

ECONOMIC FOUNDATIONS OF INTELLECTUAL PROPERTY RIGHTS

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Introductory remarks

It's a pleasure to be here, at a university where so many people are interested in intellectual property. When I was in the White House on the Council of Economic Advisors, it was hard to get anybody interested in the subject of intellectual property, other than the U.S. Trade Representative, whose view was the stronger the intellectual property regime the better.

My work in this area began some forty years ago. I realized, as I was beginning my work on the Economics of Information, that knowledge and information are really very similar. In fact, you can view information as a particular kind of knowledge, and so the problems that I was in the process of 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. It was clear that the standard paradigm of well-functioning markets solving all problems (that is, Adam Smith's invisible hand) just did not work in this arena. 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. One of the important results in my work, developed in a number of my papers, was that the invisible hand often seemed invisible, *because it wasn't there*.

This led me to a certain degree of skepticism about the standard perspectives on intellectual property. When I was at the Council of Economic Advisors, we opposed the Trade

Related Aspects of Intellectual Property Rights agreement, or TRIPS as it is known.

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. When I went to the World Bank, I continued being involved, perhaps even more so, in the issue, because one of things that 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. The World Bank has an annual report called the World Development Report, where it highlights every year a key issue, and the first year I was at the World Bank we focused on the problems of knowledge for development.¹ I included there a critique of TRIPS, which we argued imposed an unbalanced intellectual property regime.²

The issue of 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 towards a

¹ *World Development Report 1998/1999: Knowledge for Development*, World Bank: Washington, DC, 1999.

² One of my minor victories was that I anticipated the U.S. Treasury's unhappiness with our stance. We welcomed India's criticism that we had not gone far enough in criticizing TRIPS at the meeting of the Board of the World Bank where this was to be discussed. 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 U.S. 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.

knowledge economy. In my recent book *Making Globalization Work*,³ I devote a whole chapter to the problem of intellectual property. How we regulate and manage the production of knowledge and the right of access to knowledge are at the center of how well this new economy, the knowledge economy, works and of who benefits. What is 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 20 years ago I got a letter from a Chinese publisher wanting me to write a preface to a pirated edition of one of my textbooks. As a good 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 over a billion people, it would have been a major accomplishment. Looking at it even in more narrow terms, if even one 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, was not as thrilled about the notion of my ideas reaching the Chinese audience through a pirated version of my textbook as I was.

A little bit later I was at a conference in Taiwan, and at that time, I knew that intellectual property rights were not always strictly enforced there. At 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 got there. 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 be terrible. The other possibility was that they hadn't pirated one of my books and stolen my intellectual

³ WW Norton, 2006.

property, that is to say, 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. When I got to the bookstore, they in fact had stolen it, and I was relieved.

These anecdotes make the point that we, as researchers and academics, want our ideas to be disseminated. We work quite hard, in fact, traveling all over the world to disseminate our ideas. That's very different from what intellectual property does, which is to restrict the use of knowledge in one way or another. Intellectual property is supposed to encourage innovation. This morning I will argue that a poorly designed intellectual property regime—excessively “strong” intellectual property rights—can actually impede innovation.

The Role of Intellectual Property in our Innovation Systems

Let me begin by talking about the role of the intellectual property regime. It is part of society's innovation system, and its intent is to provide incentives to innovate by allowing the innovator to restrict the use of that knowledge by imposing charges, thereby obtaining a return on his investment. But it is important as we think 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. Ideas like asymmetric information are not covered by intellectual property. Sometimes I might wish that they were, as 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.

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 mention later is a prize system, which has actually been a part of the innovation system for several hundred years. I will argue that prizes have marked advantages from a societal perspective over the patent system.

Many of you who are academics may have asked the question, what motivates you? It is clear that monetary returns are only a small part of what motivates you, or you would not be here. Thus, the basic framework of what induces people to engage in research is really not reflected in the intellectual property regime. Obviously, you have to finance research; 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 question is the role of the patent system, or the intellectual property regime more broadly, within the economy’s innovation system. One has to understand the limited (though still important) role of the IPR regime to answer the next question: the design of the patent or IPR regime. There are a host of questions, many which absorb much of the energy of the lawyers involved in obtaining—and fighting—patents. There are issues like 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). Disclosure has long been an important part of the patent and intellectual property regime; 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 is being contested. Microsoft has, by most accounts, not wanted to disclose its code. The European Union has insisted that it do so, and Microsoft has tried everything not to comply with the EU requirement, even to the point of risking millions of dollars in fines.

