

With some important exceptions, empirical evidence suggests patent protection reduces innovation.

Of Patents and Property

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There is property, and then there is property. Scholars hotly debate whether intellectual property is truly property and which lessons learned about property rights in land should be applied to property rights in inventions and other intellectual property.

A patent and property kerfuffle between the University of Chicago's Richard Epstein and California, Berkeley's Peter Menell played out in recent issues of *Regulation* and other venues. (See "The Property Rights Movement and Intellectual Property" and "Intellectual Property and the Law of Land," Winter 2007; "A Final Response to Menell," Spring 2008.) Epstein and Menell debated the degree of kinship between patent law and other forms of property law, focusing on the proper role of injunctive relief in patent lawsuits. Recently, in *eBay v. MercExchange*, the Supreme Court eliminated the presumption that an injunction is appropriate in all but exceptional cases of patent infringement. Epstein, responding to the decision, acknowledged that inventions are an unruly sort of property and that injunctions might not be appropriate for some types of patent cases, but he nonetheless criticized *eBay* and concluded "strong property protection via injunctions" is necessary to limit uncertainty and assure adequate rewards to inventors. Menell defended the Court for restoring the traditional discretion of trial court judges to fashion equitable relief. He argued that the patent system needs "more flexibility at the remedy stage" to cope with problems plaguing the

U.S. patent system. Epstein prefers to deal with problems in the patent system directly; he says, "Direct fixes for those defects are surely preferable to mucking around with the core protection of injunctive relief."

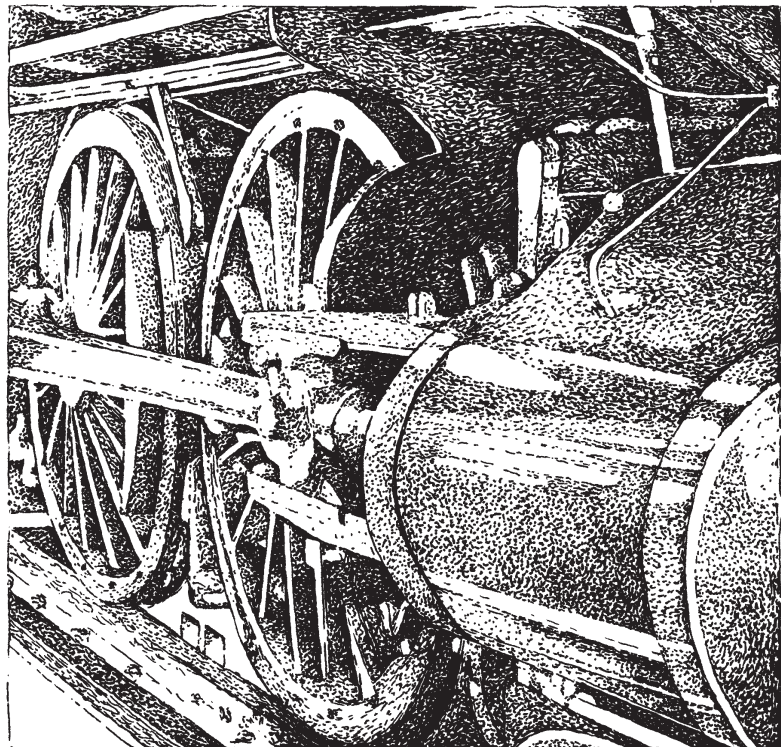
While Epstein and Menell engage these issues on a theoretical plane, we think that at the heart of their disagreement is an empirical question: Do patents, in fact, behave substantially like property rights in tangible assets? If they do, then mucking around with injunctive relief might well increase uncertainty; if not, then the issue is a bit more complicated.

This empirical question is the focus of our new book, *Patent*

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This paper is adapted from Bessen and Meurer's book Patent Failure: How Judges, Lawyers, and Bureaucrats Put Innovators at Risk (Princeton University Press, 2008).



Failure, and we will recount part of our book's discussion in this article. Economists have adduced abundant evidence that strong, tangible property regimes promote markets, investment, and economic growth. Thus, we ask, do patents likewise promote markets for technology, investment in research and development, and economic growth? The tricky part of this sort of analysis is establishing causation as well as correlation. It is quite evident that wealthier and technologically advanced countries have stronger and better-developed patent systems. That is, well-developed patent systems might cause economic growth in those nations. Or it might be, instead, that successful technology companies or other groups, such as the patent bar, have lobbied for patent protection. In the latter case, economic success promotes the expansion of the patent system, not the other way around. Indeed, patent systems in advanced nations today consist of highly sophisticated institutions supported with substantial funds. Those institutions were not simply legislated, but they developed, along with a wide variety of other legal and social institutions. Their evolution required both extensive experience and a large allocation of resources, and they would seem as out of place in 19th century America as they would in many of today's less developed nations. Thus the correlation between the sophistication of a nation's technology and the sophistication of its patent system does not provide evidence of a causal link by itself. A more advanced analysis is required.

