Perfecting Patent Prizes

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A number of commentators in recent years have suggested permitting holders of intellectual property rights to give up these rights in exchange for cash prizes from the government. In this Article, Professor Abramowicz shows that each of the proposals has significant flaws that would make implementation impractical and argues that no single perfect formula or algorithm for determining the size of prizes exists. A prize system is nonetheless worth pursuing because it could increase social welfare significantly by eliminating deadweight loss. Professor Abramowicz recommends a relatively simple approach that would complement rather than replace the patent system. The proposal is to establish an agency to distribute a fund that would be used to reward corporate efforts to reduce the monopoly effects of patent rights. As long as there is a substantial delay between the activities reducing deadweight loss and the granting of prizes, and as long as the rights to future prizes are tradable, granting of wide agency discretion has significant advantages and few drawbacks. Even assuming the agency is likely to do a poor job of distributing prizes, the system will be efficient if no biases in granting prizes are predictable. After addressing a variety of issues concerning the design of a prize system, Professor Abramowicz offers several potential applications for patent, copyright, and beyond.

When anthrax attacks recently led to a run on the patented antibiotic drug Cipro,[1] politicians and commentators suggested that the government consider purchasing generic alternatives.[2] Some used the occasion to illustrate what they perceived as a broader problem with patent protection: that pharmaceutical companies seeking profits would not allow the sick to

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[1] *See* Tamar Lewin, *Anthrax Scare Prompts Run on an Antibiotic*, N.Y. TIMES, Sept. 27, 2001, at B8.

[2] *See, e.g.*, Shankar Vedantam, *Cipro Is Not the Only Pill That Fights Anthrax*, WASH. POST, Oct. 17, 2001, at A20 (reporting that Senator Charles E. Schumer "issued a public appeal that the government suspend Bayer's patents and allow generic companies to add to the supply"); *see also* Donald G. McNeil Jr., *A Rush for Cipro, and the Global Ripples*, N.Y. TIMES, Oct. 17, 2001, at A1 (discussing such proposals); Jesse Pesta & Daniel Pearl, *Indian Drug Makers May Now Imitate Cipro: Controversial for Knockoffs of AIDS Pills, the Firms May Do Same for Anthrax*, WALL ST. J., Oct. 19, 2001, at A13 (same). President Bush rejected these proposals on the ground that patent law made them illegal. *See* Elisabeth Bumiller, *Administration Won't Allow Generic Versions of Drug*, N.Y. TIMES, Oct. 18, 2001, at B8. The Canadian government initially embraced similar proposals. *See* Amy Harmon & Robert Pear, *Canada Overrides Patent for Cipro to Treat Anthrax*, N.Y. TIMES, Oct. 19, 2001, at A1. Subsequently, however, the Canadian government backed down, agreeing to rely on Bayer unless the company was unable to accommodate requests for the drug. *See* Tom Cohen, *Canada Allows Bayer to Supply Anthrax*, AP, Oct. 23, 2001, *available at* 2001 WL 29336130.

obtain access to needed medications.[3] The argument repeated a familiar refrain in the intellectual property debate, as a long history of articles has inquired whether society would be better off with no patent[4] or copyright law[5] at all. Even recently, commentators have questioned the broad scope of intellectual property protection, arguing that business methods should not be patentable,[6] or that copyright terms should be shorter than Congress has dictated.[7] The anti-

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[3] *See, e.g.*, Ronald Johnson, *In the War of Nerves, the Capitol Is a Front*, N.Y. TIMES, Oct. 19, 2001, at A18 (arguing in a Letter to the Editor that developing countries should be allowed to import generic versions of AIDS drugs); *Ciprofloxacin: The Dispute over Compulsory Licensing*, *at* http://www.salon.com/tech/feature/2001/10/18/cipro_patent/index.html (last visited Oct. 22, 2001) (advocating governmental purchase of government Cipro, as part of a broader website critiquing expansive patent protection).

[4] *See, e.g.*, FRITZ MACHLUP, AN ECONOMIC REVIEW OF THE PATENT SYSTEM, *in* SUBCOMM. ON PATENTS TRADEMARK AND COPYRIGHT OF THE SENATE COMM. ON THE JUDICIARY, 85th Cong. 44-45 (Comm. Print 1958) (summarizing arguments both for and against the patent system); EDITH PENROSE, THE ECONOMICS OF THE INTERNATIONAL PATENT SYSTEM (1951) (arguing that the patent system harms developing countries); C. TAYLOR & Z. SILBERSTON, THE ECONOMIC IMPACT OF THE PATENT SYSTEM 194-208 (1973) (reporting results of a survey suggesting that abolition of the patent system would affect innovation in some industries more than in others); Brian Peckham, *Should the U.S. Patent Laws Be Abolished?*, 11 J. CONTEMP. L. 389, 421 (1985) (concluding that present knowledge does not strongly justify immediate abolishment of the patent system); Donald F. Turner, *The Patent System and Competitive Policy*, 44 N.Y.U. L. REV. 450, 454-55 (1969) (identifying various costs of the patent system); *The Debate on the Patent Laws*, 27 ECONOMIST 656, 656 (1869) (predicting that "it was probable enough that the Patent Laws will be abolished ere long," as the laws "either are, or are becoming, out of date"). Some recent researchers have argued that patent protection may not be necessary in some industries even if it is necessary in others. *See* JAMES BESSEN & ERIC MASKIN, SEQUENTIAL INNOVATION, PATENTS, AND IMITATION (Massachusetts Inst. of Technology Working Paper No. 11/99, 1999). For discussions of nineteenth-century debates on patent law, see H.I. DUTTON, THE PATENT SYSTEM AND INVENTIVE ACTIVITY DURING THE INDUSTRIAL REVOLUTION, 1750-1852 at 17-29 (1984); and Fritz Machlup & Edith Penrose, *The Patent Controversy in the Nineteenth Century*, 10 J. ECON. HIST. 1 (1950). For an interesting compendium of quotations denouncing the patent system, see Gordon Irlam, Coalition for Networked Information Forum, http://www.cni.org/Hforums/cni-copyright/1994-04/0648.html (last visited Aug. 22, 2001).

