

When Should We Use Intellectual Property Rights?

By PAUL ROMER*

The economic analysis of property rights proceeds in two steps. The first distinguishes rival from nonrival goods. The second contrasts the welfare effects of property rights for these two types of goods. For rival goods, strong property rights lead to efficient outcomes. For nonrival goods, property rights involve the trade-off formalized by William Nordhaus (1969): Weak property rights lead to under-provision. Strong property rights create monopoly distortions.

Recent discussions of copyright protection for recorded music have obscured the underlying economic issues. Interested firms deny that music-sharing will reduce the incentives for firms to release new recordings. Artists and recording companies never acknowledge the efficiency costs of prices that far exceed marginal cost. It is left to economists with no stake in the outcome to clarify these issues. (Full disclosure: I have not consulted for anyone in the Napster case.)

The stakes in the battle over the music business are small enough to get lost in rounding error for world GDP of about \$30 trillion. However, this battle creates a “teachable moment” that could help frame policy in more important areas. Two lessons should emerge. First, to the extent that property rights are used to encourage the provision of nonrival goods, both sides of the Nordhaus trade-off matter for policy analysis. Second, there are other ways to provide incentives for the production of nonrival goods. If the first lesson has been obscured, the second has almost entirely escaped notice.

I. Step 1: Musical Recordings Are Nonrival Goods

The fundamental good produced by the recording industry is literally a bit string, a long

sequence of 0’s and 1’s. Like any nonrival good, it comes packaged together with rival goods. A firm can ship a bit string on CDs or transmit it over the Internet. Either delivery method requires rival goods: plastic disks and trucks in the first case, computer servers and wires in the second. Additional units require additional delivery costs. However, once the bit string exists, it can be reused, at no additional cost, to make copies for millions, even billions, of people.

II. Step 2: The Nordhaus Trade-off for Musical Recordings

Music is attracting attention now because technological change has substantially undermined the effective protection offered by copyright. Anyone with a personal computer and an Internet connection can download music files and share them with others. Legal action against such intermediaries as Napster is unlikely to stop user-to-user exchanges. As a result, the recently proposed Security System Standards and Certification Act (SSSCA) would require that any “interactive digital device” (computer, handheld, set-top box, etc.) implement encryption standards set by hardware manufacturers and copyright-holders in consultation with the Secretary of the Department of Commerce.¹

The relevant economic question is whether the net harm (if any) created by a shift along

¹ Note added in proof: In March 2002, Senator Fritz Hollings and colleagues introduced the SSSCA under a new name, the “Consumer Broadband and Digital Television Promotion Act.” Its new, broader language prohibits the sale of any hardware *or software* that can reproduce, transfer, display, or play copyrighted material unless it contains industry-specified and government-sanctioned copy protection standards. The revised bill gives the final authority for approving these standards to the Federal Communications Commission rather than the Secretary of Commerce.

* Graduate School of Business, Stanford University, Stanford, CA 94035.

the Nordhaus trade-off justifies this kind of intervention.

III. Under-provision

One of the disadvantages of adversarial legal proceedings such as the one brought by the Recording Industry Association of America (RIAA) against Napster is that they generate assertions that can live like urban legends, long after the proceeding itself is over. One such claim is that weaker property rights will actually increase the provision of new music.

It is true that, in some situations, downstream sharing can increase profits (see e.g., Hal Varian, 2000). As a result, firms will sometimes encourage sharing, as movie studios did for rentals of videotapes. This kind of argument, however, cannot justify weaker property rights that encourage sharing that copyright-holders want to prevent.

Neither side in the Napster case produced convincing evidence about the effect that file-sharing had on sales of CDs. The economic expert who testified on behalf of Napster argued that, because it let potential buyers sample music before buying, it increased sales. The court adopted the sensible position that, if sampling would help CD sales, the recording industry could deploy its own system for downloading songs. It also found that, regardless of any effects on sales of CDs, widespread user-to-user sharing could prevent music companies from being able to charge for downloads of MP3-encoded versions of its products.

