
ECONOMIC FOUNDATIONS OF INTELLECTUAL PROPERTY RIGHTS

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INTRODUCTION

My work in the economics of innovation began some forty years ago. I realized, as I was beginning my work on the Economics of Information, that knowledge and information are very similar.¹ In fact, you can view information as a particular kind of knowledge, and so the problems that I was analyzing at the time, such as how well the market economy deals with information, corresponded to the question of how well the market economy deals with knowledge. My work showed that the standard paradigm (the neoclassical model, which argued that well-functioning markets solved all economic problems) just did not work when information was imperfect and *endogenous* (that is, could be affected by what individuals or firms did), and, by extension, when knowledge is endogenous (that is, when technology is changing). Adam Smith's theory argued that individuals in pursuit of their self-interest (firms in pursuit of maximizing profits) were led as if by an invisible hand to the general well-being of society.² One of the important results of my work, developed in a number of my papers, was that the invisible hand often seemed invisible *because it was not there*.³

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1. See J.E. Stiglitz, *Information and Economic Analysis*, in CURRENT ECONOMIC PROBLEMS 27, 27–28 (J.M. Parkin & A.R. Nobay eds., 1975).

2. ADAM SMITH, AN INQUIRY INTO THE NATURE AND CAUSES OF THE WEALTH OF NATIONS 423 (Edwin Cannan ed., Modern Library 1937) (1776).

3. E.g., Bruce C. Greenwald & Joseph E. Stiglitz, *Externalities in Economies with Imperfect Information and Incomplete Markets*, 101 QUART. J. ECON. 229, 230 (1986) (providing

This led me to a certain degree of skepticism about the standard perspectives on intellectual property. When I was at the Council of Economic Advisors⁴ we opposed the Trade-Related Aspects of Intellectual Property Rights agreement (TRIPS), part of the Uruguay Round of trade negotiations. Interestingly, so did the Office of Science and Technology Policy. We were not alone in our opposition; indeed, it was a view held by many, if not most, of the people who understood the issues. These views stood in contrast to the views of most of the people who had some special interest on this issue, particularly from the pharmaceutical and entertainment industries, who argued that the stronger the intellectual property rights the better. When I went to the World Bank,⁵ I continued to be involved in the issue. We had concluded that what separates developed and developing countries is not just the disparity, the gap, in resources, but also the disparity in knowledge, and closing that gap in knowledge is an essential part of successful development. We had become concerned that TRIPS might make access to knowledge more difficult—and thus make closing the knowledge gap, and development more generally, more difficult. We also worried about the effects of TRIPS on access to life-saving medicines; TRIPS attempted (successfully) to restrict access to generic medicines, putting these drugs out of the financial reach of most in the developing countries. The World Bank has an annual report called the *World Development Report*, which highlights a key development issue every year. During the first year I was at the World Bank, we focused on the problems of knowledge for development.⁶ That year's report argued that TRIPS imposed an unbalanced intellectual property regime.⁷

the basic theoretic analysis showing that markets with incomplete risk markets and imperfect information are not (constrained) Pareto optimal, that is, taking into account the costs of obtaining information or creating markets, there are government interventions that can make some individuals better off without making anyone else worse off); Joseph E. Stiglitz, *The Invisible Hand and Modern Welfare Economics*, in INFORMATION STRATEGY AND PUBLIC POLICY 12, 15 (David Vines & Andrew Stevenson eds., 1991).

4. I served as a member of President Clinton's Council of Economic Advisers from 1993 to 1997, and chairman and a member of the cabinet from 1995 to 1997.

5. I served as its chief economist and senior vice president from 1997 to 2000.

6. See THE WORLD BANK, WORLD DEVELOPMENT REPORT 1998/1999: KNOWLEDGE FOR DEVELOPMENT (1999), available at http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/1998/11/17/000178830_98111703550058/Rendered/PDF/multi0page.pdf.

7. *Id.* at 33–36. One of my minor victories was that I anticipated the U.S. Treasury's unhappiness with our stance. At the meeting of the board of the World Bank where this was

Intellectual property has become one of the major issues of our global society. Globalization is one of the most important issues of the day, and intellectual property is one of the most important aspects of globalization, especially as the world moves toward a knowledge economy.⁸ How we regulate and manage the production of knowledge and the right of access to knowledge is at the center of how well this *new economy*, the knowledge economy, works and of who benefits. At stake are matters of both distribution and efficiency.

Like most academics, I have ambivalent feelings about intellectual property, illustrated by two personal stories. About twenty years ago I received a letter from a Chinese publisher asking me to write a preface to a pirated edition of one of my textbooks. As an academic, I was enthusiastic about the idea. The motivation of much academic writing is not to make money but to influence ideas and to shape the intellectual debate. China at the time was beginning the transition to a market economy: if my book helped shape that transition in a way that enhanced its likely success in raising the living standards of more than a billion people, it would have been a major accomplishment. Looking at it even in more narrow terms, if even 1 percent of China's billion people read my book, it would be a larger readership than I would ever get in America. My publisher, of course,

discussed, we welcomed India's criticism that we had not gone far enough in criticizing TRIPS. Right after the U.S. representative gave the predictable speech about how we were "soft" on intellectual property and had to revise our report, India spoke up, followed by a couple of other countries, saying how our report was in fact very unbalanced with too much pro-intellectual property language. After their strong criticism, the United States decided not to pursue the issue any more, lest they actually wind up with a report that was less favorable than the report that we had written. The final document reflected our more balanced judgment.

Since then, the developing countries have further articulated their concerns. At the World Intellectual Property Organization (WIPO), they have called for a Development Oriented Intellectual Property Regime. See WIPO, Gen. Assembly, *Proposal by Argentina and Brazil for the Establishment of a Development Agenda for WIPO*, WO/GA/31/11 (Aug. 27, 2004), available at http://www.wipo.int/documents/en/document/govbody/wo_gb_ga/pdf/wo_ga_31_11.pdf. In a keynote address to the Ministerial Conference on Intellectual Property for Least Developed Countries, World Intellectual Property Organization, I further developed the case for a development oriented intellectual property regime. Joseph E. Stiglitz, Keynote Address at the Ministerial Conference on Intellectual Property for Least Developed Countries, World Intellectual Property Organization: Towards a Pro-Development and Balanced Intellectual Property Regime (Oct. 25, 2004) (transcript available at http://www2.gsb.columbia.edu/faculty/jstiglitz/download/2004_TOWARDS_A_PRO_DEVELOPMENT.htm). Resolutions in support of a development oriented intellectual property regime were adopted by WIPO's General Assembly in September 2004.

8. In my recent book, I devote a whole chapter to the problem of intellectual property. See JOSEPH E. STIGLITZ, *MAKING GLOBALIZATION WORK* 103–32 (2006).

was not as thrilled as I was about the notion of my ideas reaching the Chinese audience through a pirated version of my textbook.

Later I was at a conference in Taiwan. At that time, I knew that intellectual property rights were not always strictly enforced there. During a break in the conference, I had a little time to go to a bookstore. As I went to the store, I had a debate in my mind about what I hoped to see when I arrived. On the one hand, there was the possibility that they had stolen my intellectual property, that they had pirated one or more of my books. As we all know, theft is a terrible thing, and stealing intellectual property is a form of theft, so that would have been terrible. The other possibility was that they had not pirated one of my books and stolen my intellectual property, that they had ignored me. As I walked to the bookstore, I came to the conclusion that being ignored is far worse than having one's property stolen, and I resolved that I would actually be much happier if they had stolen my intellectual property than if they had ignored me. When I got to the bookstore, they had in fact stolen it, and I was relieved.

These anecdotes make the point that researchers and academics want their ideas to be disseminated. They work quite hard, in fact, traveling all over the world to disseminate their ideas. By contrast, intellectual property attempts to restrict the use of knowledge in one way or another. Intellectual property is supposed to encourage innovation. I argue below that a poorly designed intellectual property regime—one that creates excessively “strong” intellectual property rights—can actually impede innovation.