[5] *See, e.g.*, FRANCIS HARGRAVE, AN ARGUMENT IN DEFENSE OF LITERARY PROPERTY 30-33 (2d ed., Garland Publishing, Inc. 1974) (1774); T. MACAULAY, SPEECHES ON COPYRIGHT 21-24 (C. Gaston ed., 1914); ADAM SMITH, LECTURES ON JURISPRUDENCE 83 (R.L. Meek, D.D. Raphael & P.G. Stein eds., Oxford Univ. Press 1978) (1896); Robert M. Hurt & Robert M. Schuchman, *The Economic Rationale of Copyright*, 56 AM. ECON. REV. 421 (1966); William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325, 328-29 (1989); A. Plant, *The Economic Aspects of Copyright in Books*, 1 ECONOMICA 167 (1934). Perhaps the most famous exchange on the utility of copyright law is between then-Professor Stephen Breyer and Professor Barry Tyerman, with Tyerman more enthusiastic about copyright than Breyer. *See* Stephen Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs*, 84 HARV. L. REV. 281 (1970); Barry W. Tyerman, *The Economic Rationale for Copyright Protection for Published Books: A Reply to Professor Breyer*, 18 UCLA L. REV. 1100 (1971); Stephen Breyer, *Copyright: A Rejoinder*, 20 UCLA L. REV. 75 (1972).

[6] The Federal Circuit found business methods to constitute patentable subject matter in *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368 (Fed. Cir. 1998). Critics include Rochelle Cooper Dreyfuss, *Are Business Method Patents Bad for Business?*, 16 SANTA CLARA COMPUTER & HIGH TECH L.J. 263 (2000); Leo J. Raskind, *The* State Street Bank *Decision: The Bad Business of Unlimited Patented Protection for Methods of Doing Business*, 10 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 61 (1999); Brian P. Biddinger, Note, *Limiting the Business Method Patent: A Comparison and Proposed Alignment of European, Japanese and United States Patent Law*, 69 FORDHAM L. REV. 2523 (2001); and James Gleick, *Patently Absurd*, N.Y. TIMES, March 12, 2000, § 6 (Magazine), at 44. *See also* Nicholas Groombridge & Christopher Loh, *Congress Takes Aim at Business Method Patents*, N.Y.L.J., Mar. 6, 2001, at 1. Defenders of business method patents include Jeffrey R. Kuester & Lawrence E. Thompson, *Risks Associated with Restricting Business Method and E-Commerce Patents*, 17 GA. ST. U. L. REV. 657 (2001); and Sari Gabay, Note & Comment, *The Patentability of Electronic Commerce Business Systems in the Aftermath of* State Street Bank & Trust Co. v. Signature Financial Group, Inc., 8 J.L. & POL'Y 179 (1999).

[7] In 1998, Congress extended the copyright term of many works to seventy years beyond the author's death, twenty years beyond the previous length. *See* Sonny Bono Copyright Term Extension Act, Pub. L. No. 105-298, § 102(b)(1)-(2), 112 Stat. 2827, 2827 (1998) (codified at 17 U.S.C. § 302(a)). Critics have argued that this is too long. *See* Edward C. Walterscheid, *The Remarkable—and Irrational—Disparity Between the Patent Term and the Copyright Term*, 83 J. PAT. & TRADEMARK OFF. SOC'Y 233 (2001); *see also* William Patry, *The Failure of the American Copyright System: Protecting the Idle Rich*, 72 NOTRE DAME L. REV. 907, 923-30 (1997) (critiquing the proposed extension); Jenny L. Dixon, Note, *The Copyright Term Extension Act: Is Life Plus Seventy Too Much?*, 18 HASTINGS COMM. & ENT. L.J. 945 (1996) (same); Joseph A. Lavigne, Comment, *For Limited Times? Making Rich Kids Richer via the Copyright Term Extension Act of 1996*, 73 U. DET. MERCY L. REV. 311 (1996) (same). At one time, the copyright and patent terms were the same. *See* Walterscheid, *supra*, at 234.

Lloyd Weinreb has argued that arguments for increasing the scope of copyright protection generally have not considered the costs and benefits of such expansion:

protection advocates have won some victories,[8] but the Patent and Trademark Office does business largely as before, or even as never before.[9]

At least some of the Cipro-related proposals, however, offered a new twist. The government, some suggested, should allow generic drug manufacturers to produce the drug, ciprofloxacin, and charge a low price for it,[10] but Bayer, Cipro's manufacturer and patent owner, should be compensated.[11] Such a proposal may seem particularly appropriate given concerns that Bayer would not by itself be able to produce enough of the drug to meet demand,[12] but the proposal has broader resonance. In theory, the government could pay patent owners to place their discoveries in the public domain. Doing so would encourage research and development and produce inventions, while ensuring that the rich and poor alike could benefit from them. Indeed, the newest generation of scholars to challenge the foundations of intellectual property law have not called for simple abolition of intellectual property rights, recognizing the importance of the innovation incentives that these rights provide. Instead, they have considered the alternatives of prize or reward systems, in which the government would provide some form of monetary compensation instead of patent or copyright protection.

The basic idea of a prize system is not new. Michael Polanvyi trumpeted the idea as a means of patent reform back in 1944,[13] and participants in a nineteenth-century debate about the appropriateness of patent protection recognized the possibility that the government might buy out some patents.[14] There are historical precedents for awarding prizes for the development of useful

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> The inclusion of new subject matter has generally been responsive not to a demonstrated need but to the bare assertion of need, indicated only by the proliferation of copies and occasional anecdotal evidence, and an analogy to books, for which copyright was taken for granted. The expansion of copyright in ways that the argument cannot plausibly justify suggests its substantial irrelevance to the outcome, except as a talking point.

Lloyd Weinreb, *Copyright For Functional Expression*, 111 HARV. L. REV. 1149, 1243 (1998).

[8] The most prominent victories of anti-protection forces, however, have been technological rather than legal. *See, e.g.*, Lior Jacob Strahilevitz, Napster, Gnutella, Hybrids, and the (Re)emergence of Anti-Property 6-16 (Aug. 29, 2001) (unpublished manuscript, on file with author) (exploring the continuing success of copyright infringement through peer-to-peer file sharing despite the Ninth Circuit's injunction preventing such infringement on Napster).

[9] The number of patent applications rose from 90,643 in 1990 to 149,825 in 1999, with grants rising from 47,393 to 83,911. *See* http://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.pdf (last visited Oct. 25, 2001).

[10] Senator Schumer emphasized that the concern was not just adequate production, but also that the drug be sold at "reasonable prices." Robert Pear, *Government Talks with Drug Companies About Buying Antibiotics That Treat Anthrax*, N.Y. TIMES, Oct. 20, 2001, at B8 (quoting Sen. Schumer).