Empirical research has advanced to the point that we can do a more rigorous comparison of patents and other forms of property. Our objective is not to obtain a conclusive finding on whether patents are good policy instruments or not — whether, for instance, they increase “net social welfare.” Instead, we simply aim to compare the evidence of economic payoff from general property rights to the evidence on the economic payoff from patents. If the analogy to traditional property is close,

then we should see similar evidence of economic payoff.

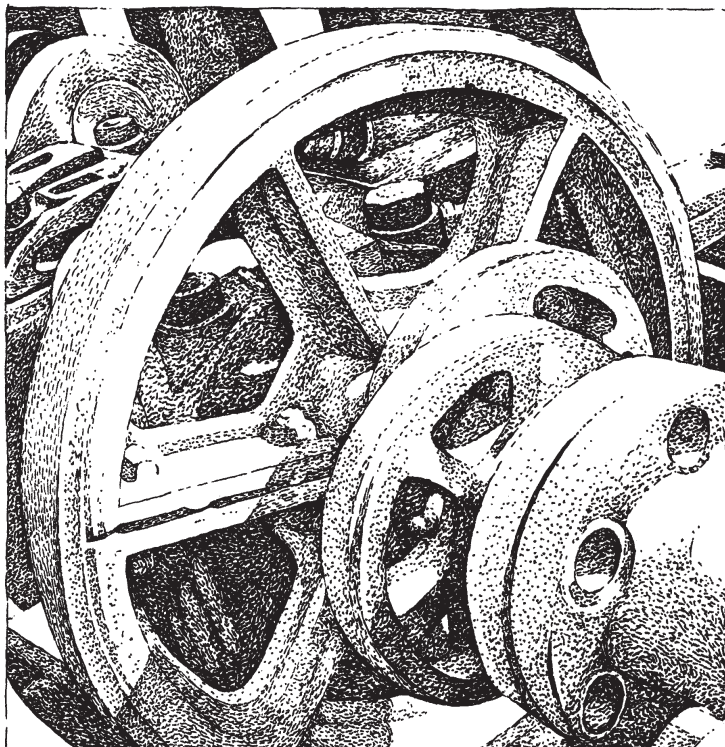
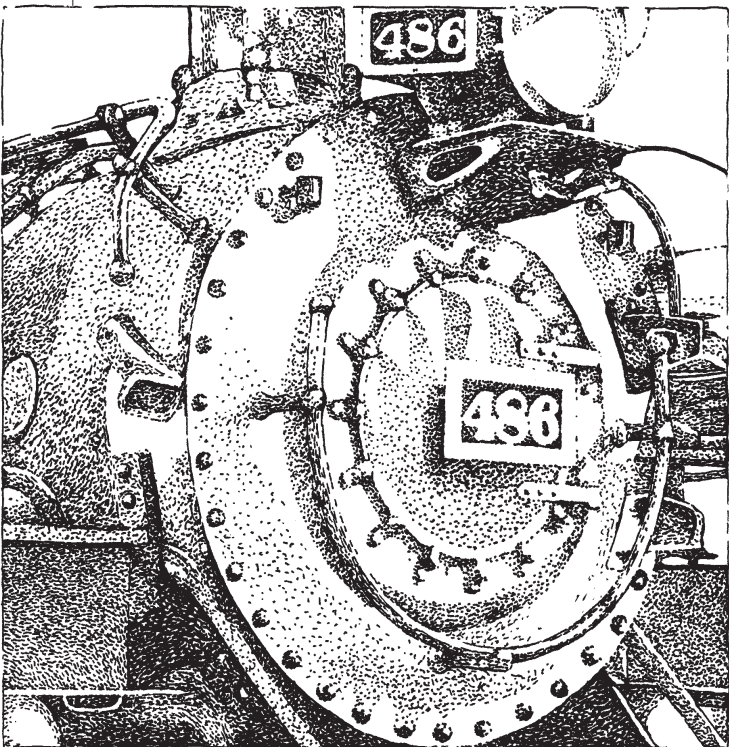
As we shall see, the evidence paints a rather mixed picture. In some industries, such as pharmaceuticals, patents provide strong positive incentives to invest in innovation. But in many other industries, perhaps most, patents fail to perform like property and they may actually discourage innovation.

HISTORICAL EVIDENCE

In what ways might we expect patent rights to perform similarly to rights in tangible property? Property rights provide incentives to invest, to trade, and to finance. Similar economic benefits are ascribed to patents. Patents provide incentives to invest in research and development and other innovative effort. Patents also provide incentives to invest in the commercialization and further development of an invention, and for investors to invest in companies holding patents. In addition, patents provide security to license and sell technology. These incentives are held to promote innovation and economic growth.