I. THE ROLE OF INTELLECTUAL PROPERTY IN INNOVATION SYSTEMS

The intellectual property regime is part of society's innovation system, and its intent is to provide incentives to innovate by allowing innovators to restrict the use of the knowledge they produce by allowing the imposition of charges on the use of that knowledge, thereby obtaining a return on their investment. But it is important when thinking about intellectual property rights (IPR)—which include patents, copyrights, and various other parts of the intellectual property system—to realize that there are many other parts of society's innovation system. There are other ways of financing and producing research—for instance, through universities and government-supported research labs. In fact, I would argue, perhaps

immodestly, that the most important ideas are those that are generated in universities, and many of the most important intellectual advances are not covered at all by the patent system. Look at the basic idea underlying the computer, Alan Turing's "Turing Machine": it was not protected by the patent system.⁹ Ideas like asymmetric information are not covered by intellectual property.¹⁰

Another example of important innovations not driven by IPR is the open source movement, which has been particularly successful in software. Even when research is financed by firms, there are other ways of providing returns on knowledge instead of using patents, such as trade secrets and advantages that come naturally to the first entrants in a market economy. There are also other ways of providing incentives; one of them I will discuss is a prize system, which has actually been a part of the innovation system for a couple hundred years. I will argue that, from a societal perspective, prizes have marked advantages over the patent system.

Our innovation system rests on foundations of basic research, and most basic research occurs within academia and government-sponsored research laboratories. Monetary returns are only a small part of what motivates these researchers. Thus, the basic framework of what induces people to engage in research is really not reflected in the intellectual property regime. Obviously, research has to be financed. It takes resources, so the question is not just how we motivate research but also how we finance it. As I shall comment below, financing research through monopoly profits may be neither the most efficient nor the most equitable way of doing so.

The key issue is the role of the patent system, or the intellectual property regime more broadly, within the economy's innovation

9. Turing was interested in the question of what it means to be computable, that is, if one can specify a sequence of instructions, or an algorithm, which when followed will result in a completion of the task. Turing Machines are thus simple, abstract computational devices which help to investigate the extent of what can be computed. David Barker-Plummer, *Turing Machines*, in *STANFORD ENCYCLOPEDIA OF PHILOSOPHY* (Edward Zalta ed., Winer 2003 ed.), <http://plato.stanford.edu/archives/win2007/entries/turing-machine/>. For more information, see generally DAVID LEAVITT, *THE MAN WHO KNEW TOO MUCH: ALAN TURING AND THE INVENTION OF THE COMPUTER* (2006).

10. These ideas have played a very important role, for instance, in modern financial markets, both in design and in regulation. Much of my earlier research focused on the analysis of markets marked by information asymmetries. Sometimes I might wish that intellectual property rights extended to such ideas; if they had, I would probably be in a different economic position than I am today, but it would have been detrimental for society had these ideas been "covered" by intellectual property.

system. To address the next issue, the design of the patent or IPR system more generally, one has to understand the limited (though still important) role of the IPR regime to address the next issue: the design of the patent or IPR regime. There are a host of questions, many of which absorb much of the energy of the lawyers involved in obtaining and fighting patents. These issues include what can be patented, the breadth of the patent, the standard of novelty, the procedures for granting and challenging patents, the rules for patent enforcement, and the notion of responsibilities as well as rights.

For instance, to get a patent you have to disclose enough information that somebody could replicate what is being patented (though often firms try to get away with disclosing as little as possible).¹¹ Disclosure has long been an important part of the patent and intellectual property regime;¹² it is one of the reasons why IPR can enhance innovation: people can build on that knowledge. Knowledge is the most important input into knowledge. Interestingly, in some of the more recent intellectual property disputes, the notion of disclosure has been contested. Microsoft has, by most accounts, not wanted to disclose even its protocols (required for interoperability with applications). The European Union has insisted that it at least disclose specifications for its protocols¹³ and Microsoft has tried everything not to comply with the European Union's requirement, even to the point of risking millions of dollars in fines.¹⁴

11. For the specification requirement applicable in the United States, see 35 U.S.C. § 112 (2000).

12. Robert P. Merges, *Software and Patent Scope: A Report from the Middle Innings*, 85 TEX. L. REV. 1627, 1643–44 (2007).

13. Commission Decision Case COMP/C-3/37.792, Microsoft of 24 March 2004, para. 30, 2007 O.J. (L 32) 23, 27 (EC) (“The Decision orders Microsoft to disclose the information that it has refused to supply and to allow its use for the development of compatible products. The disclosure order is limited to protocol specifications, and to ensuring interoperability with the essential features that define a typical work group network.”). The full text of the Commission Decision is available at <http://ec.europa.eu/comm/competition/antitrust/cases/decisions/37792/en.pdf>. In September 2007, the Court of First Instance of the European Communities upheld the European Commission decision. Press Release No. 63/07, Court of First Instance of the Eur. Cmtys., The Court of First Instance Essentially Upholds the Commission's Decision Finding that Microsoft Abused Its Dominant Position, (Sept. 17, 2007), available at <http://curia.europa.eu/en/actu/communiqués/cp07/aff/cp070063en.pdf>.

14. See Mary Jacoby, *Second Front: Why Microsoft Battles Europe Years after Settling with U.S.—Suspicious and Missteps Keep Its Antitrust Case Alive; Guarding Rival Engineers—Spat over Encrypting a Disk*, WALL ST. J., May 5, 2006, at A1; Kevin O'Brien, *Microsoft, Trying to Avoid a European Fine, Defends Demand for Royalties*, N.Y. TIMES, Apr. 7, 2007, at C12.

Furthermore, as with any property right, there are restrictions on the use of intellectual property. The fact that you have a property right does not mean you can do anything that you want with it. Owning a bat does not give you the right to hit someone over the head with it. In the case of intellectual property, one of the restrictions is that you cannot engage in abusive, anticompetitive behavior.¹⁵ The rights of governments to issue compulsory licenses form another important part of the patent regime. One of the responses to the abusive, anticompetitive practices has been to restrict the use of patents, effectively insisting on compulsory licensing, sometimes through forming patent pools. In the consent decree in the case of the antitrust action against AT&T in the 1950s, AT&T had to make its patents available to anybody that wanted to use them.¹⁶ In my Tunney filing¹⁷ in the Microsoft case, I argued that one way of dealing with that company's anticompetitive behavior was to limit its intellectual property rights.¹⁸ Such restrictions would, I suggested, enhance innovation in our economy.

More generally, the design of the patent system can affect the efficiency of the economy and its innovativeness. The current patent system imposes large costs on the economy, and one of the questions is whether there are reforms that could increase the economy's efficiency and innovativeness. I believe there are. To understand these issues one has to look at the economic foundations of knowledge.

A. *Static Inefficiency: Knowledge as a Public Good*

The important basic idea is that knowledge is a *public good*. Economists use the concept of a public good as a technical term; Paul Samuelson defined it precisely more than fifty years ago.¹⁹ A public

15. *E.g.*, *Morton Salt Co. v. G. S. Suppiger Co.*, 314 U.S. 488, 492 (1942) (explaining that public policy "forbids the use of the patent to secure an exclusive right or limited monopoly not granted by the Patent Office").

16. *United States v. W. Elec. Co.*, 1956 Trade Cas. (CCH) ¶ 68,246, at 71,139 (D.N.J. 1956).

17. Declaration of Joseph E. Stiglitz and Jason Furman, *United States v. Microsoft Corp.*, 97 F. Supp. 2d 59 (D.D.C. 2000) (Nos. 98-1232, 98-1233), available at http://usdoj.gov/atr/cases/ms_tuncom/major/mtc-00030610c.pdf. Pursuant to the Tunney Act, members of the public have an opportunity to comment on a proposed settlement of a civil antitrust suit before it is accepted by a court. Antitrust Procedures and Penalties Act, 15 U.S.C. § 16(b)-(d) (2006).

18. Declaration of Joseph E. Stiglitz & Jason Furman, *supra* note 17, at 31.

19. Paul A. Samuelson, *The Pure Theory of Public Expenditure*, 36 REV. ECON. & STAT. 387, 387 (1954).

good is a good whose consumption is nonrivalrous. By contrast, *private goods* can only be consumed by one person. For instance, only one person can sit in a chair. The same goes for food: if I eat the hamburger, you cannot eat it. Knowledge, however, is different. I have just shared with you some of the things I know, but sharing this knowledge with you has not taken away from what I know. Thus, knowledge has the quality of nonrivalrous consumption.

Another way of putting it is that there is no marginal cost associated with the use of knowledge. Thomas Jefferson described this much more poetically. Jefferson said that knowledge was like a candle: when one candle lights another it does not diminish the light of the first candle.²⁰ Understanding this concept is at the core of understanding efficiency in the use of knowledge. It is more efficient to distribute knowledge freely to everybody than to restrict its use by charging for it.