[11] *See, e.g.*, McNeil, *supra* note 2 (discussing the possibility of a taking of the patent under the eminent domain power); *US Government Could Override Bayer's Cipro Patent* (NPR radio broadcast, Oct. 17, 2001), *available at* 2001 WL 24074267 (same). Advocates of the government's overriding the patent cited 28 U.S.C. § 1498 (1994), which provides that when the United States infringes a patent, "the owner's remedy shall be by action against the United States in the United States Court of Federal Claims for the recovery of his reasonable and entire compensation for such use and manufacture."

[12] Bayer has insisted that it would be able to meet demand. *See* Keith Bradsher, *Bayer Insists Cipro Supply Is Sufficient; Fights Generic*, N.Y. TIMES, Oct. 21, 2001, § 1B (A Nation Challenged), at 7. If Bayer were not able to meet demand with its own manufacturing facilities, it could seek to contract with generic drug manufacturers to produce the drug for Bayer. *See* Vanessa Fuhrmans, *Questions of Security: Bayer May Ask Rivals to Help Make Cipro*, WALL ST. J., Oct. 18, 2001, at A10.

[13] *See* Michael Polanvyi, *Patent Reform*, 11 REV. ECON. STUD. 61 (1944). Polanvyi summarizes his primary proposal as follows: "In order that inventions may be used freely by all, we must relieve inventors of the necessity of earning their rewards commercially and must grant them instead the right to be rewarded from the public purse." *Id.* at 65 (emphasis omitted). Later, he elaborates that the proposal "is to supplement licences of right by government rewards to patentees on a level ample enough to give general satisfaction to inventors and their financial promoters." *Id.* at 67 (emphasis omitted). While Polanvyi suggests that rewards would be based on information from patent holders and licensees, he does not offer a detailed justification of his assumption that the government would be able to use such information to calculate rewards with sufficient accuracy. Polanvyi without elaboration explains simply that prizes should depend "only [on] data endorsable by accountants' certificate." *Id.* at 68. Perhaps recognizing the potential for inaccurate decisionmaking, Polanvyi adds that the system need only be "not markedly less fair than the rewards which are earned by patentees to-day." *Id.*

[14] R.A. Macfie summed up such a proposal as follows:

> In every patent there should be a condition that the State, from public moneys, or moneys supplied by individuals, shall

information,[15] and even today, government-funded research dollars rival those from private research supported by the patent system.[16] The new generation of scholars, however, has offered twists and credibility to the debate.[17] Steven Shavell and Tanguy van Ypersele have described a prize system that inventors could opt into instead of the patent system.[18] Steve Calandrillo has argued for a prize system for copyright as well as for patent.[19] Meanwhile, Michael Kremer has described a system in which patent recipients would agree to give up their patents in exchange for compensation that would be determined through a unique auction process.[20] Finally, Douglas Lichtman has suggested that the government could achieve the benefits of a prize system with much lower costs by keeping the patent system and subsidizing consumers who would value patented products above marginal cost but cannot afford them at the monopoly price.[21]

> be entitled to demand that the value of the invention be estimated, and, on this value being paid (with a liberal percentage added in consideration of 'compulsory sale'), the use of the invention should become free to all the Queen's subjects (even in the Colonies, so far as privileges granted there do not clash).

2 R.A. MACFIE, COPYRIGHT AND PATENTS FOR INVENTIONS at vi (Edinburgh, T. & T. Clark 1883). Macfie also reports comments by various supporters of reward schemes. In 1795, for example, Sir John Sinclair proposed "a general agreement among the powers of Europe, and of the United States of America, for the purpose of rewarding those who make any useful discovery, interesting to the species at large." *Id.* at 33. Others provided more detail on the mechanism for valuing patents, with Sir David Brewster arguing that a "Board at once scientific and practical, containing men of practical sagacity, and scientific men at the same time … might in my opinion come to a very sound decision on the value of a patent-right." *Id.* at 33-34 (alteration in original).

Commentators also offered concerns about the proposal, concerns that reflect some of the issues that the more modern literature addresses. R.W. Thomson, the President of the Royal Scottish Society of Arts, recognized the benefits and costs of delaying payment of a reward:

> It would be very easy for a scientific tribunal sitting now to determine the value of inventions which have been in use for a number of years, but the task the commission would have to fulfil would be to judge of the value of an invention before it is developed…. If the inventor is simply to *register* his invention and send it out into the world, letting all who wish bring it into use and work what improvements they please upon it, postponing the reward to the inventor until time has been given to ascertain the value of his invention, then the difficulty arises which, to all practical men acquainted with the growth and change which all inventions undergo, is at once evidence, how would it be possible to ascertain how much is due to the original inventor, and how much to those who have added successive improvements, and, in fact, turned what is very often a crude idea into a successful invention?

Id. at 36.

[15] A famous example is the offer of a £20,000 prize for a chronometer, a device to determine the location of a ship. Amateur clockmaker John Harrison invented the device, but was initially denied the prize. *See generally* DAVA SOBEL, LONGITUDE (1995) (providing a detailed history); Frederick C. Leiner, *Book Review*, 27 J. MAR. L. & COM. 671 (1996) (reviewing SOBEL, *supra*) (offering a brief summary). The Society of Arts and the British Parliament tried to replicate the success of such approaches by offering prizes, but the experiments were unsuccessful, in part because prizes were too small. *See* DUTTON, *supra* note 4, at 25-26. In the United States, the American Philosophical Society sometimes offered modest prizes, such as a seventy dollar prize "[f]or the best construction of improvement of ship-pumps." *Notification*, PA. GAZETTE, June 22, 1796, at n.p., *available on* Accessible Archives, Pennsylvania Gazette Database, Item No. 81211, http://srch.accessible.com/accessible/text/gaz4/00000812/00081211.htm. Prizes were of greater though still modest impact in France. *See generally* ELISABETH CRAWFORD, THE BEGINNINGS OF THE NOBEL INSTITUTION: THE SCIENCE PRIZES, 1901-1915 at 16-22 (1984) (describing scientific prizes in Europe in the years preceding the establishment of the Nobel Prizes).

[16] About sixty percent of all U.S. research and development expenditures are privately funded, with the public sector providing disproportionate resources for basic research. *See* Linda R. Cohen & Roger G. Noll, *Privatizing Public Research*, SCI. AM., Sept. 1994, at 72, 75; John M. Golden, *Biotechnology, Technology Policy, and Patentability: Natural Products and Invention in the American System*, 50 EMORY L.J. 101, 136 (2001). For an economic analysis of why the government might offer grants in addition to intellectual property protection, see Brett Frischmann, *Innovation and Institutions: Rethinking the Economics of U.S. Science and Technology Policy*, 24 VT. L. REV. 347, 386-90 (2000).

