

Intellectual Property: How the Right to Keep it to Yourself Promotes Dissemination

William J. Baumol*

*Professor of economics, New York University and professor emeritus, Princeton University

Copyright, as the guardian of society's interests in intellectual property (IP) has two primary objectives. The first, evidently, is to ensure that the creators of the property have an opportunity to obtain some reward from their efforts, both as a matter of equity, and as an incentive for the expenditure of further creative effort. But the second and apparently rather incompatible goal is ease of access and dissemination to others, to ensure that the benefits of the IP to society as a whole are as substantial and as widely available as is reasonably feasible.

The conflict between these two goals is widely recognized. The lower the hurdles that impede access to some IP, the less its creator can hope to charge for its use. If just anyone can make use of it with no impediment, the price is apt to be driven toward zero. Indeed, a simplistic argument derived from static welfare theory in economics implies that zero is apt to be the welfare maximizing price, because once some item of intellectual property has been created, its employment by an additional user need not impede its use by anyone else, so that any positive price, if it prevents anyone from using it or reduces the amount of that use, must represent prevention of a beneficial act with zero cost to society. We know, of course, that once intertemporal considerations are taken into account, this argument is simply wrong, if any reduction in the future stock of IP is the result.

The purpose of this paper, however, is to show that the two goals can be reconciled in a workable and apparently socially beneficial way. The instrument I will suggest for this purpose is the copyright. But the experience I will adduce for my conclusion will rest on analogy--upon what has been seen to occur where IP is protected by patents. For I suggest that good design of copyright rules can profit from a review of experience with patents. I will show that, contrary to what quick consideration might suggest, patents have not served primarily to impede dissemination but, on the contrary, in a wide set of circumstances, they have served to facilitate and encourage it

Patents as Instruments for Access to IP

In a rather perverse way, from their very beginnings, the primary role of patents was to encourage inter-country technology transfer. As might have been expected of the renaissance, the patent seems to have had its origins in Italy. But the story pertinent here occurred in England, during the early Tudor period [check]. The term comes from "letters patent" that is, letters issued by the monarch meant to be visible (patent) to all (as distinguished from confidential "letters close"). Initially, as today, letters patent granted a monopoly to the recipients, for a specified period, over production and sale of the item named in the letter. But initially they were granted not to the creator or inventor of the IP at issue, but to a foreign producer who could steal the idea from his own country and export its use to England. A French workman who had mastered a trade initially carried out only in France would be offered a letter patent as an incentive to migrate to England and set up a competing trade there. Thus, this early use was not designed to offer protection to *creators* of IP but, quite the contrary, as an incentive for transfer of the IP. The modern usage was only adopted into English law in the Statute of

Monopolies of 1626, in the wake of parliamentary anger over royal misuse of letters patent to reward royal favorites, and for other purposes having no connection with good IP management.

Since then, and particularly in recent decades, the voluntary dissemination of patented material has become a major economic activity, as will be indicated below. And my argument is that patents, rather than impeding the process, have once again played a key role in making efficient and voluntary dissemination possible and attractive to the IP owner. The reason is straightforward, though the forms it has taken in practice are rather more varied and subtle. But before we get to the broad explanation we should note that patent law throughout the world contains a provision that can be interpreted as a direct denial that the purpose of the patent is to impede dissemination. For patent law generally makes mandatory full disclosure of the technical details of the IP in question in some places when the patent application is approved and in other countries, when the application is received by the patenting agency. This surely is the most direct way to enable others to learn from the technology of the patented item and to facilitate the creation of competing substitutes or even outright imitations once the patent expires. So, patents are evidently not designed to handicap dissemination.

But that is not the basic point. Here we are, rather, concerned with the ways patents work out in practice, whether there are ways that they encourage dissemination in reality. To understand fully the capacity of the patent to encourage and facilitate dissemination one must consider the ways in which the creator or the proprietor of some IP can hope to use it to obtain any substantial revenues. For such a reward to be a realistic possibility the IP must somehow be protected, because without such protection, once its secret is out it can be copied by others, often without anything like the expenditure of time and effort that was required for its creation in the first place. But there are only two devices clearly capable of providing such protection: secrecy

and legal usage constraints, i.e., the patent or copyright. It is typical of patentable IP that the item to be protected is not a final consumer good or a final product for sale to business or government, but rather is only an input to the creation of such a final product—a component or a procedure that makes it easier to produce the final product or improves it. Thus, as an input, it has this attribute in common with raw materials, fuel and other inputs to production processes.