Free distribution, however, could cause problems for creating incentives for the production of innovation, and that is the dynamic issue. Before turning to the question of dynamic efficiency, though, I want to emphasize that efficiency *in use* means knowledge should be freely available. The problem is that intellectual property rights circumscribe the use of knowledge and thus, almost necessarily, cause inefficiency. Not only does intellectual property create a distortion by restricting the use of knowledge, but it also does something even worse: it creates monopoly power. Monopoly leads not just to inequities but also to major distortions of resource allocations; limiting monopoly power and its abuses is the focus of anti-trust policy. There is a quandary. We not only tolerate this distortion and inefficiency by restricting the use of knowledge, which creates monopoly power, but we sanction it: it is part of our legal framework because we *hope* it will promote innovation.

If we do not design this legal framework properly, however, it may actually impede innovation. That is where I will eventually take this argument. Before getting there, though, I want to point out that the social cost of the distortion of the patent system is particularly high. (By contrast, Schumpeter suggested that it would be lower than for other forms of monopolization.)

20. Letter from Thomas Jefferson to Isaac McPherson (Aug. 13, 1813), *in* THE WRITINGS OF THOMAS JEFFERSON 326, 334 (Andrew A. Lipscomb ed., 1904).

1. *Access to Medicine.* One of the reasons that the costs are so high is that the patent system impedes access to lifesaving drugs for billions. I opposed TRIPS (the so-called Agreement on Trade-Related Aspects of Intellectual Property Rights, part of the Uruguay WTO agreement signed in 1994) so strongly in part because of these effects. Indeed, I believe one of the main reasons the pharmaceutical industry was pushing for TRIPS was that they wanted to reduce access to generic medicines. These are so disliked by the drug companies for the same reason that they are so liked by everybody else: the prices of generic drugs are very low. The low price means that people who could not afford the brand name drugs still can buy the generic drugs, and the competition with the generics drives down the price of the brand name drugs. The loss of sales to generics as well as the lower prices in turn lowers the profits of the large (brand name) pharmaceutical companies; it is understandable why they have pushed so hard (and contributed so much to campaigns) for IPR.

One example that shows the magnitude of what is at stake (and that has received a lot of attention), are the AIDS drugs. One year's treatment of the brand name drugs, not the most recent ones, but the older ones which are less expensive, costs \$10,000.²¹ In a poor developing country, where the per capita income is \$300, or even \$3,000, a person with AIDS is not going to be able to afford \$10,000. They might be able to afford the generic medicines, which sell for less than \$200. When the trade ministers signed the TRIPS agreement in Marrakesh in the spring of 1994, they were in effect signing the death warrants on thousands of people in sub-Saharan Africa and elsewhere in the developing countries. This is one of the reasons that TRIPS has generated such immense concern.²²

21. MÉDECINS SANS FRONTIÈRES, UNTANGLING THE WEB OF PRICE REDUCTIONS: A PRICING GUIDE FOR THE PURCHASE OF ARVs FOR DEVELOPING COUNTRIES (10th ed. Sept. 2007, available at http://www.accessmedmsf.org/fileadmin/user_upload/diseases/hiv/aids/Untangling_the_Web/UTW10_RSep_horizontal.pdf).

22. Defenders of TRIPS claim that it contained "flexibilities" to address these concerns—the right to issue compulsory licenses. But the drug companies intended to make it difficult for developing countries to issue these compulsory licenses, and subsequent bilateral trade agreements have made it even more difficult. Had the intention been to retain access to life-saving generic medicines for developing countries, TRIPS would have provided for an automatic right to issue compulsory licenses for expensive, life-saving medicines. The United States has put enormous pressure on countries that have threatened to issue compulsory licenses not to do so, and few have.

The issue is not only of concern to developing countries. In the United States, with nearly 47 million individuals not having health insurance and with health insurance often not paying

2. *Leveraging Monopoly Power and Other Abuses of IPR.* The efficiency costs of IPR go beyond the direct effects associated with monopolization of the particular product covered by the patent: Intellectual Property Rights generate monopoly power that can be used to leverage further monopoly power. The most obvious example is Microsoft, which has leveraged its monopoly power in operating systems to obtain a dominant position in applications like word processing (Microsoft Office) and Internet browsers (Internet Explorer). The courts and regulators in the United States,²³ in the European Union,²⁴ and in South Korea²⁵ have all ruled against Microsoft. There is little disagreement about the fact that Microsoft has engaged in abusive, anticompetitive practices. The only debate is what to do about it; because Microsoft has so much monopoly power and has obtained such a dominant position, it is not easy to figure out how to deal with the problem.

There is actually a long history of abusive uses of intellectual property rights. Going back to the beginning of the last century, the automobile and the airplane were two of the most important innovations, and the development and success of both were impeded by IPR. In the case of the automobile, a patent was granted,²⁶ but it was an excessively generic patent for a four-wheeled, self-propelled vehicle. The person who received the patent had no intention of developing the automobile; instead, he used it to form a cartel.²⁷ Often, the best, or at least the easiest, way of making money is not to come up with a better idea but to form a monopoly or a cartel and restrict competition. For those seeking easy profits, competitive marketplaces are very bad because they drive down prices and erase

for newer drugs, the high prices also reduce access to life saving medicines. A striking example is the patent on the genes associated with breast cancer, which means that many women cannot afford the tests which can identify whether they are at risk. *See* text accompanying note 43.

23. *United States v. Microsoft Corp.*, 253 F.3d 34 (D.C. Cir. 2001).

24. Commission Decision Case COMP/C-3/37.792, Microsoft of 24 March 2004, *supra* note 12; *see also* Stephen Castle, *European Court Rejects Microsoft Appeal over Media Player*, THE INDEPENDENT (London), Dec. 23, 2003, at 33; Kevin J. O'Brien & Steve Lohn, *European Court Faults Microsoft on Competition*, N.Y. TIMES, Sept. 18, 2007 at A1.

25. Korea Fair Trade Commission, The Findings of the Microsoft Case (Dec. 7, 2005) (on file with the *Duke Law Journal*); *see also* Anna Fifield, *S. Korea Watchdog Stands by Microsoft Ruling*, FIN. TIMES (London), May 24, 2006, at 30; Choe Sang-Hun, *Microsoft Loses Antitrust Case in S. Korea*, INT'L HERALD TRIB. (Paris), Dec. 8, 2005, at 13.

26. U.S. Patent No. 549,160 (filed Nov. 5, 1895).

27. The case of the airplane raises a quite different set of issues, discussed at length in the next Section.

profits. IPR can be an important way of maintaining a cartel.²⁸ Most of the automobile companies went along with the idea of the patent-driven cartel, except for one. There was one innovator who had a different conception of what the automobile was about, and that was Henry Ford. He had the idea of a people's car, at a low price; that idea was totally inconsistent with the cartel's view of a high-priced, restricted-use vehicle. Ford challenged the patent.²⁹ Had he not had the resources and the determination, he would not have succeeded in this legal battle; however, he eventually did prevail.³⁰ Had he failed, the development of the automobile as we know it would have been delayed for a long time.³¹

The automobile patent illustrates two other problems with the patent system: The first is the difficulty of determining the "boundaries" of property rights. In the case of "real" property (land), we can define the property right precisely by the geographical boundaries. We may have to further specify whether the property right extends to mineral rights and air rights, and whether there are public rights of way. But the limitations are easy to specify and are well understood. In the case of intellectual property, there are no such natural borders. Should the intellectual property right have extended to all self-propelled vehicles, or only to those that are propelled in a particular way?

These boundary issues are related to another issue: it is widely agreed that if patents are to promote innovation, they should be given for, and only for, an idea that is "novel." If the original patent is overly broad, and encompasses all four-wheeled, self-propelled vehicles, then a truly novel way of self-propelling may not be granted a patent or may have to pay the owner of the original patent so much as to attenuate incentives for innovation. Drug companies and others have tried to extend the effective life of a patent by making

28. The holder of the patent can impose conditions on those to whom he issues a license to use his patent—restrictions on output and pricing that allow the industry to act as a cartel. In effect, the patent owner acts as the cartel ring leader. This is an instance in which IPR gives rise to what Supreme Court Justice Antonin Scalia called the supreme evil of anti-trust. See *Verizon Commc'ns Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398, 408 (2004). Whether, and under what conditions, such behavior would today be viewed as abusive remains controversial.

29. *Did Not Infringe on Selden Engine—U.S. Court of Appeals Reverses the Decision of Lower Court Against Auto Makers*, N.Y. TIMES, Jan. 10, 1911, at 5.

