrated in the hands of a few firms. Tanaka reported that in 1982 Japanese firms held 4,244 biotechnology patents and 65.5 per cent of these were held by just nine companies in a group of 135 companies holding such patents.[10]

Given the smaller amount of resources devoted to biotechnology development in Japan, and given the greater public assistance and other advantages experienced by the US biotechnology industry, it is not easy to explain the apparent relative success of the Japanese industry. The explanation given by Saxonhouse — that to some extent

the Japanese industry has been 'free-riding' on the basic and applied research and generally available new knowledge about biotechnology generated in the USA[11] — is a plausible and possible one.[12] However, it should be observed that European countries have also had this option open to them and one would have expected them to have taken advantage of it. Hence, one is still left wondering why the Japanese biotechnology industry has been more successful in patenting than, say, the West German or French industries, which have had considerable government support. In some circumstances, there is an advantage in being a close follower of new technology rather than a leader in its development.

Incidentally, Saxonhouse points out that there is less co-operative research among biotechnology companies in Japan than some statements of MITI might suggest.[13] At least one large biotechnology company has remained completely outside co-operative arrangements. This is consistent with the view that companies are wary about sharing the potentially large profits from patentable inventions that might result from co-operative R & D arrangements and would rather depend on their own laboratories.[14]

The extent to which the development of the Japanese biotechnology industry illustrates Saxonhouse's 1983 thesis (which is also implicit in his 1985 articles) is not clear. Certain types of biotechnology (but not all) require few natural resources and they do take advantage of human skills. But how does the distance factor explain the rise of this industry in Japan? Is distance an important factor in explaining the location of this industry? Certainly Japan is no longer distant from a number of important manufacturing areas, such as Taiwan, South Korea and Hong Kong, and it is not really distant from the western side of North America. Also, to what extent does the past low level of foreign direct investment in Japan help to explain Japanese economic developments, including its low level of import of manufactures? Saxonhouse's perspective clearly raises many new questions for us.

In conclusion, let me note that biotechnology has been treated as a sunrise industry in Australia, but little attention has been given to the likely relationship of the Australian industry to international developments (including those in Japan) in formulating policy.[15] There is a need to redress this neglect.

NOTES AND REFERENCES

1 Gary R. Saxonhouse, 'Biotechnology in Japan: industrial policy and factor market distortions', *Prometheus,* 3, 2, 1985, pp. 277-314. See also *idem.*, 'Industrial policy and factor markets: biotechnology in Japan and the United States', Department of Economics, University of Michigan, 1985, mimeo; *idem.*, 'The micro- and macroeconomics of foreign sales to Japan' in W. Cline (ed.), *Trade Policy in the 1980s,* MIT Press, Cambridge, Mass., 1983, pp. 259-305.

2. Saxonhouse, 'Biotechnology in Japan . . .', *op. cit.,* p. 310.

3. Saxonhouse, 'The micro- and macroeconomics of foreign sales to Japan', *op. cit.* p. 273.

4. *ibid,* p. 278.

5. Saxonhouse, 'Biotechnology in Japan . . .', *op. cit.,* p. 311.

6. M. Cantley and K. Sargeant, 'Biotechnology: the challenge to Europe', *Revue d'Économie Industrielle,* 18, 1981, pp. 365-80.

7. G. Gellf, 'Les bioindustries au Japan', and J. Liouville, 'Les pays les plus avancés en biotechnologie et la France', *Revue d'Économie Industrielle,* 18, 1981, pp. 365-80.

8. P.K. Marstrand, *Patterns of Change in Biotechnology,* Occasional Paper 15, Science Policy Research Unit, University of Sussex, 1981.

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10. M. Tanaka, 'Biotechnology in Japan' in *Biotech 83: Proceedings of the International Conference on the Commercial Applications and Implications of Biotechnology,* Online, Northwood, England, 1983, pp. 1-12.

11. F.M. Olson, *The Logic of Collective Action,* Harvard University Press, Cambridge, Mass, 1965.

12. Saxonhouse, "Biotechnology in Japan . . .", *op. cit.,* pp. 310-11.

13. Saxonhouse, "Biotechnology in Japan . . .", *op. cit.,* pp. 303-8.

14. F.P. Johnson, *Co-operative Research in Industry: An Economic Study,* Martin Robertson, London, 1973; and C.A. Tisdell, *Science and Technology Policy: Priorities of Governments,* Chapman and Hall, London, 1981.

15. See, for example, Department of Science and Technology, *Biotechnology: Appropriate Areas for Commercial Exploitation in Australia,* Australian Government Publishing Service, Canberra, 1983; and ASTEC, *Biotechnology in Australia,* AGPS, Canberra, 1982.