Furthermore, like 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 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. The rights of governments to issue compulsory licenses are 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 anti-trust action against AT&T in the 1950s, there was the notion that AT&T had to make its patents available to anybody that wanted to use them. In my Tunney filing⁴ in the Microsoft case, I argued that one way of

⁴ *Declaration of Joseph E. Stiglitz and Jason Furman*, Before the United States Department of Justice, United States of America v. Microsoft Corporation (Civil Action No. 98-1232 CKK) and State of New York v. Microsoft Corporation (Civil Action No. 98-1233 CKK). January 28, 2002.

dealing with that company's anticompetitive behavior of Microsoft was to limit its intellectual property rights. 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. There are large costs due to the current patent system, and one of the questions is if there are reforms which could increase its efficiency. To understand these issues one has to look at the economic foundations of knowledge.

Static inefficiency: Knowledge as a public good

The important basic idea here is that knowledge is a *public good*. Economists use the concept of a *public good* as a technical term; Paul Samuelson defined it precisely just over 50 years ago.⁵ A public good is a good whose consumption is nonrivalrous. For instance, only one person can sit in a chair. The same goes for food: if I eat the food, you cannot eat it. These are examples of private goods, where if one person consumes it, another person cannot consume it. However, knowledge 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; although Paul Samuelson did not give a footnote to Thomas Jefferson, the idea of a public good is an appropriation of Thomas Jefferson's property rights. But Jefferson himself was skeptical about the role of property rights. Jefferson said that knowledge was like a candle: when one candle lights another it does not diminish the light of the first candle. Understanding this concept is at the core of

⁵ [Paul A. Samuelson](#) (1954). "The Pure Theory of Public Expenditure". *Review of Economics and Statistics*, 36 (4): 387-389

understanding efficiency in knowledge. It is more efficient to distribute knowledge freely to everybody than to restrict its use by charging for it.

However, free distribution could cause problems for creating incentives for production and 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 an 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. Supreme Court Justice Antonin Scalia called monopoly the supreme evil.⁶ Thus, 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.

Access to medicine

However, if we do not design this legal framework right, 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 this distortion is especially high in the case of life-saving drugs. I opposed TRIPS so strongly in part because 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 will

⁶ In *Verizon Communications Inc v. Law Offices of Curtis V. Trinko, LLP* (U.S., 124 S. Ct. 872, 879 (2004)), “compelling negotiation between competitors may facilitate the supreme evil of antitrust: collusion.”

buy the generic drugs, and the competition with the generics drives down the price of the pharmaceuticals which in turn lowers their profits. One example that shows the magnitude of this, and which has gotten 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; the generic version of the same drugs costs under \$200 for one year's treatment. For 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. When the trade ministers signed the TRIPS agreement in Marrakech 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. That is why TRIPS has generated, not surprisingly, such immense emotional concern.

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: IPR is also used to leverage further monopoly power. The most obvious example is Microsoft, where it has levered its monopoly power in operating systems to obtain a dominant position in applications like Office and Internet Browser. The courts in the United States, in the EU, and in Korea have all ruled against Microsoft. There is no disagreement about the fact that Microsoft has engaged in abusive, anticompetitive practices. The only debate is what to do about it; because it 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, the patent was granted, but it was an excessively generic patent for a four wheel, self-propelled vehicle. (Never mind that somebody else in the rest of the world might have had the idea before this patent was granted; 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. 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.)