30. See *Columbia Motor Car Co. v. C. A. Duerr & Co.*, 184 F. 893 (2d Cir. 1911).

31. Given the concerns about global warming, that might have been a good thing, but that was not one of the issues on the agenda at the time.

incremental improvements on existing drugs. In a recent case, Indian courts ruled against Novartis' attempt to do so.³²

Whether a product is novel depends on the state of knowledge throughout the world. It is often difficult for the patent office to determine whether someone in the rest of the world might have had the idea before this patent was granted; in the case of the automobile, it is arguable that others in Europe had the idea before the granting of the 1895 patent. The United States has often been somewhat provincial in its approach to knowledge within the patent system. For instance, the United States gave a patent for basmati rice.³³ Indians had been consuming basmati rice for a thousand or more years, but those in the patent office in Washington responsible for reviewing the patent application obviously had not had the pleasure of eating basmati rice. They thought it was a wonderful innovation and granted a patent to it. Had India implemented and enforced this patent, every time anybody in India ate basmati rice they would have to send a check to Texas to pay for this idea which they thought was theirs in the first place.³⁴

Ordinarily, property rights are argued for as a means of achieving economic efficiency; intellectual property rights, by contrast, result in a static inefficiency which can only be justified by the dynamic incentives. These examples suggest that the static inefficiencies may be greater than is often thought. Later, I will argue that the dynamic benefits may be less.

Of course, any method of raising funds for innovation has a social cost. In the case of a monopoly, the way you raise funds is through the disparity between the price and the marginal cost. The patent system, however, is not an optimal way of raising money because it is not an optimal tax; it creates a particularly large set of distortions, which is one of the reasons why it is particularly objectionable.³⁵ Later in this talk, I will discuss the issue of financing research more broadly.

32. Amelia Gentleman, *Setback for Novartis in India Over Drug Patent Protection*, N.Y. TIMES, Aug. 7, 2007, at C1.

33. U.S. Patent No. 5,663,484 (filed July 8, 1994).

34. This is an example of a more general problem which has received considerable attention in developing countries, called *biopiracy*, the patenting of drugs and other products based on traditional knowledge.

35. There are also equity issues associated with this particular way of financing research.

3. *Schumpeterian Competition.* Standard competitive equilibrium theory has paid very little attention to innovation. The only rigorous proof of the efficiency of competitive markets is provided by the Arrow-Debreu model,³⁶ and that model assumes that technology is fixed. One might think this is strange; how could economic theory pay any attention to models that assume technology is fixed in a dynamic economy? That is a question that sociologists ought to address, but the Arrow-Debreu competitive model is the standard, reigning paradigm, and sadly, it ignores innovation. Most first-year graduate courses in economics, and most introductory textbooks (until my textbook came out³⁷), simply did not talk about innovation in any systematic way. But there was a strand of thought associated with Joseph Schumpeter that focused on innovation and argued that this competition for innovation resulted in temporary monopolies.³⁸ One monopoly followed after another; new firms tried to displace the existing monopolist. In this sense, there could be intense competition. This kind of competition was referred to as *Schumpeterian competition*.

Some of my earlier research, however, pointed out that Schumpeter was wrong about the temporary nature of monopoly. Monopoly power, once established, can easily be perpetuated.³⁹ Not only is it possible to perpetuate monopoly power, in fact, there is an incentive to do so. This is particularly evident in the case of network externalities and in situations where there are important switching costs, such as those that arise from learning. That is one of the reasons why Microsoft is so difficult to deal with. The monopoly power persists even after the bad practices which enabled it to create that power have been terminated.

36. Kenneth J. Arrow & Gerard Debreu, *Existence of an Equilibrium for a Competitive Economy*, 22 *ECONOMETRICA* 265 (1954).

37. JOSEPH E. STIGLITZ, *ECONOMICS* (1st ed. 1993).

38. See, e.g., JOSEPH A. SCHUMPETER, *CAPITALISM, SOCIALISM AND DEMOCRACY* 102 (5th ed. 1976) (“[T]here is or may be an element of genuine monopoly gain in those entrepreneurial profits which are the prizes offered by capitalist society to the successful innovator.”).

39. See Partha Dasgupta & Joseph Stiglitz, *Uncertainty, Industrial Structure and the Speed of R&D*, 11 *BELL J. ECON.* 1, 27 (1980) (“[T]he belief that competition in R&D is a substitute for competition in the product market or that it will eventually give rise to competition in the product market has been shown to be suspect: there are conditions under which monopolies may persist even without any formal barriers to entry other than those provided by the patent system . . .”).

4. *Further Costs to the Patent System.* The transactions costs associated with our IPR system are a further problem, although whether you view them as costs or benefits may depend on your position in the economy. For lawyers, transaction costs are a benefit, because they are a source of their income.⁴⁰ But from a social perspective, these administrative costs are a social cost. Litigation over patents also introduces uncertainty. Of course, there is always an intrinsic uncertainty of research, but it is compounded by the risk of patent infringement and the associated risk of litigation.

B. Dynamic Costs

The patent system can only be justified, given all its costs, in terms of dynamic efficiency: the benefits that result from an enhanced pace of innovation. Recent events (in particular those surrounding Microsoft)⁴¹ suggest not only that the economic costs may be higher and may last longer than was previously realized, but also that the benefits may be lower. In particular, the incentives for research and development may be less, and there may be important distortions in the way money is spent, that is to say, in the direction of research. The patent system, because of its poor design, may be slowing down the pace of innovation.

This raises the question, can one obtain the dynamic benefits—if they exist—at lower costs? I will argue that, at least in some cases, one can.

1. *The Fundamental Problem: The Disparity Between Marginal Private and Social Returns.* The fundamental problem is that under the patent system the rewards do not correspond to the marginal social returns.

The marginal social return is having innovation available earlier than it otherwise would have been. That is to say, if the idea was going to occur anyway to somebody else, then the contribution of the “innovator” is just that the idea occurred a little earlier than would otherwise have been the case.

For anyone engaged in research this is well understood, but we like to ignore it. I would like to think that if I had not solved the

40. Just as the high transaction costs faced by retirees would have been viewed as a benefit by Wall Street if we had privatized social security.

41. See *supra* notes 16, 23–24 and accompanying text.

problem of how markets with asymmetric information work, the problem would not have been solved. The reality is that somebody else would almost surely have made similar discoveries, maybe the next day, the next month, or the next year, or maybe in ten years, but it would have happened eventually. I did solve it earlier than anybody else did. From a social point of view, my contribution is making this knowledge available earlier, and only the extent to which that knowledge occurred earlier than it otherwise would have is what ought to be rewarded; economic efficiency requires that people's compensation be related to their marginal social returns.

The patent system does not reward people on the basis of the marginal social return of their contribution. It gives the individual or firm that is first the entire value of the innovation, which obviously can well exceed the marginal social contribution. The benefits to the innovator are justified by saying they are a proxy for the marginal social contribution, but the returns provided under a patent are a very bad proxy. As a result, it introduces a distortion. This is the critical insight: we are dealing with second, third, and fourth-best economics. First-best economics would have compensation commensurate with the marginal social contribution, but unfortunately, it is not easy to assess that—it is not possible, in general, to determine when the innovation would have otherwise occurred. (First-best economics also would provide compensation in a way that does not give rise to monopoly distortions.)

The human genome project is a case where there is a clear distinction between what those who obtained patents received and their marginal social returns. There was a major international effort to decode the human genome, and by the early 1990s it seemed clear that it would be done within a few years.⁴² There was a race, though, among the private entrepreneurs to complete the project a little faster; they were willing to spend lots of money to finish it a day faster, a month faster, maybe at most a year faster. Why? If they could decode the genome and identify a gene, say the gene for breast cancer, a year earlier, or even a day earlier, they would receive a patent. That would mean that anybody who wanted to be tested to know whether they had a likelihood of getting breast cancer would have to pay a huge amount of money, as they would have a monopoly

42. Clive Cookson, *A Spur for the Gene Hunters: The Mapping of Mankind's Genetic Make-up Sets a Medical Landmark*, FIN. TIMES (London), Dec. 20, 1993, at 12 (indicating that the human genome was likely to be decoded "in the first decade of the next century").

on the use of this gene. The biopharmaceutical company Myriad received this patent⁴³ and has been using, or I would say abusing, this patent. There are others who have been willing to make the diagnostic tests free, but those with the patent say no, we own your gene. You might think that you own it, but no, they own it. The market price for this test is several thousand dollars.⁴⁴ Of course, if you do not have insurance, and nearly 47 million Americans do not have insurance,⁴⁵ it means that you may not be able to afford to have this test; most of those who do not have insurance also have limited income, so they cannot pay the several thousand dollars required and will not get the test. Many of them may die as a result of not having the appropriate diagnostic test.

