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EQUITABLE PATENT PROTECTION FOR THE  
DEVELOPING WORLD

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## Preface

The papers presented herein were presented as "position papers" at the workshop "Equitable Patent Protection for the Developing World" held at Cornell University on October 2-3, 1989. The papers are intended to represent different opinions and approaches on the critical issues; economic considerations, legal issues, perspectives of business and perspectives of critics. While it is recognized no individual can express all the diverse perspectives in these areas, the papers did serve to establish the framework for the ensuing dialogue. The results of that discussion are being reported in a "primer" on the subject. This publication then serves as a vehicle for making the individual talks available to a wider audience than was able to participate in the workshop.

The participants were as follows:

|                        |  |
|------------------------|--|
| R. Barker              | Agricultural Economics, Cornell University         |
| J. Barton              | Law School, Stanford University                    |
| W.R. Coffman           | Plant Breeding & Biometry, Cornell University      |
| D. Dalrymple           | USAID  |
| W. Duffey              | Monsanto Company                                   |
| R. Echeverria          | ISNAR, The Hague                                   |
| J. Fessenden MacDonald | Cornell Biotechnology Program                      |
| H.W. Haeussler         | Cornell University Research Foundation             |
| R. Hardy               | President, Boyce Thompson Institute                |
| L. Harrington          | CIMMYT, Bangkok                                    |
| R. Herdt               | Rockefeller Foundation                             |
| W. Lesser              | Agricultural Economics, Cornell University         |
| C. Pray                | Cook College, Rutgers University                   |
| J. Putnam              | Economic Growth Center, Yale University            |
| R. Salazar             | Attorney, San Jose, Costa Rica                     |
| P.S. Sangal            | Law School, Delhi University                       |
| A. Siamwalla           | Thailand Development Research Institute Foundation |
| J. Straus              | Max Planck Institute                               |
| S. Shugeiry            | Humphrey Fellow, Cornell University                |
| G. Toenniessen         | Rockefeller Foundation                             |
| R. Vellvé              | ICDA Seeds Campaign, Spain                         |

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William Lesser  
Workshop Organizer

# AN ECONOMIC ASSESSMENT OF PATENT LAW APPLIED TO DEVELOPING NATIONS

William Lesser\*

Although the response is often emotional, patents are in the main a tool of economic policy. They are, in the words of the US Constitution, intended "to promote the progress of science and useful arts" (Art.1 Sec.8) and as such are appropriate for economic analysis. The intent of this paper is to review what economic theory and analysis can say about the implications of patents for the developing world. From that review some implications about the need for and appropriate form of patent law can be drawn.

## SOCIOECONOMIC IMPLICATIONS OF PATENTS

One of the oft-stated criticisms of patents is that they cannot be shown to increase social welfare. In a much quoted remark, Professor Machlup, a student and supporter of the US patent system, has said, "No economist, on the basis of present knowledge, can possibly state with certainty that the patent system, as it now operates, confers a net benefit or a net loss upon society." (p. 79). Critics attest what is true for the US is doubly so for the developing world with its inferior and dependent industrial system (e.g., UNCTAD, p. 63). A change in inventive activity such that, "Inventiveness is no longer the individual inventor's flash of genius, but now an institutional process" (Doyle, p.301), has also been used to raise questions about public benefits.

### Implications for R. & D: US Experience Under the PVPA

Thirty years later it remains difficult to determine the social implications of patents. Do they increase social welfare by fostering the development of new, efficient

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products or do they raise costs through the conferment of a temporary monopoly on the inventor? It is however possible to make a definitive statement about the investment-inducing effect of patents. The strongest evidence comes in the aftermath of the US Plant Variety Protection Act of 1970 (PVPA)(7 USC 2321 et seq.). The PVPA allows patent-like protection for sexually propagated plants and seeds heretofore excluded from protection. This law permits before and after analysis because prior to about 1967 (a time, arguably, when breeders anticipated its passage) there was essentially no private investment in breeding non-hybrids. Subsequently, surveys have shown 14 leading private plant breeding research firms increased total breeding expenditures (including hybrids) by four-fold in inflation-adjusted dollars from 1960-80. Numbers of private soybean breeders increased over 1966-84 from 2 to 63. Privately-bred soya bean and wheat varieties began to top lists of recommended varieties for farmers, and statistical analysis demonstrated a weak relationship between private varieties and yield (Butler and Marion; Brim; Perrin et al.). These findings are particularly significant because the PVPA provides less complete protection than does the US Patent Act (see Lesser 1986). Expenditures however have been spread highly unevenly across the crops with soya beans experiencing the largest gains.