If music-sharing reduces the revenue that the music industry collects relative to what it could collect, it follows that the diversity of music offered will be lower. Even if the industry were sufficiently concentrated to earn substantial *ex ante* rents, individual firms still have to make decisions about whether the revenue from a new recording justifies the investment required to produce it. In a world with much more music-sharing, firms would still cultivate the next boy band to replace *NSYNC and the next nymph to replace Britney Spears. These are not the marginal projects. But it might not be able to justify the kind of expense that went into the decade-long effort to select, remix, and remaster unreleased recordings from the 1960's by the Buffalo Springfield. Fans might never have

been able to hear Neil Young on vocal and acoustic guitar singing "Out of My Mind," accompanied only by Steve Stills and Richie Furay singing harmony. (Full disclosure: I do listen to Neil Young. Published reports suggest that he does not like Napster.)

IV. Monopoly Distortions

Even if file-sharing will reduce revenue for the music industry and thereby reduce the variety of musical recordings, this need not cause a net reduction in consumer welfare. The substantial markup of price over marginal cost made possible by effective copyright protection creates deadweight losses that sharing can avoid. Absent sharing, the cost for someone who wants to listen to "Without Expression" from Terry Reid's 1968 debut album is between \$15 and \$20. The cost for Spirit's 1976 studio recording of "Like a Rolling Stone" is far higher because the CD is no longer available for sale. However, anyone with an Internet connection can find and download either song in minutes. (Full disclosure: I look but do not touch.)

The explosion in music- and video-sharing since 1999 suggests that the demand for music is very responsive to price. A crude estimate suggests that the welfare loss created by the excess of price over marginal cost could be comparable to total revenue for the recording industry.

The statistical samples taken by an expert for the RIAA suggest that, during an unspecified week prior to June 2000, Napster users downloaded 140 million songs, which would imply about 560 million songs per month. This estimate is already large, but it comes before a period of rapid growth for Napster. Using representative panels of users, Media Metrix estimated that the number of unique Napster users in the United States grew from 1.1 million in February 2000 to 4.7 million in June 2000, and then to 13 million at its peak in February 2001. This implies that the number of Napster users increased by a factor of about 3 from June 2000 to February 2001. Using this factor to scale up the pre-June estimate of 540 million downloads per month yields an estimate of about 1.5 billion downloads per month in February 2001. Webnoize, a web consulting firm, used packet sniffers to estimate that Napster users downloaded

2.8 billion tracks in February 2001 and that users of successors to Napster downloaded 3 billion tracks in August 2001.

Media Metrix estimated that, in February 2001, there were as many Napster users in the rest of the world as in the United States, so worldwide music sales are the natural benchmark for comparing these numbers. In 2000, the most recent year with complete data, the music industry shipped about 3.5 billion units worldwide, of which 2.5 billion were CD albums. (The remaining units were CD singles, cassette tapes, and vinyl records.) Total worldwide revenue for the industry in 2000 was \$37 billion, about 0.11 percent of world GDP. (U.S. sales of \$15 billion are about 0.15 percent of U.S. GDP.)

Suppose that, in coming years, unrestricted music downloads continue at the pace of 1.5 billion per month or 18 billion per year. Based on the evidence to date, the vast majority of music downloads are not directly substituting for purchases of traditional recordings and, rather, represent new consumption units for listeners. Worldwide sales did fall by about 250 million units in the first half of 2001 compared to the first half of 2000, but part of the fall could have been due to the economic slowdown.

Because users can download individual songs rather than full albums, a downloaded track is most comparable to a CD single. In the United States in 2000, CD singles sold for about \$4. If the value of the first downloaded track is the \$4 cost of a single and the value of the last downloaded track is \$0, a simple straight-line approximation implies that the additional consumer surplus generated by music-sharing, \$36 billion ($= \$2 \text{ per track} \times 1.5 \text{ billion tracks per month} \times 12 \text{ months}$), is nearly equal to the \$37 billion in worldwide revenue collected by the music industry. The deadweight loss can exceed revenue because the cost of distributing music through traditional channels is so much higher than through file downloads.

V. The Appropriate Policy Response to Technological Change

To the extent that judges and legislators are guided by welfare analysis, they should respond cautiously to the growth of music-sharing. It will probably reduce the variety of music that is released by firms in the music business, but the

magnitude of this effect is unknown and could be small. New business models to support music might emerge. Even in the unlikely event that revenue from sales of recordings goes to zero, new musicians will surely release free recordings to promote themselves, enticed by such existing opportunities for generating revenue as endorsements or live performances. On the other side of the balance, music-sharing will offer benefits for consumers that could be large. Existing firms will lobby vigorously to prevent a transfer from them to consumers, but economists should stand ready to explain that the policy goal should be to maximize consumer welfare, not such popular proxies as "exports" or "industry revenues."