This is a case where there are clear social costs to the patent, and there are very little social benefits from the faster innovation. Interestingly, this is a case where other jurisdictions have taken a different view. In Canada, the government has said, in effect, this is too outrageous and will not allow the patent,⁴⁶ and so people in Canada can get this test much more cheaply.

There are further distortions associated with patents that I have talked about elsewhere. Of particular concern is that much of the returns arise as a result of what is called enclosing the commons. Professor Boyle here at Duke has used that term, “enclosing the commons,” to suggest privatizing something that was (and perhaps ought to be) in the public domain.⁴⁷ In sixteenth and seventeenth century Scotland and England, common land that was used, for instance, for grazing was enclosed. There was allegedly some benefit: privatization led to the more efficient use of the commons. In the case of knowledge, however, the enclosure results in *an inefficiency*, that is, knowledge is used less effectively. In short, privatizing knowledge

43. U.S. Patent No. 5,747,282 (filed June 7, 1995).

44. Nat'l Cancer Inst., Genetic Testing for BRCA1 and BRCA2: It's Your Choice, <http://www.cancer.gov/cancertopics/factsheet/Risk/BRCA> (last visited Sept. 6, 2007).

45. U.S. CENSUS BUREAU, INCOME, POVERTY, AND HEALTH INSURANCE COVERAGE IN THE UNITED STATES: 2006, at 19 (2007), available at <http://www.census.gov/prod/2007pubs/p60-233.pdf>.

46. Caroline Mullen, *Gene Tests for Cancer Won't Stop*, TORONTO STAR, Sept. 20, 2001, at A3 (indicating that the Ontario government would continue providing the test over Myriad's objections).

47. See, e.g., James Boyle, *The Second Enclosure Movement and the Construction of the Public Domain*, 66 LAW & CONTEMP. PROBS. 33, 39 (Winter/Spring 2003) (“Both overtly and covertly, the commons of facts and ideas is being enclosed.”).

imposes short-run costs and is only efficient when there are sufficient offsetting incentives for more research.

Biopiracy provides an important instance where it is evident that this is *not* the case. I was first introduced to the concept of biopiracy when I was in a small indigenous village in the high Andes of Ecuador.⁴⁸ In this particular village, the mayor went on at great length about the problem of biopiracy (the patenting by American and other foreign companies of indigenous medicines, plants, or a variety of indigenous ideas and traditional knowledge) in Ecuador. In other words, biopiracy involves taking what was in the public domain and privatizing it. Basmati rice is one example. Another example, in some ways more dramatic, concerns the healing property of turmeric. Turmeric is a root, used widely as a spice, but which has been known in India for its healing properties for hundreds, probably thousands of years. Two South Asian doctors working in the United States recognized that, under American law, they could get a patent; even though the healing properties of turmeric were known in India, they may have guessed that the patent examiner in Washington would probably not know about those properties. They may have thought that, because the healing properties of turmeric were not “published,” they had a good chance of getting a patent. But, of course, there is a difficulty of publishing things that “everybody” knows—or at least everybody except the patent examiner. This presents a classic Catch-22 situation. You cannot publish it because it is widely known, but if it is not published, then it is (from the perspective of the patent examiner) “not known.” It is not prior art, and so you can get a patent. In the end, the doctors received the patent,⁴⁹ with the result that if India had recognized and enforced this patent, it would have meant that anyone in India who used turmeric for healing purposes would have to send a check to these Indian doctors in the United States in recognition of their patent. This was not a patent that was generating research, or an advance of knowledge, in any way. It imposed a societal cost, without any corresponding benefit.

48. I am always astounded by differences in what people know about. Those in the high Andes might not know about abstruse aspects of intellectual property, but they knew more about how IPR was affecting them and about biopiracy than many specialists in IPR in the advanced industrial countries.

49. U.S. Patent No. 5,401,504 (filed Dec. 28, 1993).

2. *Why Patents May Impede Innovation: Raising the Cost of Knowledge.* So far, I have explained why it is that the returns to patents do not correspond to the social benefits. I now want to go further and explain why it is that patents may actually slow innovation. Knowledge is the most important input into the production of knowledge. Intellectual property restricts this input; indeed, it works by limiting access to knowledge. One way of thinking about this is in terms of any standard production process. If you increase the price of an input, it reduces the supply of the output.⁵⁰ In this case, the input is knowledge; patents increase the price of this input, which in turn reduces the output.

3. *Why Patents May Impede Innovation: Monopolization.* There are other reasons that patents may impede innovation. One is that incentives for innovation are less with monopoly than in a more competitive marketplace. There are several reasons for this. First, monopolists produce less—because they charge higher prices. Because they produce less, the benefit from reducing the cost of production by a given amount is less.⁵¹ Moreover, monopolists do not have the spur of competition. They may realize, in addition, that an innovation may lead to a decrease in the value of their existing capital.

Not only do monopolists have a diminished incentive for engaging in research themselves, but monopolists can also increase their profit by discouraging innovation by rivals and raising rivals' costs. It was, in my judgment, correctly argued that Microsoft did exactly this. In fact, one of the charges brought against Microsoft in one state was not only that Microsoft's behavior raised prices, but that it actually also slowed down innovation.⁵² That argument was also

50. JOSEPH E. STIGLITZ, *ECONOMICS* 304–05 (2d ed. 1997).

51. See Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources of Invention*, in *THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS* 609, 619–22 (Richard Nelson ed., 1962).

52. Plaintiffs Modified Fourth Amended Petition at 2, *Joe Comes, Riley Paint, Inc. v. Microsoft Corp.* (Iowa Dist. Ct. Feb. 8, 2006) (No. CL82311) (“The purpose and effect of Microsoft’s illegal conduct has been to deny purchasers of Microsoft operating systems and applications software at a competitive price and free choice among competing software products, as well as to deny them the benefit of software innovation.”); see also David Elbert, *Lawyers for Microsoft Try to Limit Class-Action Suit; Plaintiffs Say the Software Giant Kept Innovations from Reaching Consumers*, *DES MOINES REG.*, Sept. 23, 2006, at D1.

an important part of the European Union's case against Microsoft.⁵³ In particular, as Microsoft repeatedly demonstrated its ability to leverage its monopoly power in PC operating systems (maintained through IPR) into other arenas (by, for instance, squashing rival innovators like Netscape), it discouraged innovation further. Innovators knew that if they produced a product of sufficient import to attract Microsoft's attention, they would lose the battle with this giant.

4. *Why Patents May Impede Innovation: Patent Thickets.*

Another important problem with the patent system arises from defining what a piece of intellectual property is. For instance, land can be staked out and described precisely, although even then there may be boundary disputes. Intellectual property, however, is different; it is very hard to define precisely what is your property, what is somebody else's property, and what is in the public domain. Intellectual property does not have clear longitude or latitude; it is difficult to delineate boundaries. This results in numerable patent disputes that discourage innovation, and in a specific problem that is called a *patent thicket*. Patent thickets especially impede innovation. Again, this is a problem that has been known for a very long time.

As I mentioned earlier, one important innovation at the beginning of the last century was the automobile; patents almost suppressed this important innovation. The other important innovation was the airplane, and a patent thicket did impede the development of the airplane. Everyone knows about the Wright brothers and their first manned flight at Kitty Hawk, North Carolina, in 1903; their plane is even depicted on the license plates in that state. The Wright brothers obtained some key patents, but so did another innovator, named Glenn Curtiss. Thus, it was unclear whom you paid if you wanted to develop an airplane. If you paid both of them what they demanded, it became too costly to develop an airplane. If you paid only one of them, you risked a suit from the other. And so, the airplane was not developed until World War I, when it was recognized that winning the war was more important than IPR (or allowing patent lawyers to make money). The United States

53. Commission Decision Case COMP/C-3/37.792, Microsoft of 24 March 2004, *supra* note 12, at para. 29 ("The tying of WMP rather shields Microsoft from effective competition from potentially more efficient media player vendors, which could challenge its position, thus reducing the talent and capital invested in innovation in respect of media players.").

government effectively seized the patents and determined how much was to be paid to whom. The development of the airplane proceeded very quickly thereafter.⁵⁴

5. *Distortions in the Patterns of Research.* Patents may not only discourage innovation generally, but they also may lead to a distortion in the *pattern* of innovation. On the one hand, research and development activity can be directed at circumventing monopolies—getting around a patent—or, on the other hand, they can be directed at strengthening monopolies. Arguably, one of the concerns about Microsoft's new Vista operating system is that it was designed to make interoperability more difficult in order to strengthen its monopoly power. These research and development expenditures actually lower welfare, in contrast with the social returns that arise from creating new products and lowering costs, both of which enhance welfare. This illustrates the point that stronger intellectual property rights may not lead to a faster pace of innovation.