[17] Other scholars have advocated radical reform of the intellectual property system without endorsing rewards. *See, e.g.*, Lester C. Thurow, *Needed: A New System of Intellectual Property Rights*, HARV. BUS. REV., Sept.-Oct. 1997, at 95.

[18] Steven Shavell & Tanguy van Ypersele, *Rewards Versus Intellectual Property Rights*, 44 J.L. & ECON. 525 (2001).

[19] Steve P. Calandrillo, *An Economic Analysis of Intellectual Property Rights: Justifications and Problems of Exclusive Rights, Incentives, and the Alternative of a Government-Run Reward System*, 9 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 301 (1998).

[20] Michael Kremer, *Patent Buyouts: A Mechanism for Encouraging Innovation*, 113 Q.J. ECON. 1137 (1998).

[21] Douglas Gary Lichtman, *Pricing Prozac: Why the Government Should Subsidize the Purchase of Patented Pharmaceuticals*, 11 HARV. J.L. & TECH. 123 (1997).

This recent revival of interest in prize systems, even among such prominent scholars, seems unlikely to lead to full-scale implementation. For one, the change may be simply too radical to be politically palatable in the near future. Calandrillo might be correct that the government would be able to levy sufficient taxes to pay the rewards that would be necessary in a prize system,[22] and Shavell and van Ypersele might be correct in stating that "industry should not object" to an opt-in proposal, "as it can only raise firms' profits."[23] Nonetheless, there might be some special interests opposed to such a change, such as patent attorneys,[24] and there certainly is not a powerful interest lobbying for such a change. Likelihood of adoption, of course, does not detract from the proposals' academic merits, but it does suggest that any reform proposal should be incremental.[25] In addition, radical proposals to replace existing legal institutions may offer substitutes for some of the features of those institutions while missing the importance of other features. The survival of an institution provides at least some evidence that it serves a useful purpose, but it may not be the purpose for which the institution was originally intended.[26]

Moreover, as the diversity of reward proposals indicates, there is no academic consensus on how a prize system should work, let alone on whether any particular prize system is advisable. Prize system advocates recognize that the devil is in the details, and that the devil for a prize system is the government's ability to dispense rewards accurately. Although prize system proponents have given more or less developed indications of what the government should look to in determining awards, none has given a detailed assessment from the perspective of public administration of how such an agency should work. That is the project of this Article, but the Article's aim is not to fill in obvious implementation details for such a regulatory scheme. Outlining a design for a regulatory agency charged with disbursing funds is a familiar, if not easy, task. Give rulemaking authority, authorize the appointment of commissioners, create hearing procedures, and appropriate funds, and the agency will work well enough. Or perhaps it will not work so well, which is the point of those who laud the copyright[27] and patent[28] system's ability to induce innovation with a relatively small amount of governmental involvement and expense.

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[22] Calandrillo, *supra* note 19, at 345.

[23] Shavell & van Ypersele, *supra* note 18, at 544.

[24] Members of the patent bar have in the past expressed opposition to many patent reform proposals. *See, e.g.*, Allan M. Soobert, *Breaking New Grounds in Administrative Revocation of U.S. Patents: A Proposition for Opposition—and Beyond*, 14 SANTA CLARA COMPUTER & HIGH TECH L.J. 63, 83 (1998) (describing one such instance). The patent bar, of course, is not a monolith, and different groups of attorneys may have different interests. *Cf.* Lee Rousso, Comment, *Japan's New Patent Attorney Law Breaches Barrier Between the "Legal" and "Quasi-Legal" Professions: Integrity of Japanese Patent Practice at Risk?*, 10 PAC. RIM L. & POL'Y J. 781 (2001) (discussing such a conflict in Japan).

[25] Shavell and van Ypersele implicitly acknowledge this, concluding in the last line of their article that "serious study of the possibility of reward systems, with a view towards their implementation at least on an experimental, partial basis, is worth contemplating." Shavell & van Ypersele, *supra* note 18, at 545. They do not, however, describe how such an experimental, partial program would work.

[26] F. Scott Kieff has offered powerful arguments against prize system proposals based on the patent system's role in facilitating commercialization of inventions, a problem that reward proponents have not considered. F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 705-17 (2001); *see also infra* Part II.A.1. A second author who offers a brief but insightful critique of prize proposals is Arti Rai. *See* Arti K. Rai, *The Information Revolution Reaches Pharmaceuticals: Balancing Innovation Incentives, Cost, and Access in the Post-Genomics Era*, 2001 U. ILL. L. REV. 173, 198-202; *see also infra* note 117 and accompanying text.

[27] *See, e.g.*, Wendy J. Gordon, *Asymmetric Market Failure and Prisoner's Dilemma in Intellectual Property*, 17 U. DAYTON L. REV. 853, 868 (1992) (concluding that markets are likely to be superior to courts and administrative agencies in setting appropriate prices for use of copyrighted material).

[28] As Dutton notes in explaining the reasoning of those who rejected prize systems in the 19th century, "Patents at least let the market decide." DUTTON, *supra* note 4, at 26.

This Article seeks to undermine a premise common to all recent proposals. The quest underlying the renaissance of scholarship on prize systems seems to be for a specification of just how such an agency should act in granting awards. If only the task of giving awards can be reduced to a formula or algorithmically designed procedure, it must seem, then the objection that government will not do the job right will go away. Specify the formula or algorithm in the statute governing the reward-granting agency, leaving as little bureaucratic discretion as possible, and the system will work just fine. I will argue, however, that there are so many considerations relevant to dispensing of prizes, many of which cannot be measured in an objective way, that no suitable proposal is likely to be forthcoming. Even if academics could settle on a solution, and even if there were sufficient political will to effect a radical change in the patent system, Congress might not adopt the proper formula. Political considerations might interfere, and the ideal formula or procedure might be altered so as to benefit a key legislator's constituent or district. In addition, legislators might distrust formulas and procedures that would be difficult for even an economist to understand quickly.