Courts might reasonably interpret existing copyright laws to mean that they should enjoin firms that facilitate file-sharing. But if, as seems likely, these efforts do not stop the diffusion of user-to-user exchanges, there is no clear economic justification for the legislative changes proposed in the SSSCA, changes that would hobble the development of all digital devices and the software they run. Music may be a negligibly small part of the world economy, but information technology is not. Imagine how much slower the pace of technological change in information technology would have been if no new device or software could be sold without a sign-off from the Secretary of Commerce and the RIAA. At an even broader level, giving an industry veto power over new technologies that threaten its current business model would set a very dangerous public-policy precedent.

If, with the passage of time, under-provision of music looms as a serious social problem, the appropriate policy response would be to find a more efficient way to provide incentives for new recordings. Current copyright law means that recordings are financed, in effect, by a commodity tax with the tax revenue flowing directly to the producing firm in proportion to the number of copies that it sells. The theory of optimal taxation suggests that this is not an efficient arrangement. If an album can be downloaded at a cost of less than \$0.15 and sells for \$15, this implies a commodity tax rate of 10,000 percent. More importantly, as technology advances, skyrocketing compliance costs will cause much larger social losses.

As Steven Shavell and Tanguy van Ypersele (2001) argue, it is economically and technically feasible to design a system that uses general tax revenue to reward people who produce such goods as musical recordings. The rewards could be proportional to the number of copies consumers select, so that market demand still allocates funds between alternative artists and recordings. These rewards could exist in parallel with the existing system of sales of recordings. Such a system would leave the total quantity of funding partially under political control, and as with any government funding or regulatory system, it would create the risk of capture by special-interest groups. However, the same disadvantages apply to any intrusive legislation designed to force compliance with the existing copyright system. Direct funding would arguably be more transparent and less subject to political abuse than hidden restrictions that slow the pace of technological change in the information-technology industry.

It is an open question whether the economic benefits of government incentives for the production of musical recordings would outweigh the potential political harms. There is, however, no urgent need for a decision. New incentives could easily be introduced in the future. Even in a worst case in which the government takes no action and all of the traditional music firms go out of business, the net harm to the economy in the United States or the rest of the world would be trivial.

Economic analysis of these issues still matters because other nonrival goods, the ones that drive human progress, are far more important than musical recordings. Governments throughout the world have mechanisms for subsidizing the production of nonrival goods, the most important of which are direct subsidies for the production of research results and indirect subsidies via educational systems that produce the human capital used to produce nonrival goods. Nonetheless, the production of such critical nonrival goods as pharmaceuticals and network

protocols still suffer from serious problems. An example where under-provision might really matter lies in the drawn-out effort to revise the IP protocol on which the entire Internet is based, an effort that is being led by many volunteers who do the work of the informal Internet Engineering Task Force. (On the new version of the IP protocol, see the volume edited by Scott Brander and Allison Mankin [1996]. For a discussion of mechanisms that could avoid monopoly price distortions on pharmaceuticals, see Michael Kremer [1998].)

The standard textbook answer, that the government should provide public goods and the private sector should provide private goods, entirely misses the subtlety and importance of the challenge and opportunity we face. If anything specific emerges from court battles and lobbying efforts over the future of the music business, one can hope that it is a broader and more thoughtful public discussion of alternative mechanisms for producing and distributing nonrival goods.

REFERENCES

- Brander, Scott and Mankin, Allison**, eds. *IPng, Internet Protocol next generation*. Reading, MA: Addison-Wesley, 1996.
- Kremer, Michael**. "Patent Buyouts: A Mechanism for Encouraging Innovation." *Quarterly Journal of Economics*, November 1998, 113(4), pp. 1137–67.
- Nordhaus, William D.** *Invention, growth, and welfare: A theoretical treatment of technological change*. Cambridge, MA: MIT Press, 1969.
- Shavell, Steven and van Ypersele, Tanguy**. "Rewards versus Intellectual Property Rights." *Journal of Law and Economics*, October 2001 44(2), pp. 525–47.
- Varian, Hal R.** "Buying, Sharing and Renting Information Goods." *Journal of Industrial Economics*, December 2000, 48(4), pp. 473–88.