The investment response to one law in the US does of course not prove anything about the effects of patent law in the developing world. What it does show is that patents can have the incentive effect predicted by economic theory. Lacking is any real evidence that patents do not have an incentive effect in developing countries.

#### Share of Patents Held by Nationals and Foreigners

Data show a very high proportion of patents in the developing world are held by foreigners, particularly those from the developed countries. Typically the level is placed at about 80-85 percent as shown in Table 1. The proportion "not worked" is estimated even higher, 90-95 percent. (For a more complete and up-to-date listing see Evenson, Evenson and Putnam, Table 19.2).

Table 1: Patent Holdings in Developing Countries by Ownership and Use, 1972

| <i>Item</i>                                  | <i>Number of<br/>patents held<br/>(in thousands)</i> | <i>Percentage<br/>distribution</i> |
|--|--|------------------------------------|
| <i>World distribution:</i>                   |  |                                    |
| Developed countries . . . . .                | 3,300  | 94                                 |
| Developing countries . . . . .               | 200  | 6                                  |
| TOTAL ..                                     | 3,500  | 100                                |
| <i>Distribution in developing countries:</i> |  |                                    |
| Held by nationals . . . . .                  | 30   |                                    |
| Held by foreigners . . . . .                 | 170  |                                    |
| <i>of which:</i>                             |  |                                    |
| used . . . . .                               | 10-20  | 5-10                               |
| not used . . . . .                           | 150-160  | 90-95                              |

Source: UNCTAD, Table 12

These data are taken as evidence ". . . the patent system reserves Third World markets for foreigners. . . In the ultimate analysis, the present patent system can be said to represent the most unequal and most unjust of all relationships between industrialized and third world countries." (Abraham, p.54). Greif however points out that a small proportion of domestic patents is not unique to the developing world (p. 207). He cites data showing foreign holdings of patents are in fact higher in smaller industrialized countries like Canada and Belgium (90%) than in some developing countries, e.g. Argentina at 65 percent. In fact, he shows for the developing world the proportion of foreign held patents rises with level of development, as measured by GNP (Figure 1). Rhetoric aside, what is seen is a commercial relationship in which foreigners patent in the more robust economies for they provide the stronger markets.