Congress could charge an administrative agency with the task of creating regulations for optimal disbursement of funds, but this just moves the problem to a new venue, with concerns about agency capture replacing concerns about special interest influence in Congress.[29] The agency might adopt an unsatisfactory formula too. Nonetheless, I will argue that leaving individual prize decisions to an agency to resolve on a case-by-case basis is both more feasible and more attractive than resolving the problem in Congress or through detailed regulations. A proposal that simply gives an agency a set amount of money to distribute also is more palatable than one that leaves the Treasury with an open-ended liability that could be both massive and difficult to project. A simple approach would be to give an agency a fixed sum, say $100 million initially, with which to reward industry concessions in a particular year that offset the negative consequences of patent monopolies in a particular market, and let the agency determine how to spend the money in adjudications with various claimants. My thesis is that such a flexible system is superior to a prize system working according to rigid pre-established rules.

This proposal must seem naïve to the advocate of a particular formula or algorithm, but this Article will recommend it nonetheless. There is an important caveat, however, a caveat that can be summarized in one word: Delay. Instead of creating the agency immediately and distributing the money shortly after claimants file requests, Congress should place the money aside in an investment account, with statutory instructions that the agency not even be created until some years, perhaps a decade, later. Only once the agency is created would the government process the claims and distribute the money, including interest accrued, for actions by then long in the past. A claimant eager for immediate payment could sell the claim on the fund, but the government would not accommodate such eagerness in any other way. This is a unique design in a legal world that abhors delay,[30] but it has the virtue of being simpler than any of the formulas or algorithms advocated by prior scholars. Moreover, I will show, it is more likely to encourage cost-effective concessions and projects that best offset the monopoly effects of patents.

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[29] On capture theory and its successors, see Thomas W. Merrill, *Capture Theory and the Courts: 1967-1983*, 72 CHI.-KENT L. REV. 1039 (1997).

[30] Delay by courts in resolving civil litigation has resulted in innovations such as the creation of "rocket dockets." *See, e.g.*, T.S. Ellis III, *Judicial Management of Patent Litigation in the United States: Expedited Procedures and Their Effects*, 9 FED. CIR. B.J. 541 (2000); Heather Russell Koenig, *The Eastern District of Virginia: A Working Solution for Civil Justice Reform*, 32 U. RICHMOND L. REV. 799 (1998); Carrie E. Johnson, Comment, *Rocket Dockets: Reducing Delay in Federal Civil Litigation*, 85 CAL. L. REV. 225 (1997).

Though a novel tool in a public administrative regime, delay is not a new idea in the world of prizes. Nobel Prizes are typically awarded only long after the achievement being credited.[31] The wait ensures that achievements withstand the test of time and do not prove to be errors or frauds.[32] Indeed, delay seemed so necessary to those entrusted with awarding the prizes that the practice of waiting was adopted despite a provision in Alfred Nobel's will specifying that the Prizes were to be awarded for achievements made in the preceding year.[33] Similarly, garden-variety inventions may turn out to be more weeds than flowers only a few years after introduction, either because an inventor exaggerated the importance of the invention or because the invention turns out to be part of a fad of only transient importance.[34] Sales figures and other data over a series of years may provide a more meaningful measure of an invention's significance and expose any flaws in an invention that an inventor might recognize but sensibly withhold from the prize grantor. One purpose of delay in my proposal is thus similar to the purpose of waiting to award Nobel Prizes, subjecting claimants to the test of time.

There is, however, an additional, and arguably more important, justification different from the one for Nobel Prizes. Delay prevents prize applicants from being influenced by the identity and idiosyncratic preferences of those granting the rewards. It is delay that makes a prize system in which the eventual awarders of prizes are not bound to a previously agreed formula or method attractive. Without delay or constraint, a prize system might amount to nothing more than a system allowing decisionmakers to spend money on pet projects as they please. With delay, as long as innovators do not believe that the ultimate decisionmakers will deviate in any predictable way from granting optimal rewards, they will expect that their inventions will receive the socially optimal amount of compensation, and this in turn will induce socially optimal investments, or at least the investments that seem most likely to be optimal at the time that they are made. Delay thus serves as an alternative to a system of detailed and constraining rules in preventing individual decisionmakers' preferences from having too large an effect on the system. Moreover, I will argue, it is preferable to a system of rules, both because of the difficulty of

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[31] *See, e.g.*, http://www.britannica.com/eb/article?eu=57415&tocid=93433#93433.toc (last visited August 29, 2001) (providing an overview of the criteria for awarding prizes).

[32] The Nobel committees' caution may be a result of some awards that the committees would come to regret. For an account of Nobel Prizes that seem today to have been errors, see LEO KATZ, ILL-GOTTEN GAINS: EVASION, BLACKMAIL, FRAUD, AND KINDRED PUZZLES OF THE LAW 221-22 (1996). The Nobel Peace Prize is often given for recent efforts toward peace and is often controversial for precisely this reason. *See, e.g.*, Padraic P. McGuinness, *Nobel Prize for Political Meddling*, AGE, Oct. 19, 1996, at 31 (criticizing the committee awarding the Peace Prize for making political decisions); Shawn Pogatchnik, *Hume, Trimble Win Nobel Peace Prize*, AP, Oct. 16, 1998, *available at* 1998 WL 21172668 ("The Oslo Nobel judges previously have used their award to encourage progress in peacemaking . . . .").

[33] Nobel provided that the interest from the fund established "shall be annually awarded in prizes to those persons who shall have contributed most materially to benefit mankind during the year immediately proceeding." Code of Statutes of the Nobel Foundation § 1 (June 29, 1900), *reprinted in* CRAWFORD, *supra* note 15, at 221. This provision was interpreted liberally as follows:

The proviso in the Will to the effect that for the prize-competition only such works or inventions shall be eligible as have appeared "during the preceding year", is to be so understood, that a work or an invention for which a reward under the terms of the Will is contemplated, shall set forth the most modern results of work being done in that of the departments, as defined in the Will, to which it belongs; works or inventions of older standing to be taking into consideration only in case their importance have not previously been demonstrated.

Id. § 2, *reprinted in* CRAWFORD, *supra* note 15, at 222. The statutes also provide, "No work shall have a prize awarded to it unless it have been proved by the test of experience or by the examination of experts to possess the preeminent excellence that is manifestly signified by the terms of the Will." *Id.* § 5, *reprinted in* CRAWFORD, *supra* note 15, at 223.