If secrecy is the only effective means to protect some IP, then its proprietor has no choice. It must use the IP itself in the creation of its final products, whether or not the IP owner is particularly capable as a manufacturer of those final products. For release of the IP for use by others must undermine its protective secrecy. The owner cannot even sell the IP to others who, who will want to know what it does and how it works before laying out the cash demanded for it. But this is changed completely by a patent, which transforms the IP into a readily saleable or rentable item. The patent, in effect, transforms the IP and the right to use it into marketable products. Once this transmogrification has occurred, it becomes a matter of economic calculus to determine which of the options best suits the owner's interests: sale, grant of access for a royalty fee, exclusive use by the owner or some combination of these. And since at least the latter half of the 19th century the sale or rental of access has become so attractive that it has resulted in the creation of markets dedicated to such transactions with the assistance of professionals who have specialized in the required activities (On this see the fascinating work of Lamoreux and Sokoloff (1996)

Today, the sale, licensing and trading of technology has become a large scale activity. Arora, Fosfuri and Gambardella [2001] list a sample of “leading deal makers in markets for technology” that includes companies such as Microsoft, IBM, AT&T, Monsanto, Motorola, Bell South, Daimler-Benz, Eli Lilly, Eastman Kodak, Sprint, Philips Electronics, Siemens, General Motors, Honeywell, Boeing, Fiat, Ford, General Electric, Hitachi, Toshiba, Dow Chemical,

Johnson & Johnson and many others. [pp. 34-37] They report the results of a survey of 133 companies by a British consulting firm, indicating that 77 percent of the companies studied had licensed technology from others while 62 percent had licensed technology to others. But they report that “When compared to internal R&D, however, licensing is a fairly modest activity in terms of budgets involved. The survey estimated that expenditures for licensing technology from others amount to 12 percent, 5 percent and 10 percent of the total R&D budgets of North American, European and Japanese respondents, respectively.” [pp. 30-31] However, they estimate that “the size of the market for technology” is about \$25 billion in North America alone, which, they note, is about the size of the 1996 gross domestic expenditure on R&D in France and greater than that of the UK. [p.31]

For a number of firms, participation in markets in technology is of critical importance. For example, the sale of access to polypropylene technology has constituted a major activity of the Union Carbide corporation, and IBM has informed me that it has a technology exchange contract with every major manufacturer of every significant computer part throughout the world. We have estimated that in the year 2000 approximately 20 percent of IBM’s total profits derive from the sale of licenses.

The prevalence of the activity has been sufficient for the formation of the Licensing Executives Society that reports a membership of nearly 10,000 from more than 60 countries, and that runs seminars and conferences such as one on “Leveraging Technology for Competitive Advantage.” There are many websites offering information and help for licensing and technology transfer. According to the U.S. National Science Board, between 1980 and 1998 American, European and Japanese firms arranged some 9,000 strategic technology alliances. It is clear that voluntary dissemination is no isolated and unusual phenomenon.

Varieties of Technology Marketing Arrangements

Sharing of information on proprietary technology can take many forms. The most widely recognized are research joint ventures in which several firms finance some R&D activity whose results are to be made available to all the companies that supported it (see, e.g., Katz and Ordover [1990]). Sometimes the sharing is informal, with no contracts and no license fees, each firm helping its rivals to adopt and utilize new techniques with the understanding that the favor will be returned when appropriate. For example, Von Hippel reports that this is the normal approach to technology trading by the U.S. steel mini mills. Often, of course, firms enter into contracts in which one gives the other permission to use its proprietary technology in return for a license fee. Firms also often enter into reciprocal licensing contracts with licenses, in which the participants agree to permit one another to use not only their current technology, but in addition, any future innovations of the sorts specified and for a specified period. The contracts also vary in the ways in which the payment obligations are calculated, in terms of the obligations for updating of information on improvements of the technology and on the amount of training that the licensor will provide to employees of the licensee. Thus, there is no one standardized approach employed in the voluntary business dissemination of technology.

VI. Technology Sharing and Transfer Arrangements: Why do Firms Undertake them?

The existence of extensive markets in intellectual property means that access to improved technology can at least sometime be a relatively straightforward matter, though it does often entail extensive negotiation and complex contractual arrangements. But this widespread and

voluntary transfer of technology may fly in the face of the widespread impression that firms with intellectual property generally can be expected to do whatever they can to prevent others, and particularly competitors, from getting access to the innovations that contribute competitive advantage to their proprietors. After all, is that not the purpose of patents—to prevent anyone from using them without the patent holder's permission? We have already implied one reason why this is not so. If the price offered by the would-be user is right, it *will* be profitable to permit its use. And here it should be noted once again that a market operated with this motivation is made possible only by a patent system or some close substitute, for without patent rights the owner of the intellectual property would have nothing to sell on remunerative terms, and could profit only by withholding the pertinent information from others.