Economic historian and Nobel Laureate Douglass North has argued persuasively that the British Industrial Revolution was facilitated by secure property rights. Many European nations were hobbled with feudal customary rights that were often disputed, undocumented, and hard to establish. In contrast, by the time of the Industrial Revolution, writes economic historian Joel Mokyr, Britain's government was “one of, by, and for private property.” Britain had well-defined private property rights, less arbitrary courts and police, and institutions that limited confiscatory taxation. That reduced transaction costs and encouraged the growth of markets, allowing for greater specialization, economies of scale, and more secure returns on investment. Those benefits are seen as important preconditions for the innovations and, ultimately, the economic growth that arose from the Industrial Revolution.

MORGAN BALLARD



North includes patents among Britain's advantageous property rights during the Industrial Revolution. Britain's patent law dates from 1624, while most other European countries did not have patent laws until the end of the 18th century. But more than a few economic historians are skeptical about the significance of patents for the British Industrial Revolution, as Mokyr notes.

One reason for his skepticism is that relatively few inventors of key technologies prior to the mid-19th century seemed to benefit from patents. James Hargreaves and Samuel Crompton, inventors of cotton spinning machines, did not obtain patents. Crompton did not obtain a patent because Richard Arkwright held a broad patent on spinning technology. (Crompton did later receive compensation from Parliament.) Arkwright had patents, but his key patent was challenged and invalidated; he nevertheless made a fortune. Edmund Cartwright, inventor of

inventive step prior to the 20th century. One study found that 42 percent of patents were either partly or wholly anticipated by earlier patents and many inventions were patented multiple times. Also, prior to 1883, the British patent system was very costly, both in fees and in the indirect costs of bureaucratic red tape.

H. I. Dutton is perhaps the economic historian with the most optimistic interpretation of the British experience. He cites evidence that hundreds of inventors did patent, many obtained multiple patents, and that there was some trade in patents. This suggests that some inventors obtained some benefit from patents, but it does not mean that they received a net benefit from patents — the costs of litigation and disputes can easily offset the gains. Dutton and others recognize that litigation costs were substantial. He floats the idea that despite those major problems, patents may have encouraged innovation because perhaps inventors accepted the “socially wholesome illu-

In Britain, relatively few inventors of key technologies prior to the mid-19th century seemed to benefit from patents.

the power loom, and Richard Roberts, inventor of a successful automatic spinning machine, both obtained patents on their inventions, but were unable to earn profits from them despite the ultimately wide adoption of their machines. John Kay, inventor of an improved weaving shuttle, and the Fourdrinier brothers, inventors of a paper-making machine, were both nearly ruined by the costs of patent litigation.

James Watt is a happy and prominent exception. Watt obtained a patent on his improved steam engine design and, thanks in part to Parliament's extension of the patent term, the firm of Boulton and Watt made a substantial return on the investment needed to commercialize the invention. But we should not overestimate the significance of Watt's example. His reputation appears to have outpaced the merit of his inventions, which made only a limited contribution to economic growth. Most of the impact of the steam engine on economic growth appears to have come much later, after many additional improvements had been made in steam engine efficiency. This is significant because Nuvolari shows that most of this later increase in efficiency can be attributed to “collective invention,” where engineers actively shared inventions rather than patented them.

Economic historians have suggested several reasons why patents may not have played a role similar to other property rights in Britain. A major problem was that patent litigation was costly and risky. Courts were not always sympathetic to patent holders, patent law was complex, and patents could be invalidated. Litigation may have been more common than necessary because Britain had a registration system instead of patent examination. British patents were not examined for novelty or

“invention” that the patent system was more perfect than it really was. But Christine MacLeod finds that about nine out of 10 patents arose in industries that saw little innovation, and that patenting was at best loosely related to technological innovation. And although there were some inventors who obtained 10 or more patents and although there was some trade in patents, the numbers were small, especially in comparison to those in the United States, even though the United States lagged in economic development. Petra Moser, using information on inventions exhibited at the 1851 Crystal Palace World's Fair, finds that only 11 percent of British inventions were patented. So it seems particularly hard to argue that British patents played a very significant role during the Industrial Revolution, even if some inventors had irrational expectations of the patent system.

UNITED STATES The experience in the United States was quite different from that in Britain. The United States initiated patent examination in 1836 and patent fees were quite low. When examination standards were relaxed during the 1850s, patent applications soared, leading to what Zorina Khan calls the “Democratization of Invention.” Individual mechanics and farmers could and did obtain patents in large numbers, and an active market for patents developed that lasted until the end of the century. And although there were some well-known cases where patents were “invented around,” such as Eli Whitney's cotton gin and Francis Cabot Lowell's power loom (which he copied from British models), many of the famous inventors in the United States did make profits from patented inventions.