In the case of the automobile, the person who got the patent had no intention of developing the automobile; he used it to form a cartel. Those of you from business school know that the best 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 market places are very bad because they drive down prices and erase profits. IPR can be an important way of maintaining a cartel. 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-price, restricted usage vehicle. Ford challenged the patent. Had he not had the resources and the determination, he would not have succeeded in this legal battle. However, he eventually did prevail. Had he failed, the development of the automobile would have been delayed for a long time. (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.) Ordinarily, property rights are argued for as a means of achieving economic efficiency, but 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, and 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. However, the patent system is not an optimal way of raising money because it is not an optimal tax; it creates a particular set of distortions, which is why it is particularly objectionable. Later in this talk, I will discuss the issue of financing research more broadly.)

Schumpeterian competition

It is interesting that standard competitive equilibrium theory paid very little attention to innovation. The only rigorous proof of the efficiency of competitive markets is provided by the Arrow-Debreu model⁷, and that model assumed that technology is fixed. One might think this is strange for economists; 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

⁷ Arrow, K.J. and Debreu, G. (1954) "Existence of an Equilibrium for a Competitive Economy," *Econometrica*. Vol. 22: 265-290.

textbooks (until my textbook came out⁸), 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. 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*.

However, one of the results in my earlier analysis pointed out that Schumpeter was wrong about the temporary nature of monopoly. Monopoly power, once established, can easily be perpetuated.⁹ In fact, there is an incentive to perpetuate that monopoly power, and it is particularly evident in the case of network externalities and in situations where there are important switching costs, such as 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 led it create that power have been terminated.

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 the source of income. (Just as the high transaction costs faced by retirees, if we had privatized social security, would have been viewed as a benefit by Wall Street.) But, from a social perspective, these administrative costs are a social cost, and they are high. These high costs also introduce a high level of uncertainty. Of

⁸ J.E. Stiglitz, *Economics*, First Edition, New York: W.W. Norton, 1993.

⁹ P. Dasgupta and J. E. Stiglitz, "Uncertainty, Market Structure and the Speed of R&D," *Bell Journal of Economics*, 11(1), Spring 1980, pp. 1-28

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.

Dynamic Costs

The patent system can only be justified, given all its costs, in terms of dynamic efficiency. Recent events (in particular those surrounding Microsoft) suggest that these 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 R&D may be less, and there may be important distortions in the way money is spent, that is to say, in the direction of research. Indeed, the patent system may even impede innovation. The patent system, because of its poor design, may even be slowing down the pace of innovation instead of encouraging innovation.

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

The Fundamental problem: the disparity between marginal private and social returns

The fundamental problem is that the rewards do not correspond to the marginal social returns, and everything after really follows from this. The patent system does not reward people on the basis of what is the marginal social return of their contribution. It is a proxy for that, and it is 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.

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 your contribution is just that the idea occurred a little earlier.

For those of us who write articles, this is always a source of frustration, and we like to ignore it. I would like to think that if I had not solved the problem of how markets with asymmetric information work, the problem would not have been solved. The reality is that I know that somebody else would have done, it 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, and from a social point of view, only the extent to which that knowledge occurred earlier than otherwise is what ought to be rewarded; economic efficiency requires that people's compensation is related to their marginal social returns.

The human genome project is a case where there is a clear distinction between what those who got patents 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. There was a race, though, among the private entrepreneurs to complete the project a little faster, and 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 be able to have a patent. That would mean that anybody who wanted to get 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 on the use of this gene. Myriad got this patent and have 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. Of course, if you do not have insurance, and more than 50 million Americans do not have insurance, it means that you cannot afford to have this test; most of these people who do not have insurance also have a 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.

That 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, and so people in Canada can get this test much more cheaply.

There are further distortions associated with monopoly 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. I think Professor Boyle here at Duke was the first person to use that term, "enclosing the commons," which means privatizing something that ought to be in the public domain. In the case of the sixteenth and seventeenth century enclosure movements in Scotland and England, there was allegedly some benefit: privatization led to the more efficient use of the commons. In this case, when what is in the public domain that is privatized is knowledge, there is a cost but no benefit.