Figure 1: Patent Applications of Foreign Origin and Gross National Product

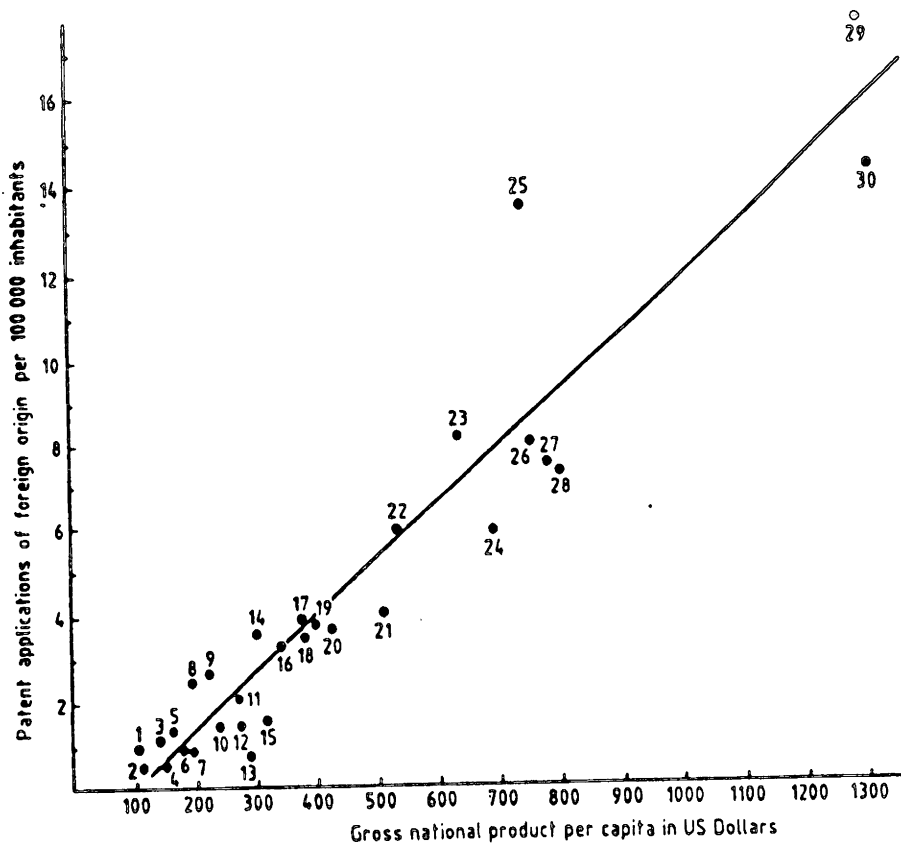


Figure 2: Patent Applications of Foreign Origin and Gross National Product

List of Countries (to Figure 2)

- |                 |                 |                |
|-----------------|-----------------|----------------|
| 1. Sri Lanka    | 11. Morocco     | 21. Peru       |
| 2. India        | 12. Jordan      | 22. Brazil     |
| 3. Pakistan     | 13. Ghana       | 23. Costa Rica |
| 4. Uganda       | 14. South Korea | 24. Lebanon    |
| 5. Malawi       | 15. Syria       | 25. Mexico     |
| 6. Kenya        | 16. Ecuador     | 26. Uruguay    |
| 7. Sierra Leone | 17. Gambia      | 27. Chile      |
| 8. Bolivia      | 18. Tunisia     | 28. Jamaica    |
| 9. Philippines  | 19. Colombia    | 29. Argentina  |
| 10. Egypt       | 20. Guatemala   | 30. Singapore  |

Source: Greif, Figure 2

The small portion of patents "worked" in a developing country - 5-10% - is interpreted as suggesting patents are sought as a means of maintaining an import monopoly. The low figure of working however comes from a particular definition of

that term. Working in that case means domestic production/use of a patented product/process. If the definition is expanded to include any utilization of the patent -- production or importation -- then, according to Greif, approximately 50-60 percent are not used at all (e.g. not produced or marketed) and 30 percent are used to protect imports. The UNCTAD report indicates use rates of 30 to 60 percent during the lifetime of the patent (p. 40). But these are nearly the same percentages as for developed countries (UNCTAD, p.207) and again suggest no discrimination under the patent laws against developing countries. Admittedly the data base for both of these positions is small and quite dated so more current work is called for.

#### Individual Inspiration vs. Corporate R&D

The suggestion that patents are no longer a valid incentive because invention has shifted from the inspired individual to the plodding corporation represents a misunderstanding of the role of patents. Economists have categorized the inventive process in three stages, often called "invention, innovation and diffusion." Invention is that flash of inspiration that something new will and can work (Jewkes, et al.). Studies of the inventive process have shown that major inventions tend not to be fostered by financial reward but rather stem from a creative drive. The following and necessary step is innovation, the reduction to practice referred to in patent discussions. This is typically expensive, exacting work, the "99 percent perspiration" Edison referred to when describing the inventive process. It is to compensate this endeavor, for which there is little but financial reward, that patents are directed. And because much of this work is highly detailed, it is often better suited to the corporation than the individual. This is also true for the developing world where much of the "inventive process" is indeed an adaptation of existing knowledge to a new environment (Evenson, Evenson and Putnam).

The existence of patents nonetheless may assist the individual making the base invention. The individual (or country) with a new concept but lacking the resources and/or interest in developing it fully risks its loss when discussing a joint arrangement with another party. A patent on the product provides a basis for protecting that



invention while revealing it to possible partners.

### Monopoly of Patents

Several studies have expressed concern over the concentration of ownership of patents in developing countries. Vaitos for example quotes data from Columbia showing 60 percent of the patents in pharmaceuticals and chemicals were owned by 10 firms, all foreign (p. 76). This is cited as evidence that patents are used not to encourage inventive activity "... but to aid profit maximization through minimization of competitive forces." (p. 77).