So patents may have played a more positive role in the economic growth of the United States, although research has not

yet established the extent of that contribution. On the other hand, the ready availability of patents also had a dark side: it permitted small groups or individual firms to accumulate patent “thickets” or to set up patent pools that may have substantially extended their market power and posed entry barriers or disincentives to other innovators. The first patent pool was formed for sewing machines in 1856 after extensive litigation. Also in the 1850s, the Draper Co. perfected the technique of amassing a large number of patents to extend its monopoly, first with patents on loom temples, then with spinning spindles beginning in the 1870s, and later with the Northrup automatic loom in the 1890s. Draper controlled over 400 patents on spindles and over 2,000 patents on the automatic loom. This arsenal and Draper’s aggressive litigation posture allowed it to monopolize key textile equipment for many decades.

Despite its faults, the U.S. patent system possibly had a much more positive effect on innovation and economic growth than the British system. But the differences only underline the contingent nature of the benefits of a patent system. They depend very much on the details of the system and the nature of the institutions that support it.

INTERNATIONALLY There were also important differences across industries and technologies. This is evident in Moser’s research on the effect of patents on innovation in different countries during the 19th century. Moser measures national innovation by looking at the number of important innovations (selected by panels of experts at the time) each nation displayed at world’s fairs in 1851 and 1876. She finds that nations with patent systems were no more innovative than nations without patent systems. Similarly, nations with longer patent terms were no more innovative than nations with shorter patent terms. However, patents did seem to make a difference in national patterns of specialization. In countries without patents, innovation was centered on industries that appeared to have strong trade secrecy protection; in countries with patents, this was not the case.

So, in contrast to general property rights, patents had a much more uneven and limited effect on economic development during the 19th century. The role of patents seems to have varied depending on the specific features of patent institutions, the technologies, and industries involved.

CROSS-COUNTRY STUDIES

In recent years, economists have developed a large literature comparing the economic performance of different countries as a means of identifying factors that influence economic growth. The studies use panels of data that typically consist of dozens of countries observed over several decades. They conduct multiple regression analyses to control for a wide variety of factors that are thought to influence growth. Property rights institutions have featured prominently in this literature. Patent and other intellectual property rights also appear in several studies; the results for those measures have been quite different from the results for more general measures of property rights.

Early studies used measures of political instability and measures of civil rights as proxies for the quality of property

rights institutions. Philip Keefer and Stephan Knack developed indices that capture contract enforceability, risk of government expropriation, rule of law, constraints on the executive branch of government, and bureaucratic quality. They incorporated those variables in a regression of each country’s per-capita economic growth rate, including additional controls for education, labor force growth, and other factors. Across a variety of specifications, they found that the quality of property rights institutions is strongly and positively correlated with a nation’s economic growth rate.

However, Keefer and Knack did not control for “reverse causality,” that is, for the possibility that economic growth may have caused improvements in property rights institutions instead of the other way around. As above, this might be the case if, say, wealthier nations tended to allocate more resources to improving property institutions because wealthier nations have more property potentially at risk from bad institutions. Robert Hall and Charles Jones build a similar model that does control for reverse causality. Again, the property variables show a strong relationship with economic growth.

The same cannot be said for patents or intellectual property rights. David Gould and William Gruben use a measure of a country’s strength of patent protection in a regression similar to that of Keefer and Knack. In their base model, the patent index has a positive coefficient, but it is not statistically significant. They try a wide variety of other specifications and interactions, and in a few cases they obtain coefficients that are statistically significant, but most results are only weakly significant. Moreover, this study has some important limitations that make any results difficult to interpret. In particular, their regressions do not include measures of other property rights — one might expect patent rights to be correlated with other property rights, which, as above, are known to have a positive effect on economic growth — nor do they control for reverse causality.

Walter Park and Juan Carlos Ginarte conducted a more elaborate study that included measures of general property rights, specifically an index of “market freedom.” They also used a more sophisticated measure of a country’s patent rights and a more sophisticated estimation technique. In their base regression, they find that the market freedom variable has a positive and statistically significant effect on economic growth, but the intellectual property rights index has a negative coefficient that is not statistically different from zero. However, although intellectual property rights do not appear to have a direct positive effect on economic growth, they find some limited evidence that intellectual property rights are correlated with a country’s research and development spending. It might be the case that intellectual property rights encourage such spending, but the effect is too small to show up as a major direct influence on economic growth. But even this result is limited for two reasons. First, Ginarte and Park find that it only holds among the wealthier countries in their sample. Second, they do not control for reverse causality — that is, firms that spend a lot of research and development might, after they become established, lobby for stronger patent laws.