Once one frees oneself of the prejudgment that the self interest of firms will generally lead them to withhold their technological information from others, it is easy to think of many reasons why they may want to behave otherwise, though we will see presently that there can be reasons that are not quite so obvious.

The most straightforward reason is the high cost of R&D activity. By entering into some sort of sharing consortium the burden can obviously be divided and reduced for each participant. Given the public-good attribute of the resulting information, it is far less expensive (per user) to provide such information to several firms than only to supply it to one, or two firms may be able to divide up the cost of some contemplated R&D if each of them undertakes a different portion of the task.

A second reason is reduction of risk. In any given year a single firm's R&D division may fail to come up with any significant breakthroughs. The fear by management of firm A that this

will happen to it in a year when its rival, B, manages a significant breakthrough is a fear that is replicated in firm B. Since, product and process improvement are a matter of life and death in the high-tech industries characterized by vigorous oligopolistic competition, technology sharing agreements serve as effective insurance policies, protecting each participant from such catastrophes.

A third reason is simply straightforward profit. Suppose firm A invents a new widget component and expects to make a net profit of X dollars per widget of the resulting new type that it produces. Then if rival firm B offers A a Y dollar license fee ($Y > X$) for each unit of the new widget it is able to sell, A obviously can be better off letting B do so, even if every widget sold by B means one less sale for A. Of course, B will generally be able to afford so high a fee only if it is a more efficient *producer* of widgets than A, even though it may be an inferior inventor. In this way the price mechanism will not only encourage licensing, but will, as usual, encourage efficient specialization, with inventive activity undertaken primarily by the more effective inventor and production of the resulting products undertaken predominantly by the more efficient producer. This sort of unreciprocated licensing does take place in practice, but it seems most frequently to entail the sale of licenses by large firms that are in a position to undertake extensive R&D activity, the licensees being smaller enterprises that cannot afford to carry out such activity and do not possess personnel qualified to do so.

A fourth and less obvious reason for voluntary dissemination also entails trading of technology, but it is undertaken because it protects the trading firms from entry. To see how this works, consider, for example, an industry with 10 firms of identical size, each with an R&D division with similar staffing and similar funding to those of the others. Each firm in such a consortium will then have available to it not only the discoveries of its own R&D establishment,

but those of nine other firms in addition. Now suppose an eleventh firm wants to enter the market, but is not invited to join the technology sharing consortium. Having only the products of its own R&D division at its disposal, while the other firms each obtain the outputs of 10 R&D establishments, the entrant can evidently find itself at a severe competitive disadvantage.

This type of arrangement can also be shown to stimulate innovative effort (provided that anticompetitive conspiracy is absent). Obviously, like any profitable sale of a license for use of proprietary technology it helps to internalize the externalities generated by the innovative efforts of each firm. But in addition, if as happens in practice, in such an exchange each firm undertakes compensation equalization payments to any other member of the consortium if the latter's innovations are of market value significantly superior to its own, then the firm has a direct incentive to come to the contract bargaining table with a menu of valuable innovations to offer. It can also be shown that the formation of such a consortium tends to enhance the economic welfare of the general public [Baumol 2002 Chapter 7].¹

There is at least one more reason for voluntary technology sharing that is highly significant and appears to be growing in importance—the problem of “patent thickets” and the widespread patent pools that have been formed to deal with the thicket problem. A complex piece

¹ Yet there are evidently exceptions. Such consortia can serve as vehicles or as camouflage for anticompetitive behavior. For example, the contract discussions can conceivably serve as a disguise for price fixing by the competitors. Or they can enter into an agreement for mutual restriction of their R&D expenditures, each firm knowing that it can safely limit its innovative efforts if it can rely on its rivals to do the same. Or the contracts can be offered in a discriminatory manner that limit the benefits offered to entrants or denies them access altogether.

It is of some interest that the U.S. Department of Justice and the Federal Trade Commission have recognized the two sides of the issue. Their 2000 *Guidelines for the Licensing of Intellectual Property* very explicitly discuss the procompetitive benefits of licensing as well as the nature of the associated concerns. This is not the place to offer an evaluation of the *Guidelines*. What is significant for us here is that licensing as the prime instrument for technology dissemination has become sufficiently important to merit this sort of attention by the antitrust agencies.

of equipment, such as a computer, characteristically is made up of many components each of which is covered by patents, and the patents pertinent for such an item are usually owned by a number of different firms,² many of them direct competitors in the final-product market. This puts many of these firms in a legal position that can enable each to bring the manufacturing process of the others to a halt. The most effective way to prevent the catastrophic consequences this threatens for each of them is the formation of a patent pool in which each allows use of its patents by the other members of the pool, and even by outsiders (as a step to avoid intervention by the anti-monopoly authorities), all on preset compensation terms. There are many such pools in the U.S., with widely varying membership rules, license fee arrangements and other differences that are not germane here.