[34] John Thomas notes the danger of fads in addressing the appropriate patent policy for pioneer inventions. *See* John R. Thomas, *The Question Concerning Patent Law and Pioneer Inventions*, 10 HIGH TECH L.J. 35, 97 (1995) ("The remarkable success of a particular invention may be due to elements such as marketing efforts and technological fads, which may falsely suggest that an undeserving invention is worthy of an award of broad patent protection.") (footnotes omitted).

forging agreement on any particular set of rules for compensation ex ante and because the creation of any given set of rules invites potential prize applicants to exploit loopholes.

Delay is not by itself enough to assure a sound system for prizes, and the Article will also deal with a number of other design issues. For example, it is important to provide incentives to third parties to point out defects in others' applications for rewards.[35] Although the decisionmakers themselves might notice some problems, they may have trouble verifying some assertions, such as those based on sales data, that may in fact be controversial. A solution to this is to provide for each prize applicant a third-party opponent that will benefit from producing evidence that will keep rewards low. This solution, in turn, introduces a new problem, the prospect that litigation between prize applicants and the opponents will use up too many social resources, necessarily limiting the benefits of prize systems. The challenge is to ensure that the costs of such litigation, as well as the related problem of rent-seeking by prize applicants and third parties once the prize distribution apparatus is established, are minimized, without losing the benefits attributable to more optimal resource use. These implementation details are not central to the task of creating a politically palatable prize system, but I will consider them in some detail, with the intent of persuading those who otherwise would believe that such concerns would make a prize system unattractive.

Though the system for awarding prizes is particularly appropriate in the patent context, I will argue that prize systems, though previously neglected in the legal and political science literatures, are a potentially useful tool of governmental administration. The argument for patent prizes is generalizable to many other areas in which the government distributes funds to private organizations in order to produce some social benefit. Often, there are reasons to doubt that the government will be capable of making sound decisions about how to distribute funds, either because a decision is inherently complex or for reasons familiar from public choice scholarship.[36] For example, in giving scientific research grants, a government agency may have trouble identifying which research projects are most likely to be successful and produce social benefit, or have difficulty deciding how much money to allocate each of a number of potentially successful proposals.[37] Similarly, we might worry that some budget allocations by Congress will reflect indulgence in "pork barrel spending" rather than dispassionate analysis of the public good.[38] While it would be fanciful to imagine Congress giving up such spending altogether, it is conceivable that if new systems for promoting certain kinds of projects developed, a norm against certain types of line item appropriations might develop.[39]

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[35] *See infra* Part II.A.2.

[36] Public choice scholars are generally skeptical about the legitimacy of the administrative state and about the quality of decisions made by administrative agencies. *But see* David B. Spence & Frank Cross, *A Public Choice Case for the Administrative State*, 89 GEO. L.J. 97 (2000) (seeking to counter public choice critiques of administration). Public choice has also long concerned itself with government spending, providing explanations of phenomena such as government deficits. *See, e.g.*, E. Donald Elliott, *Constitutional Conventions and the Deficit*, 1985 DUKE L.J. 1077, 1090 (summarizing public choice theories explaining spending that benefits particular interest groups). For a useful, albeit skeptical, introduction to public choice, see DANIEL A. FARBER & PHILIP P. FRICKEY, LAW AND PUBLIC CHOICE (1991).

[37] The problem may not be solely technical. As Thomas McGarity notes, even with peer review, various forms of bias can affect the quality of decisions made in the awarding of government grants. *See* Thomas O. McGarity, *Peer Review in Awarding Federal Grants in the Arts and Sciences*, 9 HIGH TECH L.J. 1, 38-55 (1994).

[38] For an argument that even legitimate government programs should count in a definition of "pork," see Einer Elhauge, *Are Term Limits Undemocratic?*, 64 U. CHI. L. REV. 83, 118 (1997).

[39] There is precedent to justify such a belief. It once was common practice for Congress to award pensions through private bills, but the emergence of systematic pension systems has all but eliminated them. *See, e.g.*, Note, *Private Bills in Congress*, 79 HARV. L. REV. 1684, 1684 (1966) (noting that although the definition of "private bill" includes pension awards, currently private bills rarely involve such awards). *See generally* United States v. Hall, 98 U.S. (8 Otto) 343, 346 (1878) (finding the award of pensions constitutional); Susan Sterett, *Serving the State: Constitutionalism and Social Spending, 1860's-1920's*, 22 LAW & SOC. INQ. 311

A prize system can achieve the particularism that is a virtue of the common law in a context that, because of the subjectivity of government spending decisions, is not easily amenable to the crafting of doctrine and precedent. By delaying payment and allowing tradability of prizes, the government may be able to induce efficient private allocation of funds toward achieving desired social goals even if the government itself would never be able to make funding decisions in an optimal way. The possibility of government failure is not an argument against a retrospective prize system, but an argument for it. The decisions that matter most in a prize system are not the government's, but those of private parties predicting what the government will do, and spending based on the expected value of governmental awards reduces the arbitrariness that sometimes is associated with governmental decisionmaking. With the prevailing approach to government spending, the government makes all decisions ex ante, so noise in individual allocation decisions impairs the government's ability to achieve the desired social goal. A retrospective prize system neutralizes random deviations from efficient allocation decisions. Just as venture capitalists provide funding to firms that invest in research and development that might or might not result in a commercially successful project, so too would projects be funded in proportion to the prizes that they would be expected on average to garner.[40]

The Article proceeds as follows. Part I critically reviews the recent literature urging acceptance of reward mechanisms in the patent context. It begins by identifying weaknesses in each of the major proposals for a comprehensive system that either would replace the patent system or would be available for inventors as an alternative to it. While my purpose in doing so is partly to critique the mechanics of the proposals, it is more broadly to emphasize that any approach is likely to have advantages and disadvantages. Part II then identifies potential obstacles for any such comprehensive system. Problems include inadequate incentives for commercialization, deadweight loss attributable to the distortionary effect of taxes, redundant research effort by competitors, uncompetitive markets for production or distribution of goods, lack of incentives for adequately screening reward applications, high administrative costs, and rent-seeking.

Part III details the proposal summarized above by considering a variety of design issues facing a patent reward system. It argues, for example, that a system allowing flexibility in providing awards is superior to one that hews to a formula, and that a system providing for delayed determination and payment of rewards is better than one that pays rewards immediately. Other significant issues concern the structure of the agency charged with distributing prizes and the design of a system for litigating disputes about prizes. Finally, Part IV identifies criteria for determining the suitability of particular markets for a prize system of the type described here. It then examines several specific patent areas in which such a prize system would be helpful. These areas include prescription drugs, genomics, and business methods. Part IV concludes by assessing the potential usefulness of the basic scheme for areas other than patent, such as copyright for digital recordings and government spending for social services.