In a separate paper, Ginarte and Park look at the factors that

determine a country's intellectual property rights. They find, in fact, that lagged research and development is positively correlated with subsequent intellectual property rights strength. This suggests that there is, indeed, a significant reverse causality.

In summary, the qualitative difference between regression results for general property rights and those for intellectual property rights is striking. General property rights have a strong and direct influence on economic growth that is robust to a wide variety of specifications and to controls for reverse causality. In contrast, intellectual property rights appear to have at best only a weak and indirect relationship to economic growth, the relationship appears to apply only to certain groups of countries or certain specifications, and the direction of causality is unclear.

Intellectual property rights are not just like other property rights and simple casual observations about the correlation between U.S. or Western technology and patent systems can

and entered a period of positive and, in some cases, rapid economic growth. The outcome apparently depended on the particular set of reforms that each country adopted. Svejnar distinguishes two levels of reforms. Almost all of the countries initiated "Type I" reforms involving macroeconomic stabilization policies, removal of price controls and subsidies, and dismantling of the institutions of the communist system. Some countries — notably Poland, Hungary, Slovakia, and Slovenia — also pursued "Type II" reforms that permitted the development of government policies and institutions to support a robust market economy. Type II reforms included privatization of large enterprises and establishment of effective market-oriented legal systems, commercial banking, regulatory infrastructure, and labor market regulation. Type II reforms were critical in providing a reliable tax base for government agencies and for limiting corruption and rent-seeking behavior. And they appear to have made the crucial difference in eco-

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be misleading. On the other hand, this does not mean that patents have no measurable effects, just that it appears that their effects may be more tentative, contingent upon the details of the patent system or dependent on the particular technology, industry, or state of economic development.

NATURAL ECONOMIC EXPERIMENTS

One way that researchers have sought to untangle the direction of causality is to look at "natural economic experiments" — compare economic activity before and after a discrete change in the law. Even though economic policy may have changed in response to "endogenous" factors (such as successful firms lobbying for stronger property rights), when the change occurs as a sharp break, the effect of that change should be observable immediately after it goes into effect. There are studies of natural economic experiments both for changes in property rights generally and for patent rights specifically.

Perhaps the biggest economic experiment in recent years is the transition of Eastern European economies from centralized planning to market-based economies beginning with the collapse of the Soviet system in the late 1980s. Jan Svejnar studied the economic performance of the countries that made that transition. Prior to the fall of the Iron Curtain, per-capita GNP growth had declined steadily in Soviet Bloc countries for decades, to a level of 0.8 percent growth per annum during the 1980s. Economists had high expectations that moving to a market system would generate an immediate, rapid increase in economic growth. But that did not happen. Per-capita GNP fell rapidly in all the countries, but some eventually recovered

economic performance — the countries that initiated Type II reforms now have strong economic growth in contrast to those countries that adopted more limited institutional change.

This analysis suggests that when it comes to the economic effects of property, the devil is in the details. It is not enough to eliminate centralized control and provide legal rights to property. Effective economic performance depends on well-developed public and private institutions to support the property system, and those institutions are often more difficult to develop.

The evidence from changes in patent law suggests that the devil may be even more deeply hidden in the details of patent institutions. Mariko Sakakibara and Lee Branstetter looked at the effect of a 1988 law that increased patent scope in Japan. They found no evidence of an increase in either research and development spending or innovative output that could be plausibly attributed to the patent reform. James Bessen and Robert Hunt looked at the effect of changes in the U.S. treatment of inventions that involve software, and they found that the number of software patents grew dramatically. However, firms in the software industry acquired relatively few patents; instead, most were obtained by firms in electronics and computer industries known for stockpiling large arsenals of patents to use as bargaining chips. Moreover, the firms that acquired relatively more software patents tended to actually reduce their level of research and development spending relative to sales.

Several studies have looked at the effect of extending patent protection to pharmaceutical products and processes. Many countries historically have limited patent coverage of phar-

maceuticals, but they extended coverage in recent decades under pressure from trade negotiators. F. M. Scherer and S. Weisburst studied the effect of strengthened drug patents introduced in Italy in 1978 and found no evidence that drug research and development accelerated within the well-established Italian drug manufacturing industry after the law change. Jean Lanjouw and Iain Cockburn studied the effect of the “TRIPS” treaty that went into effect in 1995 and required about 40 less-developed signatory countries to implement pharmaceutical patent protection by 2005. Among other items, they looked at the research and development allocated to products specifically directed to less-developed country markets. They did find some increase in spending during the mid- and late 1980s, perhaps in anticipation of the changes. However, the trends appear to have leveled off or reversed during the 1990s when the TRIPS changes went into effect.