This is evident in the controversy over bio-piracy. I was first introduced to the concept of bio-piracy when I was in a small indigenous village in the high Andes of Ecuador. I am always astounded by what people will talk about and what they know about. Those in remote places may know less about some things, but there are certain things that they know a lot about. In one of the villages, they were very worried about what I thought was going to happen to the Euro-Dollar exchange rate, because it affected their sales to Brazil. In this particular village, the

mayor went on at great length about what was going on in Ecuador because of bio-piracy, which is the patenting by American and other foreign companies of indigenous medicines, plants, or a variety of indigenous ideas and traditional knowledge. In other words, taking what was in the public domain and privatizing it, such as with basmati rice that I mentioned earlier.

Another example, in some ways more dramatic, is the healing property of turmeric. Turmeric is a kind of spice, a root, which has been known for its healing properties for hundreds, probably thousands of years in India. Two South Asian doctors working in the United States recognized that, under American law, they could try to get a patent on this; even though it was known in India, they knew that probably the patent examiner in Washington would not know about it. 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. Thus, there is this Catch 22. 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, they got the patent, with the result that if India had recognized and enforced this patent, it would have meant that anyone in India that 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.

Why patents may impede innovation: raising the cost of knowledge

These all help explain why it is that the returns to patents do not correspond to the social benefit, but I want to go further and explain why it is that patents may slow innovation. The most important aspect of this is that knowledge is the most important input into the production of knowledge. Intellectual property restricts this input, the access to knowledge. Another way of thinking about it is in terms of any production process. If you increase the price of the input, it reduces the supply of the output. In this case, the input is knowledge, so patents increase the price of the input, which in turn reduces the output.

Why patents may impede innovation: monopolization

Of course, incentives for innovation with monopoly are less than in a more competitive marketplace. Monopolists can, in addition, increase their profit by discouraging innovation by rivals and raising rivals' costs; it was 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. That argument was also an important part of the EU case against Microsoft. 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.

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; while there still may be boundary disputes, a piece of property can be well-defined. However, intellectual property is different; it is very hard to define precisely what is your property, what is in the public domain, and what is somebody else's property. Intellectual property does not have clear longitude or latitude, or any kinds of specifications. The result is what is called a patent thicket, and that patent thicket can 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; we saw how patents almost suppressed this important innovation. The other important innovation was the airplane, and a patent thicket did impede the development of the airplane. In North Carolina, everyone knows about the Wright brothers and their first manned flight at Kitty Hawk in 1903; they are even on the license plates in North Carolina. The Wright brothers got some key patents, but so did another innovator, called Curtis. 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 came along, when it was recognized that it was more important to be able to bomb Germany than to allow the patent lawyers to make money. The United States Government basically seized the patents and determined how much was to be paid to whom. The development of the airplane proceeded very quickly thereafter.

Distortions in the patterns of research

Of course, patents may not only discourage innovation generally, but they also may lead to a distortion in the pattern of innovation. On the one hand, R&D activity can be directed at circumventing monopolies – getting around a patent – or strengthening monopolies. Arguably, one of the concerns about Microsoft’s new Vista operating system is that it is being designed to make interoperability more difficult in order to strengthen its monopoly power. These R & D expenditures actually lower welfare, in contrast with the social returns from creating new products and lowering costs, both of which enhance welfare; this illustrates the point that strong intellectual property rights may not lead to a faster pace of innovation.

The Innovation System

As I said, one needs to look at the patent system, or copyright system, within 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*. Knowledge is not costless, so there has to be some way of financing it. This also raises the issue of *risk absorption*; research is risky: if you knew the outcome, it would not really be research. There is an inherent uncertainty about research. Fourthly, you also have to create *incentives* for individuals to work hard, and fifthly, you have to *disseminate* the knowledge when it is produced.

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 economic system. I already referred to the patent system’s high distortionary cost as well as the transactions costs. I would argue that a well-designed innovation system will be a *mixed* system, involving patents and other elements,

like prizes and government provision of basic research, for instance, at a university. Then the questions become, 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?

The patent system

The critique of the patent system is that, besides the large static and dynamic distortions that I have just described, there is a problem of finance. As I said before, under the patent system research is financed out of monopoly profits. But you can view, conceptually, the difference between the price and the marginal cost as a tax. In other words, you could think of the patent system as a competitive pricing system, but then adding onto that a tax on top of the marginal cost, to raise the price to what is charged by the monopolist; in other words, *if* all the monopoly profits were devoted to research, one could view the monopoly distortion as a tax, with the revenue being used to finance research. Part of the problem 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. 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 life-saving drugs. So, there is a lot of what you might call “leakage” in this particular tax system. It is an inefficient tax system in delivering the revenue into the important areas of research, where it should go.