II. THE INNOVATION SYSTEM

As I have said, one needs to look at the patent system, or copyright system, within the context of the broader innovation system. There are a number of tasks that any innovation system has to perform. The first is the *selection* of projects and researchers. Who is going to do the research, and what projects are going to be undertaken? The second task is *financing*. The production of knowledge is not costless, so there has to be some way of financing it.

This is related to the third issue, that of *risk absorption*; research is risky: if you knew the outcome, it would not really be research. There is an inherent uncertainty about research. The question is, who bears that risk?

Fourth, any effective innovation system has to provide *incentives* for individuals and firms to innovate (both incentives to work hard and incentives to innovate).

Fifth, a well functioning innovation system has to *disseminate* and *use* the knowledge when it is produced.

54. For a discussion of this story, see TOM D. CROUCH, *THE BISHOP'S BOYS: A LIFE OF WILBUR AND ORVILLE WRIGHT* (1989); SETH SHULMAN, *UNLOCKING THE SKY: GLENN HAMMOND CURTISS AND THE RACE TO INVENT THE AIRPLANE* (2002).

In evaluating the different parts of the innovation system, one has to ask how well they perform these roles and what costs they impose on the rest of the economic system. I already referred to the patent system's high distortionary cost⁵⁵ as well as the transactions costs.⁵⁶ I would argue that a well-designed innovation system will be a *mixed* system, involving patents and other elements, like prizes and government support of basic research, for instance, at a university. In assessing our current innovation system, the questions are, are we relying too heavily on the patent system? And is the patent system well designed for achieving the objectives, or should we reform it?

A. *The Patent System*

The critique of the patent system is that, besides the large static and dynamic distortions that I have described, there is a problem of *distortionary* finance. As I said before, under the patent system research is financed out of monopoly profits. The difference between the price and the marginal cost can be viewed as a tax. In other words, one can think of the patent system as combining a competitive pricing system with a tax per unit output (the difference between the price and the marginal cost of production), the revenues from which are devoted to financing research. Part of the problem with the patent system, however, is that much of that revenue does not go to finance research. The drug companies spend more money on advertising and marketing than they do on research.⁵⁷ Moreover, the *directions* in which they allocate their research budget do not accord well with broader social objectives: they spend more money on lifestyle drugs, such as for hair regrowth, than they do on lifesaving drugs. So, there is a lot of what you might call "leakage" in this particular tax system: It is an inefficient tax in failing to deliver the revenue into the important areas of research, where it should go.

Putting that critical problem aside, one can still ask, is it a good tax system? Is it a good way of raising revenue for financing research and development? The answer is no. It has one property which some may think is desirable (although, as I shall explain, I think even this property may, especially in this context, actually be undesirable): the "tax" is a benefit tax. That is to say, the only people who are

55. See *supra* Part I.

56. See *supra* Part I.A.4.

57. Marc-André & Joel Lexchin, *The Cost of Pushing Pills: A New Estimate of Pharmaceutical Promotion Expenditures in the United States*, 5 PLOS MED. 29, 29 (2008).

ostensibly⁵⁸ paying for a heart medicine are the people who use the heart medicine, so there is a linkage between who benefits and who pays. But in most other areas it is not viewed to be a good thing to have a benefit tax, which is why there is relatively little reliance on benefit taxes. It is a particularly poor way of raising revenues for research on diseases. It is bad enough that a person has a heart problem, but then to say because someone has a heart problem then he or she should also have to pay for heart research is imposing a double penalty. Put another way, within the context of any utilitarian or Rawlsian social welfare function, (or any of the other generally accepted views of social justice), a benefit tax for medicine cannot be justified. There are other public services in which a benefit tax might be justified, but not in the areas of lifesaving medicines.

Financing research through “monopoly power” entails, of course, using a distortionary tax, and one of the major areas of advancement in public finance in the last thirty years has been the analysis of the distortionary and distributive impacts of tax systems. We know how to raise revenues in ways that are less distortionary and more equitable.⁵⁹ The “monopoly benefit tax” is more distortionary and more inequitable than alternative tax systems.

There are, in particular, a number of broader inequities and inefficiencies associated with patents as a source of finance for research. I have noted that knowledge is a global public good, which means the benefits can be enjoyed by anybody in the world.⁶⁰ The

58. I am quite deliberate in saying that the people who benefit from the drug are “ostensibly” the ones who pay, because in fact, few people actually pay for their own medicines when it comes to life-saving drugs, such as those dealing with AIDS. In most countries, it is the government who bears the cost; in the United States and a few others, some of the costs are borne by private insurance companies. In either case, the price system is not working in the same way that it does for conventional commodities, like steel or chairs. Individuals do not make decisions on their own about what drugs to take, and they normally are simply following the directions of doctors. In particular, because someone else is picking up the tab, they, or their doctors, pay little if any attention to price. Doctors can be encouraged to pay some attention to prices, but the prices that they should be paying attention to are the marginal costs, not the price cum “tax” (the monopoly price). That price distorts decisionmaking.

59. The general theory is laid out in A.B. ATKINSON & J.E. STIGLITZ, LECTURES IN PUBLIC ECONOMICS (1980).

60. Global public goods are any goods of which the benefits accrue to anybody in the world. The concept was first articulated in J.E. Stiglitz, “The Theory of International Public Goods and the Architecture of International Organizations,” Background Paper No. 7, Third Meeting, High Level Group on Development Strategy and Management of the Market Economy, UNU/WIDER, Helsinki, Finland, July 8-10, 1995. For more information, see Joseph E. Stiglitz, *Global Public Goods and Global Finance: Does Global Governance Ensure that the*

standard principles of equitable finance say that a public good should be financed by those most able to pay.⁶¹ Unfortunately, IPR do not, for the most part, recognize differences in circumstances other than the extent to which profits can be extracted. In other words, IPR will (effectively) recognize differences in elasticities of demand (because the monopolist can extract more profits when demand is less elastic), but not any other circumstances, and therefore inherently represents an inequitable way of financing research.

The bottom line is that raising revenues for financing research through the granting of monopoly power cannot be justified by any generally accepted principles of public finance.

There is another problem that has not received adequate attention: the bias toward excessive patenting. This bias arises because there is an asymmetry between the granting of a patent and fighting a patent. When a firm gets a patent, it encloses the commons, making private what would otherwise be public; it receives a private return for obtaining a patent—regardless of whether the patent was or was not deserved. But when a firm challenges a patent, it creates a public good, because if it successfully challenges a patent, that piece of knowledge enters the public domain, where anybody can use it. Thus, challenging a patent is a public good. The result, of course, is that there will be an underinvestment in fighting bad patents, and an overinvestment in trying to get bad patents.

The problem is exacerbated by poor procedures, especially in granting and enforcing patents in the United States. In Europe, there is a process of *opposition*: those who believe the patent should not be granted have an opportunity to express their views to the patent office *before* a patent is granted.

In America, once granted, the owner of the patent can exclude others from using his intellectual property *until the patent is overturned*. The consequences were seen in a dramatic way in the case of the Blackberry, which was accused of patent infringement. Even though Blackberry challenged the patents—and so far in preliminary rulings (two of the rulings are final), all the patents have been

Global Public Interest is Served?, in *ADVANCING PUBLIC GOODS* 149, 149–64 (Jean-Philippe Touffut ed., 2006). Knowledge is an especially important example of a global public good. See J.E. Stiglitz., *Knowledge as a Global Public Good*, in *GLOBAL PUBLIC GOODS: INTERNATIONAL COOPERATION IN THE 21ST CENTURY* 308, 308–25 (Inge Kaul, Isabelle Grunberg & Marc A. Stern eds., 1999).

61. E.g., JOSEPH E. STIGLITZ, *ECONOMICS OF THE PUBLIC SECTOR* 469–70 (3d ed. 2000).

rejected—the owner of the patent held BlackBerry up for ransom: it had to pay over \$600 million to keep operating.⁶² It had originally demanded that if the patent was overturned, it get back part of that money, but the owner of the patent insisted that the amounts be unconditional.⁶³

Moreover, the legal system can lead to unfair outcomes. The high costs of implementing IPR, including the high costs of challenging patents, put developing countries at a disadvantage, exacerbating the risks of biopiracy. The advocates of the patents often argue that one should not worry about biopiracy, because the patents will not survive. Even if that conclusion were true (which does not appear to be the case), it is very expensive to challenge these patents. India is large enough and well enough off that it can afford challenging them, but Ecuador does not have the necessary resources.