Concluding Comment

The main point, evidently, is that, *with the aid of the patent system* the market mechanism itself has introduced powerful incentives for rapid dissemination of novel products and processes and has done so without creating a major disincentive for investment in the innovation process. That is surely no minor accomplishment and no minor contribution to technical progress and growth. While the free market has hardly eliminated the conflict between encouragement of innovative effort and facilitation of dissemination, it has nevertheless adopted practices that ameliorate the problem to a considerable degree. It has done this by creating markets in technology, in which inventors willingly offer the use of their intellectual property to others, but only in return for a *quid pro quo*, which rewards the inventor while actually facilitating and speeding the use of the intellectual property by others. Evidently, under such an arrangement, society has it both ways – technology imitation by others becomes a benefit both to the imitator

² E.g., Peter N. Detkin, vice president and assistant general counsel at Intel Corporation (the world's largest semiconductor company), estimates that there were more than 90,000 patents generally related to microprocessors held by more than 10,000 parties in 2002 (Federal Trade Commission, 2002, p. 667).

and to the inventor, and through the resulting stimulus for growth it becomes a very valuable benefit to society.

So much for the working of patents in dealing with the problem. I am of course well aware that my audience is interested in copyrights rather than patents. But the purposes of the two and even their workings are not so dissimilar. Surely the experience gleaned from patent usage should offer some guidance for analysis of the functioning of copyrights and for contemplating ways in which both their design and their usage can be improved in serving the public interest.

Bibliography.

Arora, Ashish, Andrea Fosfuri and Alfonso Gambardella, *Markets for Technology: the Economics of Innovative and Corporate Strategy*, Cambridge, Mass.: MIT Press, 2001.

Baumol, W.J., *Entrepreneurship, Management and the Structure of Payoffs*, Cambridge, Mass.: MIT Press, 1993.

-----, *The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism*, Princeton: Princeton University Press, 2002.

de la Escosura, L.P., *Exceptionalism and Industrialization: Britain and its Industrial Rivals, 1699-1815*, Cambridge: Cambridge University Press, 2004.

Gomory, R.E. and Baumol, W.J., *Global Trade and Conflicting National Interests*, Cambridge, Mass.: MIT Press, 2000.

Katz, Michael and Janusz Ordover, "R&D Cooperation and Competition," *Brookings Papers on Microeconomics*, Washington, D.C.: The Brookings Institution, 1990, 137-203.

----- and Carl Shapiro, "On the Licensing of Innovation," *RAND Journal of Economics*, 16, 1985, 504-520.

Lamoreaux, N.R, and K.L. Sokoloff, "Long-term Change in the Organization of Inventive Activity," *Proceedings of the National Academy of Sciences*, 92, Nov. 1996, 12686-12692.

Ordover, Janusz A, "A Patent System Both for Diffusion and Exclusion," *Journal of Economic Perspectives*, 5, Winter, 1991, 43-60.

Rosenberg, Nathan, *Schumpeter and the Endogeneity of Technology: Some American Perspectives*, London: Routledge, 2000.

Scherer, Frederic .M., *Industrial Market Structure and Economic Performance*, Chicago, Illinois: Rand McNally Publishing, 1980.

Teece, D.J. "Profiting from Technological Innovation," *Research Policy*, 15, 1986, 285-305.

-----, "Capturing Value from Knowledge Assets: the New Economy, Markets for Know-how, and Intangible Assets," *California Management Review*, 40, 1998, 55-79.

U.S. Federal Trade Commission, Statement of Peter N. Detkin, Session on "Business Perspectives on Patents: Hardware and Semiconductors," FTC Hearings on "Competition and Intellectual Property Law and Policy in a Knowledge-Based Economy," February 28, 2002, p. 667, available at <http://www.ftc.gov/opp/intellect>.

U.S. Small Business Administration, *The State of Small Business: A Report of the President, 1994*, Washington, D.C.: U.S. Government Printing Office, 1995.

Vogelsang, Ingo, *Price Regulation of Access to Telecommunications Networks*, 41 J. Econ. Lit. 830, 834 (2003).

Von Hippel, Eric, *The Sources of Innovation*, New York: Oxford University Press, 1988.