Putting that problem aside, is it a good tax system? Is it a good way of raising revenue for financing R&D? The answer is no. It has one property which many people may think is desirable (although, as I shall explain, I think even this property may be undesirable): it is a

benefit tax. That is to say, the only people who are 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 a good thing to have a benefit tax, which is why there is relatively little reliance on benefit taxes. It is particularly not a good 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, if you wrote down any utilitarian or Rawlsian social welfare function, (or any philosophical model social justice), you would not, in the case of drugs, use a benefit tax: you cannot justify it. There are other public services in which a benefit tax might be justified, but not in the areas of life saving 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 least distortionary tax systems. The benefit tax is more distortionary and more inequitable than alternative tax systems.

There are, in addition, a number of inequities and inefficiencies associated with patents as a source of finance for research. I mentioned at the beginning of this talk that knowledge was a global public good, which means the benefits can be enjoyed by anybody in the world. The standard principles of equitable finance say that a public good should be financed by those most able to pay. Unfortunately, IPR does not, for the most part, recognize differences in circumstances other than the extent to which profits can be extracted. In other words, IPR will recognize differences in elasticities of demand, but not any other circumstances, and therefore inherently represents an inequitable way of financing research.

The bottom line is that the way we raise 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 gotten adequate attention: the bias towards excessive patenting. That arises because there is an asymmetry in the granting of a patent and fighting a patent. When you get a patent, you enclose the commons, making private what would otherwise be public, and so you get a private return for getting a patent. But when you challenge a patent, you create a public good, because if you successfully challenge a patent then that piece of knowledge becomes in 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 underinvestment in fighting bad patents, and an overinvestment in trying to get bad patents. (The problem is exacerbated by poor procedures.) The very structure of the patent system leads to a bias towards excessive patenting.

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 bio-piracy. The advocates of the patents often argued that one should not worry about bio-piracy, because the patents will not survive. However, even if that conclusion were true (which does not appear to be the case), it is very expensive to challenge these patents. India is a relatively rich poor country, and it can afford challenging them, but Ecuador does not have the resources. Even in the cases where they have been successfully challenged in some courts, other courts have not been swayed. One of the other examples of bio-piracy entails the variety of uses of the neem tree oil, which is employed in India for a range of purposes. The U.S. and Europe granted a large number of patents for a variety of uses of neem

oil, 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 U.S. refused to overturn the patents. Thus, the neem oil patents continue to be enforced in the United States even though in another jurisdiction they've been overturned.

One of the complaints I mentioned earlier was access to generic medicines in the TRIPS agreement. The WTO has its own vocabulary, called "flexibilities," that allow people to issue generic medicines. These flexibilities are very inflexible, however; they are designed to make generic medicines difficult to get, through a whole set of complicated procedures. If the WTO really was interested in making sure people had access to generic medicines, the set of procedures would look very different. The head of the WTO has been upset at my public criticisms of TRIPS, especially in those lectures where I explain how the WTO is causing people to die; he thinks this is an unfriendly act towards the WTO. He wrote me to remind me that I was forgetting about the flexibilities. But he is forgetting about the inflexibilities in these flexibilities and that the United States exacerbates the problem by coming down hard on any country that attempts to use a compulsory license. The US threatens to take all kinds of other actions (and there are a variety of actions which 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.

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 while they are being forced to pay high prices for brand names, the current system provides little incentives for R&D 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 life-saving drugs. Almost all the money that they spend on life-saving drugs goes towards diseases of the 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 developing countries. The World Health Organization has finally also recognized that the intellectual property regime is not addressing these concerns of the developing countries.