Even in the cases in which a patent has been successfully challenged in some courts, other courts have not been swayed. This is illustrated by another famous example of biopiracy, entailing a variety of uses of the neem tree oil, which is used in India for a wide range of purposes. The United States and several European countries granted a number of patents for some of these uses, even though they had been known in India for a long time. In Europe, they were challenged, and the challenge was sustained—that is to say, the patents were overturned—but the United States refused to overturn the patents. Thus, the neem oil patents continue to be enforced in the United States even though in another jurisdiction they have been overturned.⁶⁴

One of the most vocal complaints against the TRIPS agreement that I mentioned earlier was that it reduces access to generic

62. See Susan Decker & Rebecca Barr, *BlackBerry Patent Settlement Frees RIM to Head Off Rivals*, INT'L HERALD TRIB., Mar. 6, 2006, at 16.

63. There are alternatives to a system in which patent owners can so severely restrict access to their innovations. For instance, under the “liability system,” those who use someone else’s intellectual property have to pay compensation; but the owner of the intellectual property cannot exclude someone from using the property. Even more modest reforms, such as allowing the use of intellectual property so long as there is a challenge (with appropriate compensation paid if the patent is upheld) would be preferable. See, e.g., J.H. Reichman, *Legal Hybrids Between the Patent and Copyright Paradigms*, 94 COLUM. L. REV. 2432, 2442–48 (1994); Carl Shapiro, *Patent Reform: Aligning Reward and Contribution* 33–35 (Nat'l Bureau of Econ. Research, Working Paper No. 13141, 2007), available at <http://papers.nber.org/papers/w13141>.

64. See Vandana Shiva & Ruth Brand, *The Fight Against Patents on the Neem Tree*, in LIMITS TO PRIVATIZATION: HOW TO AVOID TOO MUCH OF A GOOD THING 51, 52–54 (Ernet Ulrich von Weizsäcker, Oran R. Young & Matthias Finger eds., 2005).

medicines.⁶⁵ The World Trade Organization (WTO) has its own vocabulary, called “flexibilities,” that allow countries to issue compulsory licenses for generic medicines.⁶⁶ The head of the WTO has been upset at my public criticisms of TRIPS, especially in those lectures in which I explain how the WTO is causing people to die because without access to generic medicines, the poor in developing countries suffering from life threatening diseases simply cannot afford to pay the “brand name” prices. He wrote me to remind me that I was forgetting about the *flexibilities*. But he is forgetting about the inflexibilities in these flexibilities. They are designed to make it difficult to issue compulsory licenses even for life saving generic medicines. If the WTO really were interested in making sure people had access to generic medicines, the set of procedures would look very different. There might, for instance, be a list of life saving drugs, or drugs that addressed debilitating disease, in which any generic producer could sell in any country whose income was below a critical threshold. Even better would be the reverse presumption: any generic producer could sell any drug in any country whose income was below a critical threshold unless the owner of the patent substantiated that it was a lifestyle drug, of little value in addressing either life-threatening or debilitating diseases.

As it is, not only do the rules make it difficult for developing countries to get access to these vital medicines at prices that they can afford, but the United States exacerbates the problem by coming down hard on any country that attempts to use a compulsory license. The United States threatens to take all kinds of other actions (and there are a variety of actions that are costly to a developing country going against its wishes), even when the country is complying with all the rules of TRIPS. So, it is not just how the rules were designed but also the way they are being implemented that has made it more difficult to get access to these generic medicines.⁶⁷

65. *See supra* Part I.A.1.

66. World Trade Organization, Ministerial Declaration on the TRIPS Agreement and Public Health, WT/MIN(01)/DEC/2, 41 I.L.M. 755 (2002), available at http://www.wto.org/English/thewto_e/minist_e/min01_e/mindecl_trips_e.pdf (recognizing the “flexibilities” of the TRIPS agreement).

67. The provisions on data exclusivity which have been included in many of the bilateral trade agreements that the United States has signed have also exacerbated the problem of access to generic medicines. Even if a compulsory license is issued, there is an attempt to restrict the use of data that might be required to establish the safety and efficacy of the generic drug. Although there are changes to the regulatory structures that might allow developing countries

Reduced access to generic medicines is one of the most important and most visible concerns of the developing countries, but there are a whole set of other concerns. One of the complaints of the developing countries is that although they are being forced to pay high prices for brand name drugs, the current system provides little incentive for research and development on the diseases that afflict them. I mentioned that the drug companies are spending more money on marketing and advertising than on research, and more money for research on lifestyle drugs than on lifesaving drugs.⁶⁸ Almost all the money that they spend on lifesaving drugs goes toward diseases prevalent in advanced industrial countries, which is predictable. One of the problems of being poor is that you do not have any money and therefore cannot spend a lot of money on drugs, even though if you do not buy the drugs you may die. There is clearly a strong potential demand for these drugs from poor countries, but the poor do not have the income to convert this potential demand into a real demand. The drug companies, of course, realize this; some of them have been very upfront about it. They admit that the patent system does not provide incentives for developing cures or vaccines for the diseases that afflict the poor, especially the poor in developing countries. The World Health Organization has finally also recognized that the intellectual property regime is not addressing these concerns of the developing countries.⁶⁹

The other concern, which I mentioned earlier, is the gap in knowledge that separates the developing and developed countries: TRIPS has made it more difficult to close that gap. More broadly, even advocates of free trade, like Jagdish Bhagwati, argue that TRIPS should never have been part of the WTO.⁷⁰ At the same time, as I have already made clear, TRIPS provides little protection for the

to circumvent the restrictive impact—for example, simply by requiring generic producers to show the bio-equivalence of their product to products that have been shown to be safe and efficacious in the United States or Europe—developing countries appear to be under pressure not to make the necessary regulatory changes.

68. See *supra* Part II.A.

69. WORLD HEALTH ORGANIZATION, PUBLIC HEALTH, INNOVATION AND INTELLECTUAL PROPERTY RIGHTS: REPORT OF THE COMMISSION INTELLECTUAL PROPERTY RIGHTS, INNOVATION AND PUBLIC HEALTH (2006), available at <http://www.who.int/intellectualproperty/documents/thereport/ENPublicHealthReport.pdf>.

70. See, e.g., Jagdish Bhagwati, *Don't Cry for Cancún*, 83 FOREIGN AFF., Jan./Feb. 2004, at 52, 56–57 (“Intellectual property protection is a matter of collecting royalties, and including them in a trade institution such as the WTO seriously distorted what the organization should accomplish.”).

intellectual property of developing countries. It is not just an issue of biopiracy but also protection of biodiversity. This is not, of course, just a matter of TRIPS, but also of the Biodiversity Convention—the United States has refused to sign the convention that was intended to provide some protection for their biodiversity largely because the drug companies do not want to pay for the use of genetic materials obtained from developing countries.

Given all of these problems, it is not surprising that the developing countries have called for a development-oriented intellectual property regime, which I mentioned earlier. It should be clear that there is no reason to expect that the design of an IPR system, which balances costs and benefits of intellectual property protection, that is optimal for the United States would also be optimal for developing countries. The developing countries are, as a result, calling for a more balanced intellectual property regime, one that reflects the costs and benefits to *their* economies.

B. Prizes

One alternative to the patent system is called the *prize system*. This entails giving a prize to whoever comes up with an innovation, or at least those innovations that meet announced objectives. For instance, the person who finds a cure or a vaccine for AIDS or for malaria would get a big prize. If a person comes up with a drug with slightly different side effects than existing drugs (but which is otherwise no more effective) he or she might get a small prize. In other words, the size of the prize would be calibrated by the magnitude of the contribution.

This idea is actually an old one. The Royal Society of Arts and Technology have been advocating and even using prizes to incentivize the development of needed technologies for some two centuries. For instance, they thought it was important to come up with an alternative to chimney sweeps; small, underfed boys used to be sent down chimneys. It was not good for the health of these young boys and not a socially desirable way of cleaning chimneys; but not cleaning chimneys meant increasing the risk of fire, with serious consequences. Thus, the Royal Society offered a prize to anybody who invented a mechanical way of cleaning chimneys. The prize provided an incentive, and it worked. A patent system might also have motivated the development of a mechanical device (though it did not), but if it had, there might have been a problem. The owner of the patent might

have been tempted to attempt to maximize the return to his innovation by charging a high fee for its use. That might mean that only rich families could afford to use the mechanical device, and young boys' lives would have continued to be put at risk.

There are a whole host of other things for which they have offered prizes.