(1997) (discussing the granting of pensions for military and other service in the nineteenth century). Presumably, some legislators might like to reward individual constituents with supplemental pensions, but the existence of a governmental system for providing pensions in a neutral way has made such private bills politically impossible. Similarly, if it became common for the government to encourage certain kinds of initiatives through prizes, bills granting money to specific organizations for initiatives of dubious value might not succeed.

[40] *See infra* text accompanying notes 400-403 and accompanying text.

I.   THE LIMITS OF PATENT PRIZE PROPOSALS

This part considers four recent proposals to establish patent prize systems. The proposals exhibit a remarkable diversity in approaches. All, however, share the goal of addressing how the government might determine the size and form of prizes. The earliest proposal, in Part I.A, imagines that the government would use its eminent domain power to take certain patents, with a "market test" available to patent holders to challenge the size of the prize given. The proposal in Part I.B, by contrast, seeks to derive a formula that a government agency could use in providing prizes, and the proposal in Part I.C describes a market mechanism involving auctions and randomization for determining how much should be paid in patent buyouts. The most distinctive of the proposals is that in Part I.D, which urges that the government give prizes in the form of coupons instead of buying out patents. Besides describing the proposals, I aim to show that each has significant flaws and that even if these flaws could be corrected, different approaches might be optimal in different situations.

A.   Guell and Fischbaum's Market Test

Robert Guell and Marvin Fischbaum offered the first of the recent proposals for prize systems, focusing specifically on the prescription drug industry.[41] Their proposal is useful initially for describing the central problem that all proposals for patent prizes seek to attack: the inefficiency associated with the grant of a limited monopoly.[42] As Guell and Fischbaum explain, "[t]he problem is that, in order to garner [monopoly] profits, monopolists set price above marginal cost and produce less than the socially desirable output."[43] By definition, a profit-maximizing firm will raise its prices on a product until the decrease in the number of consumers purchasing the product more than offsets the profit attributable to the higher price paid by consumers who will still buy it. If the producer can prevent other firms from selling the same product, as a patent entitles the producer to do,[44] then the price the producer charges ordinarily will be more than it costs to make an additional unit of the product. A pill that costs just a few cents to manufacture might sell for tens or hundreds of dollars.

This is a familiar story, but two points are worth emphasizing. First, as Guell and Fischbaum note, "monopoly profits per se are not a cause for concern.[45] The economist's standard objection is not that the drug producer will get rich at the expense of consumers, a distributional issue.[46] The economist worries about the effect of an increase in price on production.[47] Some consumers who value the drug at more than the price it costs to manufacture the drug will fail to purchase the drug at the monopoly price, either because they decide that their money is better spent elsewhere or because they do not have sufficient resources to make the

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[41] Robert C. Guell & Marvin Fischbaum, *Toward Allocative Efficiency in the Prescription Drug Industry*, 73 MILBANK Q., June 1995, at 213.

[42] *See, e.g.*, ROBERT B. EKELUND, JR. & ROBERT D. TOLLISON, ECONOMICS 273-74 (3d ed. 1991) (describing the welfare losses associated with the exercise of monopoly power).

[43] Guell & Fischbaum, *supra* note 41, at 216-17.

[44] *See* 35 U.S.C. § 271 (prohibiting infringement of a patent). Excludability is, of course, the essence of the patent right.

[45] Guell & Fischbaum, *supra* note 41, at 216.

[46] *See* Louis Kaplow & Steven Shavell, *Why the Legal System Is Less Efficient Than the Income Tax in Redistributing Income*, 23 J. LEGAL STUD. 667 (1994).

[47] This emphasis is apparent in George Stigler's Coasean observation that in a world of zero transactions costs, consumers could pay a monopolist to increase output. *See* George J. Stigler, *The Law and Economics of Public Policy: A Plea to the Scholars*, 1 J. LEGAL STUD. 1, 12 (1972). In effect, in a patent prize system, the government serves as the consumers' representative in making just such a bargain with a patent holder.

purchase.[48] When this occurs, "consumers lose more from higher prices than producers gain,"[49] and a deadweight loss results. Second, the economist's concern may not be the same as the politician's concern. To be sure, politicians sometimes worry publicly about people being denied health care.[50] It is at least as common, however, for politicians to complain about the effect of the high cost of prescription drugs, sometimes on specific groups like senior citizens.[51]

The possibility of deadweight loss is by itself not sufficient to justify eliminating the patent system, of course. Guell and Fischbaum recognize that the "static efficiency" from elimination of the patent system might be outweighed by the system's "dynamic efficiency."[52] Elimination of patent protection would produce a short-term benefit, as the price of products currently inflated because of patents fall.[53] It would, however, discourage producers from innovating in the future. The end of patents would not be the end of invention altogether. Innovators might still be able to protect some inventions by keeping them secret.[54] In addition, research and development might be worthwhile because of first-mover advantages.[55] In a survey, chief R&D executives acknowledged that many of their inventions would have been developed even in the absence of patent protection, more in some industries than in others.[56] A drawback of the patent system is that it covers, perhaps by necessity, both inventions spurred by the promise of a monopoly and inventions that would have been developed in any event.[57] Deadweight losses

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[48] This occurs because consumers' demand for the drug is not completely inelastic. *See* EKELUND & TOLLISON, *supra* note 42, at 119-22 (explaining elasticity).

[49] Guell & Fischbaum, *supra* note 41, at 217.

[50] *See, e.g.*, *Gore Vows Penalties if HMOs Cut Seniors*, DES MOINES REG., Sept. 26, 2000, at 8, *available at* 2000 WL 4975826 (describing Al Gore's criticizing of drug companies for refusing coverage and dropping patients).

[51] *See, e.g.*, *GOP Rips Al's Far-Fetched Story on Pooch's Drug Prices*, N.Y. POST, Sept. 19, 2000, at 4 (discussing a controversy involving Gore's allegation that his mother-in-law paid more for arthritis medication than the price of the same drug for his dog).

[52] Guell & Fischbaum, *supra* note 41, at 221.