All of those studies are subject to the caveat that other, simultaneous changes might have caused a reduction in innovation or in research and development, potentially confounding the results. However, the similarity of results across the various studies suggests that confounding factors are not responsible for most of what has been observed. One study uses the power of numbers to limit the explanatory role of possible confounding effects. Josh Lerner looks at 177 changes in patent law that “strengthened” patents in a panel of 60 countries over 150 years. In such a large sample, the role of confounding factors should be limited — positive confounding events will tend to be offset by negative confounding events in estimates of the average response. In his accounting of events that strengthened patents, Lerner includes changes in substantive law that improved the scope or extent of patent rights and he also includes reductions in patent fees. Although the latter does not strictly imply an increase in patent rights, inven-

tors have been found to increase their rates of patenting in response to cheaper patents. Lerner is not able to measure directly the effect of the changes on innovation. Instead, he measures their effect on patenting within the country making the change and also the effect on patenting by domestic inventors at Great Britain’s Patent Office. As indicated in Figure 1, he finds that foreign inventors increased their patenting in countries that strengthened their patent laws. However, domestic inventors actually patented at a lower rate after the change, both within their country and at the British Patent Office. Exploring alternative specifications, Lerner finds that the decline applies more to poor nations and nations with initially lower levels of patent protection. Nevertheless, the overall results seem consistent with the studies of changes in pharmaceutical patent coverage: it may benefit foreign inventors who trade in patented goods, but it is not clear from the studies that stronger patent laws improve domestic innovation.

FREE-RIDING

It is helpful to ask whether patents do, in fact, play the role prescribed for them in economic theory. The standard argument is that without patents, inventions will be quickly copied by imitators. Competition from the “free-riders” will drive down prices, making it impossible for the inventor to earn sufficient profits to recoup his investment in developing the invention. Without the promise of secure profits, inventors will not invest in the first place, so the argument goes.

This is a plausible and oft-told tale, but what is the actual evidence to support it? Do patents prevent the market entry of free-riders who would otherwise destroy or reduce incentives to innovate? Empirical research suggests that the answer is “sometimes” and “to some extent.” This may help explain the nature of the findings described above.

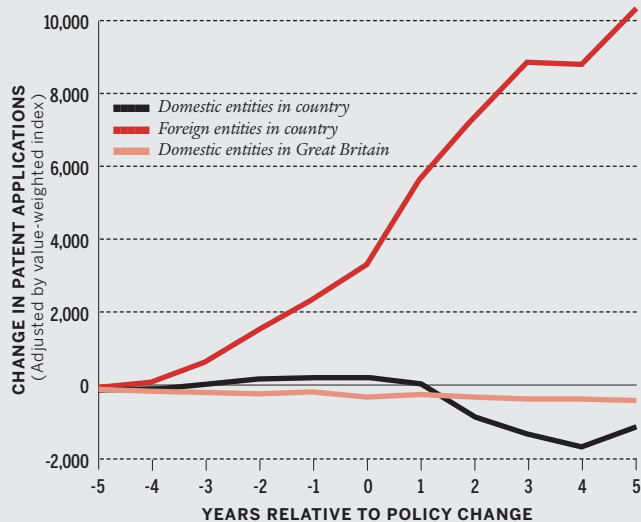
The canonical example of the free-riding problem is traditional drug development (biotech is different in some important respects). Joseph Dimasi, Henry Grabowski, and Ronald Hansen estimate that the average out-of-pocket cost for a drug company to develop a new drug, including the costs of research projects that were abandoned, is \$402 million (in 2000 dollars). About 70 percent of that cost is incurred during the clinical trials necessary to obtain government approval. Generic drug manufacturers are not required to repeat the same clinical trials, so their research and development costs are far less than those of the original manufacturer. This means that when patents expire, generic manufacturers can enter the market and compete at lower prices. In a separate study, Grabowski and John Vernon find that drug prices drop to 37 percent of their original level two years after the entry of generic manufacturers. The higher prices that pharmaceutical firms charge while they are still on patent allow them to earn above-normal profits — “rents” — that more than recoup their development investments.

But the pharmaceutical industry may be atypical. Certainly, few other industries have such a high regulatory burden on initial innovation. Typically, imitators are not at such a large cost advantage relative to initial innovators. Edwin Mansfield, Mark Schwartz, and Samuel Wagner, using survey data, find that imitation cost and imitation time are about

Figure 1

Patents and Domestic Innovation

Patent applications around the time of patent law strengthening



SOURCE: “150 Years of Patent Protection,” by Josh Lerner (American Economic Review, Vol. 92, No. 2)

two-thirds of the original development cost and time on average. This is still an advantage for imitators, but not such a large advantage; imitators also face significant entry costs.

Also, perhaps the nature of pharmaceutical patents — patents on small, well-defined molecules — may enhance the effectiveness of patenting in this industry. These patents have clear boundaries that promote efficient enforcement of the patent rights. Survey respondents told Mansfield et al. that patents increased imitation costs only 7 percent for electronics and machinery inventions at the median; the figure was 30 percent for pharmaceutical inventions.