The current patent system is, of course, similar to a prize system, but it is a very inefficient one, because the "prize" is a grant of monopoly power, and with monopoly power there are incentives to restrict the use of the knowledge. One of the characteristics of a desirable innovation system is that the ideas and innovations, once developed, be widely used and disseminated, but the patent system is designed to restrict the use of knowledge. The alternative is to use the competitive market to ensure efficient dissemination; giving a license to a large number of people uses the force of competition to drive down the price and to increase the usage of the knowledge. In both cases, market forces are used: one is the incentive of a monopoly to restrict knowledge and raise prices, the other is the market force of competitive markets to drive down prices and extend the benefit of knowledge widely.

Moreover, the prize system has the advantage that there is less incentive to waste money on advertising and to engage in other anticompetitive behaviors designed to enhance monopoly profits. I mentioned that the drug companies spend more on advertising and marketing than they do on research. These marketing expenditures are designed to reduce the elasticity of demand, which allows the owner of the patent to raise prices and increase monopoly profits. From a social point of view these expenditures are totally dissipative.

There is today a widespread recognition that drug companies have insufficient incentives to develop medicines for the diseases that afflict the poor, simply because there is no money in those drugs. One of the widely discussed ideas for addressing this problem is a guaranteed purchase fund, where the World Bank or the Gates Foundation would guarantee one or two billion dollars to someone who discovers (and patents) a vaccine or a cure for AIDS or malaria or some other disease afflicting the developing world *for the purchase of the drug*. In effect, there would be a guaranteed market. The guarantee of purchasing one or two billion dollars of the drug would act like a prize, and a sufficiently large guarantee would motivate research. These guaranteed purchase funds, however, would still maintain the inefficiency of the monopoly patent system. The

discoverer receives his “prize”—the monopoly profits—by charging monopoly prices. The poor who get the drugs through the guaranteed purchase fund do not, of course, pay the monopoly price. But the funds are limited. When the funds are used up, a government that wants to provide to its citizens, say, the malaria medicine that has been incentivized through the guaranteed purchase fund will have to pay the full monopoly price. Money spent to purchase this drug at the monopoly price is money that cannot be spent on the country’s other health needs. It is a transfer payment to the monopolist, beyond what the monopolist may have needed to undertake the research. It is far better to use the money for the guaranteed purchase fund to offer a prize, or to buy the patent, and make it available freely (or to anyone willing to pay a limited licensing fee). In short, in areas where there are well-defined needs (such as the need to develop a malaria vaccine) both the prize system and the patent system can provide comparable incentives to undertake research. Both have as an advantage over government-funded research that no one has to pick who should undertake the research: there is a process of self-selection; those who think that they have the best prospects of succeeding (and are able to finance the research and willing to bear the risk) undertake the project. But the prize system uses the force of competitive markets to ensure the widespread dissemination of the benefits of the innovation; the patent system uses monopoly power, restricting the usage, and often distorting the markets in other ways.

C. *A Portfolio Approach to Innovation*

Intellectual Property rights should be part of an innovation system that also includes prizes and government-supported research and grants (which are probably the most important component of the innovation system, in supporting basic research). Each of these has its strengths and weaknesses. Table 1 provides a chart of some of the attributes of these three alternatives. We should have a portfolio of instruments, but, in my view, in the current portfolio, too much weight has been assigned to patents.

The first attribute I list is *selection*. One problem facing any innovation system is how to select those to engage in a research project. The advantage of both the patent and the prize system is that they are decentralized and based on self-selection. Those who think that they are the best researchers make the decision to undertake the research. They make the investment, risking their own money, in the belief that they have a good chance of winning the prize (the formal

prize, or the prize of the patent). The prize and patent systems have this advantage over the government-funded research, where there is a group of peers (or bureaucrats), deciding who is the best researcher. There is obviously, in addition, a concern about “capture” of the research-awarding process, for example by political interests whose agenda may not be the advancement of science and technology.

Table 1. Comparing Alternative Systems

Attribute	Innovation System		
	Patent	Prize	Government-Funded Research
Selection	Decentralized, self-selection.	Decentralized, self-selection.	Bureaucratic.
	Lacks coordination.	Lacks coordination.	More coordination possible.
Finance (tax)	Highly distortionary and inequitable.	Can be less distortionary and more equitable.	Most efficient.
Dissemination Incentive	Limited—monopoly.	Strong—competitive markets.	Strong.
Risk	Litigation risk.	Less risk.	Least risk.
Innovation Incentives	Strong but distorted.	Strong, less distorted. Requires well-defined objectives.	Strong non-monetary incentives.
Transaction Costs	High.	Lower.	Lower.

On the other hand, one of the disadvantages of both the patent and the prize system is the lack of coordination. From a societal point of view, there is the risk of excessive duplication.⁷¹ The lack of coordination increases the cost of doing research. One of the risks that each researcher faces is that he does not know how many other people are engaged in that research. That increases the risk someone *else* will get the patent or prize first. Those engaged in research may demand increased returns to compensate them for the increased risk;

71. I say “excessive” because it may in fact be optimal to have several independent, parallel research efforts.

in effect, the lack of coordination discourages innovation. The government-funded research can be more coordinated.

In regards to finance, the patent system is the worst of the three systems. It is highly distortionary and inequitable in the way funds to support research are raised—by charging monopoly prices, for example, on the sick. By the same token, the transactions costs (especially those associated with litigation) and the distortions in the economic system are much higher with a patent system than with the other two.

In particular, with respect to the dissemination of knowledge and its efficient use, government-funded research is best (because knowledge is generally made freely available); the prize system is second (though there may be little difference with government-funded research if, after the prize is awarded, knowledge is made freely available, or, if, with government-funded research, the government charges a licensing fee); and the patent system is the worst, given that it relies on monopolization, which entails high prices and restricted usage. In short, under the prize and the government-funded research systems, knowledge, once acquired, is more efficiently used. These are among the key advantages of these alternatives.

There is a very big difference in the nature of the risk faced by researchers in the three systems (besides the risks arising from lack of coordination, just discussed). In terms of risk, the patent system is the worst because of the huge amounts of litigation risk. The government is the best because it has the advantages of paying for the input rather than the output. That is to say, a researcher gets money for his time and other resources spent doing the research whereas in the prize and the patent system researchers only get money if their research is successful—and successful before their rivals.

The reason that risk is important is that in equilibrium consumers have to pay for the risk borne by researchers. People and firms⁷² are

72. The evidence is that capital markets do not fully spread risks faced by firms, because of imperfections of information. *E.g.*, Bruce C. Greenwald & Joseph E. Stiglitz, *Asymmetric Information and the New Theory of the Firm: Financial Constraints and Risk Behavior*, 80 AM. ECON. REV. 160 (1990) (discussing the effect of information imperfections on firm behavior and arguing that informational problems in the capital market cause firms to act in a risk-averse manner). There is also considerable empirical evidence that markets do not efficiently distribute risk, that is firms act in a risk averse manner, even to risks which are uncorrelated with the market. *See, e.g.*, Joseph E. Stiglitz, *Ownership, Control and Efficient Markets: Some Paradoxes*

risk averse, and if they have to bear risk, they have to be compensated for doing so. The patent system makes society bear the cost of that risk in an inefficient way. Under the government financed research system, the risk is shared by society in a more efficient way.

The innovation incentives are strong in the patent system, but they are distorted,⁷³ whereas the prize system can provide equivalently strong incentives that are less distorted.

On most accounts, the prize system dominates the patent system; but the prize system has one limitation: it cannot work when the objective is not well defined. That is why the prize system will never replace the patent system. At the same time, in basic research—the foundation on which everything else is built—government-funded research will continue to remain at the core of the innovation system. No one has proposed otherwise: the costs of restricting the usage of knowledge associated with the patent system far outweigh any purported benefits. The debate today revolves only around applied research, which often entails translating the knowledge acquired in basic research into applications.

CONCLUSION

Intellectual Property Rights are important, but the importance of IPR has been exaggerated, as they form only one part of our innovation system. IPR should be seen as part of a portfolio of instruments. We need to strengthen the other elements of this portfolio and redesign our intellectual property regime to increase its benefits and reduce its costs. Doing so will increase the efficiency of our economy—and most likely even increase the pace of innovation.

in the Theory of Capital Markets, in *ECONOMIC REGULATION: ESSAYS IN HONOR OF JAMES R. NELSON* 311, 321 (Kenneth D. Boyer & William G. Shepherd eds., 1982).

73. They are distorted, as I have noted, because there are incentives to engage in research to innovate around a patent, and to spend money in ways that extend the effective life of the patent. These innovation distortions are in addition to the other market distortions, for example associated with expenditures attempting to make demand curves less elastic.