The concentration of patent ownership is potentially a problem, especially in smaller economies which cannot support multiple competing firms. It is however important to recognize the inventive process itself does not inherently lead to concentration of ownership for while the patent may issue to the firm the invention did not necessarily initiate there. An in-depth study of 70 major 20th century inventions indicated that only 24 originated from corporate R&D. According to another study, DuPont's own labs provided only 10 of its 25 most important inventions (Jewkes, et al., Chps. 15 and 16; Mueller). The remaining inventions were licensed from other, often smaller firms, in a pattern of specialization between invention and innovation which is being repeated in much of the biotech industry today.

A second factor mitigating the concentrating effect of patents is the fact that R&D projects tend to be modest in size, with typical projects falling in the \$250,000 - 400,000 range, well within the financial scope of many corporations (Scherer, Chap. 15). But perhaps more significant, the financial ability to invent (as well as to absorb the risks of R&D investments) must be balanced with the incentive to invest in such uncertain ventures. Studies have shown that smaller firms often must innovate as a means of gaining access to an industry dominated by established firms. The established firms for their part may not feel the need to innovate to such a degree. Thus patenting, by providing a means of protection of innovation research, helps to provide some competitive dynamics in many industries.

Empirical analysis supports these theoretical projections. Expenditures (R&D/sales) tend to rise then fall off at modest firm sizes of \$250-400 million in sales. Both patenting rates and commercialization of patents follow a similar but more pronounced pattern (Scherer, pp.415-22; Greer, pp.582-83). This pattern of rising then falling inventive action is further reflected in the market control (concentration) of firms. Using four firm concentration, the share of sales of the largest four companies in an industry, inventive activity is limited below 15, then rises up to a peak at about 50-55 percent and falls again (Scherer, pp.433-37). A four firm concentration level of 55 is generally considered to be moderate to high. Firms of higher concentration levels likely have other means of protecting their market position than through innovation, or have become complacent and are in danger of losing their lead to more innovative rivals. Manufacturers of steam locomotives, for example, ignored the threat of diesel electric engines until it was too late.

#### Conclusions

Much is not known about the inventive process and the role of patents as part of corporate strategy. Economists are now beginning to turn their attention to firm behavior, of which a patenting strategy forms a part. Certainly many of the classical studies of patents are dated and in need of updating.

But much is known, at least enough to question the most extreme criticisms of the role of patents in developing countries. We have some evidence that patents do indeed promote investment in inventive activities. There is little evidence supporting the counter argument that they have no effect. The ownership and use of patents differs little between the developed and developing worlds. In particular, the ownership of patents does not appear to be excessively concentrated in a comparative sense in the developing countries. Patents do appear to be playing a role in making new technologies available to developing countries, even if they are less successful in the more demanding role of promoting domestic production.

## ACCESS TO NEW TECHNOLOGIES

Evenson and Putnam have identified the following general objectives of a patent system (p. 26):

- \* Stimulating national invention at the lowest cost;
- \* Purchasing technology from abroad at the lowest possible cost;
- \* Protecting the interests of its sellers of technology abroad.

Like most policy decisions, there are substantial trade-offs among these objectives. The achievement of the first two for example may be possible through a law biased to favor indigenous inventors, but that would likely confound the third objective. Indeed, it was to avoid just that situation the Paris Convention was adopted over a century ago with the principal provision that foreign applicants be treated the same under the patent law as national applicants. Today there are nearly 100 signatures to the Convention, including many developing countries.

### Access in the Absence of Patent Laws

The balance among these objectives can be achieved through the form of the patent law. That issue is discussed below. Here the basic question of whether a country should have a patent law at all is addressed. Fundamental to this question is whether a country can free-ride on an invention elsewhere, that is, is access possible without the need to license and pay royalties? If indeed it is then a patent law may be difficult to justify.

Here we may recognize two classes of developing countries:

- 1) more industrially advanced countries like India which are able to adapt and utilize imported products and processes, and
- 2) less sophisticated countries which must import technical expertise along with the products.

Next one must consider the perspective of the patent holder; will he/she be willing to make the invention available in countries lacking patent protection, and can access be prevented anyway? Combined with the technological sophistication of the