More generally, imitation costs are high aside from patents because firms have means other than patents for protecting their innovations. Innovators may earn above-normal profits because they have lead-time advantages, or because they come down a learning curve first; they may earn profits from complementary products and services, or they may rely on trade secrecy. Surveys find that in most industries (pharmaceuticals are the exception), research and development managers report

that these other means of appropriation are more effective than patents in obtaining returns on their investments. For this reason, it is not surprising that survey research also finds that most inventions are not patented. On average, large European firms applied for patents on only 36 percent of product innovations and 25 percent of process innovations. Again, pharmaceutical firms are outliers — they applied for patents on 79 percent of pharmaceutical products.

This evidence does not mean that patents have no value. Rather, the effectiveness of patents varies by industry and technology, and for many industries and technologies their effectiveness is limited. This assessment is supported by the estimates of the private value of patents discussed in the next section.

ESTIMATES OF THE NET BENEFIT

It is possible to make more direct estimates of the incentives that patents provide to their owners. The gross private benefits of patents can be inferred from the value owners place on their patents. And some of the major costs that patents impose on innovators can be inferred from data on patent litigation.

Economists have used a variety of techniques to estimate the private value of patents to their owners. Some estimates are based on the observed behavior of patent owners, such as their willingness to pay fees to keep patents in force or their willingness to patent in multiple countries. Other estimates are based on the contribution that patents make to the stock market value of public firms. The good news is that these different methods produce estimates that roughly correspond. Not surprisingly, patent values vary tremendously, depending on the industry. The average value of patents held by large pharmaceutical firms is easily an order of magnitude larger than the average value of patents held by firms in other industries.

Because the value of a patent can be thought of as the expected present value of the profit stream from the patent, the gross profits from a patent can be estimated by multiplying patent value by a rate of return, say, 15 percent. The profits represent the stream of rewards that provide an incentive to invest in innovation.

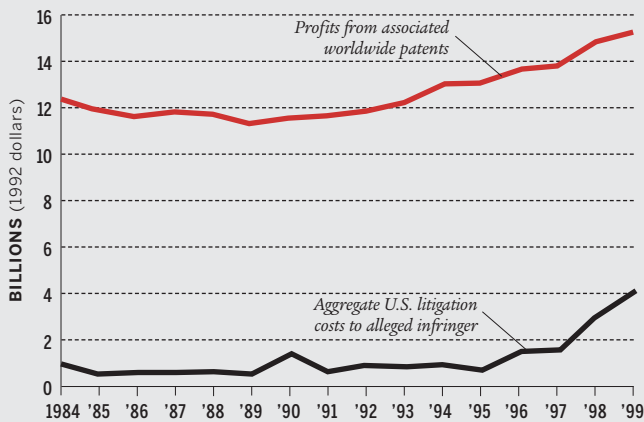
However, patents may also impose disincentives on innovators. Litigation costs represent an important disincentive to innovation. A firm looking to invest in innovation will consider the risk that the innovation will inadvertently expose it to a patent-infringement lawsuit. Since infringement lawsuits are usually filed against firms exploiting new technologies, development of a new technology exposes the innovator to risk of inadvertent infringement if patent boundaries are hidden, unclear, or unpredictable. That risk weighs against the profits that can be made from innovation. Of course, firms are both patent holders and potential defendants, so a comparison of profit flows and litigation costs for a group of firms should reveal the sign of net incentives. Several studies have estimated the expected cost of litigation using stock market event studies around the date of patent lawsuit filings.

Figure 2 shows a comparison of estimates of the profits and litigation risks from owning patents. The results in Figure 2A show that chemical and pharmaceutical firms earn far more from their patents than they lose to litigation. But for other

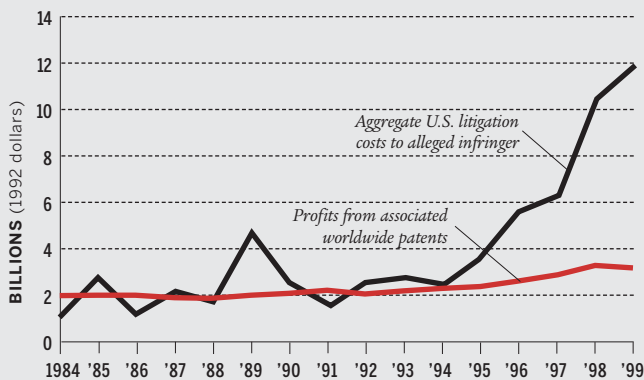
Figure 2

Patents, Profits, and Costs

A. Aggregate profits from patents and aggregate litigation costs for public U.S. chemical and pharmaceutical firms



B. Aggregate profits from patents and aggregate litigation costs for public U.S. firms in other industries



SOURCE: Patent Failure, by James Bessen and Michael J. Meurer (Princeton University Press, 2008)