The other concern, which I mentioned earlier, is the gap in knowledge that separates the developing and developed countries, and 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. At the same time, as I have already made clear, TRIPS provides little protection for the intellectual property of developing countries. It is not just an issue of bio-piracy but also protection of biodiversity, and, although this is not just a matter of TRIPS, but also of the Biodiversity Convention, the fact is that the U.S. has refused to sign the Convention that was intended to provide some protection for their biodiversity.

Given all of these problems, it is not surprising that the developing countries have called for a development-oriented intellectual property regime. 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 which reflects the costs and benefits to *their* economies.

Prizes

I want to talk very briefly about an alternative to the patent system, called the prize system. This entails giving a prize to whomever comes up with an innovation, or at least those innovations for which there has been 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 prize would be calibrated by the magnitude of the contribution.

This idea is actually an old one. I was giving a talk in Edinburgh as part of the book festival last August on my new book, *Making Globalization Work*. My lecture was sponsored by the Royal Society of Arts and Technology. They were extremely enthusiastic about my book, in which I discuss this idea more extensively, because they say they have been advocating and even using this prize system 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 obviously 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. 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 dissemination and the use of knowledge, and the patent system is one which 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 earlier that the drug companies spend more on advertising and marketing than they do on research. (There might even be more *disinformation* if they could get away with it.) 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. Thus, the patent system provides incentives to spend money to reduce elasticity of demand and enhance monopoly profits; from a social point of view these expenditures are totally dissipative.

One of the ideas advocated by many people who are aware of the problems of the current system is a guaranteed purchase fund, where the World Bank or the Gates foundation would guarantee \$1 or \$2 billion to someone who came up with a vaccine or cure for AIDS. Poor

people cannot afford to buy these drugs, but the guarantee of purchasing \$1 or \$2 billion of the drug would act like a prize. A sufficiently large guarantee would clearly motivate research. However, these guaranteed purchase funds would still maintain the inefficiency of the monopoly system. It is far better to use that guarantee to buy the patent and make it available freely than to use the monopoly system.

A portfolio approach to innovation

I want to conclude by arguing that we should view IPR as part of an innovation system that also includes prizes and government supported research and grants, which are probably the most important part in supporting basic research. Each of these has their strengths and weaknesses. Table I provides a chart of some of the attributes of these three alternatives. My view is that we should have a portfolio of instruments, but that 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, based on self selection. Those who think that they are the best researchers make that decision to undertake the research, and they think that they are going to win the prize. So, it has that 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.

On the other hand, one of the disadvantages of both the patent and the prize system is the lack of coordination. 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, and, in some cases, this could actually discourage innovation. The government-funded research can be, obviously, more coordinated—and the adverse effects to the individual research are obviously less.

In regards to finance, the patent system is the worst of the three systems. It is highly distortionary and inequitable. By the same token, the transactions costs 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 (since it 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, since it relies on monopolization—entailing 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. 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 doing the research, whereas in the prize and the patent system a researcher only gets money if his research is successful—and successful before his rivals. The reason that risk is important is that in equilibrium consumers have to pay for the risk borne by researchers. People and firms¹⁰ are risk averse, and if they

¹⁰ The evidence is that capital markets do not fully spread risks faced by firms, because of imperfections of information.

have to bear risk, they have to be compensated for doing so. Thus, the patent system makes society bear the cost of that risk in an efficient 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, whereas the prize system can have equivalently strong incentives which are less distorted.

On most accounts, the prize system dominates the patent system; but the prize system has one limitation: the problem with the prize system is that 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—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.

In conclusion, IPR is obviously important, but the importance of IPR has been exaggerated, as it is 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.

COMPARING ALTERNATIVE SYSTEMS

	Patent	Prize	Government Funded Research
Selection	Decentralized, self-selection Lacks coordination	Decentralized, self-selection Lacks coordination	“bureaucratic” But can be more coordinated
Finance (tax)	Highly distortionary and inequitable	Can be less distortionary and more equitable	Most efficient
Risk	Litigation risk	Less risk	Least risk
Innovation Incentives	Strong but distorted	Strong, less distorted Cannot work when objective is not well- defined	Strong non- monetary incentives
Dissemination Incentive	Limited—monopoly	Strong—using competitive markets	Strong
Transaction Costs	High		