firms, Figure 2B tells a simple but dramatic story: During the 1980s, these firms might have, at best, broken even from patents, but in the mid-1990s, litigation costs exploded. By almost any interpretation, the patent system could not be providing overall positive incentives for those United States public firms by the end of the 1990s. The risk of patent litigation that firms faced in their capacity as technology adopters simply outstripped the profits that they made by virtue of owning patents. A firm looking to invest in an innovative technology during the late 1990s, taking this risk into account, would expect the net impact of patents to reduce the profits from innovation rather than to increase them.

Note that patents do provide profits for their owners, so it makes sense for firms to get them. But taking the effect of other firms' patents into account, including the risk of litigation, the average public firm outside the chemical and pharmaceutical industries would be better off if patents did not exist.

CONCLUSION

The historical evidence, the cross-country evidence, the evidence from economic experiments, and estimates of the net benefits of patents all point to a marked difference between the economic importance of general property rights and the economic importance of patents or intellectual property rights more generally. With the cross-country studies in particular, the quality of general property rights institutions has a substantial direct effect on economic growth. Using the same methodology and in the same studies, intellectual property rights have at best only a weak and indirect effect on economic growth.

The research also suggests a reason why patents differ from general property rights in motivating economic growth overall: the positive effects of patents appear to be highly contingent. Differences in technology and industry seem to matter a lot for 20th century research and development managers and

also for the innovative performance of 19th century world's fair exhibitors. Some results from the cross-country studies suggest that less developed countries have a harder time realizing benefits from patents, or that countries that participate actively in international trade may benefit more.

Some of these differences arise because of differences in the relative costs and effectiveness of alternatives to patents. Patents may contribute more to economic growth in the pharmaceutical industry than they contribute in electronics industries because the latter can more effectively earn returns on innovation through lead time advantage, sales of complementary products and services, etc. Other differences may arise because of subtle differences in patent institutions. During the 19th century, the U.S. patent institutions performed differently (and perhaps better) than their British counterparts. Patents are likely to work better in the pharmaceutical industry because patents on chemical entities have much sharper boundaries than, say, patents on software.

Of course, the economic effectiveness of all forms of property depends on details of the supporting institutions — this is evident from the disparate growth paths of Soviet Bloc economies. But the economic effectiveness of patents may be much more sensitive to the details of the relevant institutions than are general property rights. Perhaps this is because patent law may be much more specialized, complex, and sophisticated than, say, real property law and, so, effective institutions may be more difficult to develop and maintain.

In any case, the empirical economic evidence strongly rejects simplistic arguments that patents universally spur innovation and economic growth. The direct comparison of estimated net incentives suggests that for public firms in most industries today, patents may actually discourage investment in innovation, and routine injunctive relief may contribute to this problem. R

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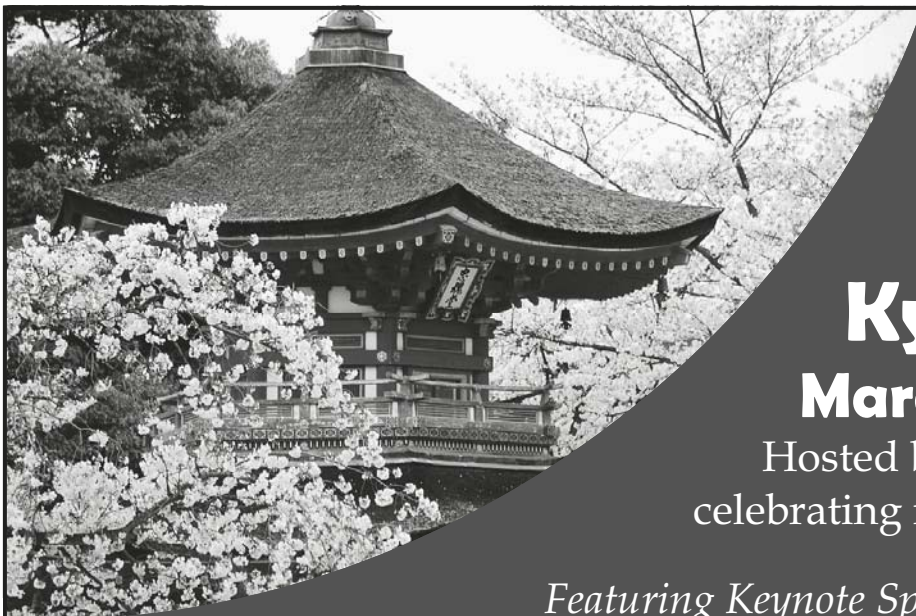
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