[53] This assumes that the government could eliminate the patent system without providing compensation, which is unlikely given the Takings Clause. *See* Mitchell N. Berman et al., *State Accountability for Violations of Intellectual Property Rights: How to "Fix" Florida Prepaid (And How Not To)*, 79 TEX. L. REV. 1037, 1072 (2001) ("[S]tate infringements of patents, copyrights, and trademarks are likely in some cases to constitute takings of intellectual property that will require the state to pay just compensation to the rightsholders."). *See generally* Shubha Ghosh, *Toward a Theory of Regulatory Takings for Intellectual Property: The Path Left open After* College Savings v. Florida Prepaid, 37 SAN DIEGO L. REV. 637 (2000) (arguing that state infringement of intellectual property might be remedied by takings suits, despite state sovereign immunity).

[54] *See* Vincent Chiapetta, *Myth, Chameleon or Intellectual Property Olympian? A Normative Framework Supporting Trade Secret Law?*, 8 GEO. MASON L. REV. 69, 136-45 (1999) (analyzing the relationship between trade secret law and patent law).

[55] The classic study of the advantages of being a first-mover is Richard Schmalensee, *Product Differentiation Advantages of Pioneering Brands*, 72 AM. ECON. REV. 349 (1982). *See also* Cecelia C. Conrad, *The Advantage of Being First and Competition Between Firms*, 1 INT'L J. INDUS. ORG. 353 (1983); Paul Klemperer, *Entry Deterrence in Markets with Consumer Switching Costs*, 97 ECON. J. supp. at 99 (1987). For an assessment of whether first-mover advantages would be sufficient to spur innovation in the pharmaceuticals industry, see F.M. SCHERER & DAVID ROSS, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 588-92 (3d ed. 1990). Calandrillo specifically discusses first-mover advantages in considering the virtues of prize systems. Calandrillo, *supra* note 19, at 318-21.

[56] *See* Edwin Mansfield, *Patents and Innovation: An Empirical Study*, 32 MGMT. SCI. 175 (1986). "Weighting the responses according to 1982 company-financed R&D expenditures in the reporting groups, the aggregate loss of inventions without patent protection would have been roughly 14 percent of those actually made." SCHERER & ROSS, *supra* note 55, at 629 (basing a calculation on National Science Foundation data). For a more recent survey suggesting that executives generally view patents as a relatively ineffective way of protecting intellectual property, but that reliance on patents may have increased since the Levin et al. study, see WESLEY M. COHEN ET AL., PROTECTING THEIR INTELLECTUAL ASSETS: APROPRIABILITY CONDITIONS AND WHY U.S. MANUFACTURING FIRMS PATENT (OR NOT) (National Bureau of Econ. Research Working Paper No. 7552, 2000).

[57] Some commentators have suggested enforcing only patents on inventions that would not have been developed in the absence of patent law. *See, e.g.*, A. Samuel Oddi, *Beyond Obviousness: Invention Protection in the Twenty-First Century*, 38 AM. U. L. REV. 1097, 1101 (1989); *see also* Roberts v. Sears, Roebuck & Co., 697 F.2d 796 (7th Cir. 1983) (Posner, J.) (employing such reasoning).

will exist not only for inventions that would never have existed but for the patent system, but also for inventions that would have existed anyway.

Nonetheless, it is at least theoretically plausible that the benefits of the patent system exceed the costs,[58] and for the purposes of this Article, we will assume this to be true. Patent advocates cannot end the inquiry here, though, because the question is whether it is possible to provide incentives for the inventions that the patent system offers without suffering the deadweight loss inherent in monopoly pricing. One way that this might be achieved is by having the government provide funds for research and development directly, with requirements that the results of the research be released and shared with the public. If research is a public good, let it be publicly produced. The government, of course, does just this with basic research, conducting much basic research itself and providing subsidies for other basic research.[59] Governments, however, may be unsuccessful at picking winners,[60] that is at deciding what type of research is important and who is best suited to perform it. Even if the government knew what invention it would like developed and who is best situated to develop it, Guell and Fischbaum argue that inefficiencies in government contracting may make direct procurement "a recipe for disaster."[61] Presumably, the government encourages research with both patent protection and subsidization of research because each approach is the more efficient in its own sphere.

Enter the proposal for a prize system. Instead of having the government only choose ex ante what research projects to finance, the government could allow the invisible hand to work, inventers to obtain patents, and then pay the inventers for their patents. Guell and Fischbaum propose simply "that the government buy prescription drug patents at a price equaling the net present value of the profit they would have generated and distribute the patents to U.S. drug manufacturers."[62] Assuming that the government could do this, it is easy to see how this approach would solve the deadweight loss problem. By allowing free use of the patent by

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[58] Even if the patent system imposes greater costs than benefits for run-of-the-mill inventions, its benefits may exceed its costs once truly revolutionary inventions are taken into account, since these may require "completely new marketing channels and production facilities." A. Samuel Oddi, *Trips—Natural Rights and a "Polite Form of Economic Imperialism*, 29 VAND. J. TRANSNAT'L L. 415, 442 n.112 (1996).

[59] The United States typically performs basic research itself instead of subsidizing research when the research is aimed at direct government use, for example for national defense. *See* Michael L. Doane, *Green Light Subsidies: Technology Policy in International Trade*, 21 SYRACUSE J. INT'L L. & COM. 155, 160 (1995).

[60] Michael Hart, for example, argues, "Governments do not have a good track record of picking winners and losers, but losers have an excellent record of picking governments. When governments are committed to picking winners, the losers will show up and insist on their share . . . ." Michael Hart, *The Chimera of Industrial Policy: Yesterday, Today and Tomorrow*, 19 CAN.-U.S. L.J. 19, 36 (1993); *see also* Steve Charnovitz, *Designing American Industrial Policy: General Versus Sectoral Approaches*, 5 STAN. L. & POL'Y REV. 78, 85 (1993) (noting the difficulty that the government faces in establishing adequate criteria for picking winners). One problem with the critique that government is ineffective at picking winners is that the private sector has its share of losers too, from the Edsel to New Coke. On the other hand, when the government seeks to pick winners, even when it seems to be successful, it may have literally picked the winners by creating an unequal playing field. *See* Joel B. Eisen, *Antitrust Reform for Joint Production Ventures*, 30 JURIMETRICS J. 253, 254 (1990).

[61] Guell and Fischbaum note that the government could accomplish procurement either through fixed-cost pricing, in which a contractor agrees to do research for a set fee, or cost-plus pricing. Fixed-cost pricing "can lead to cost minimization without regard to quality." Guell & Fischbaum, *supra* note 41, at 222. It is particularly problematic for research whose prospects are uncertain and for which assessments ideally should be made each step of the way whether the research should continue or scrapped as a sunk cost. Cost-plus pricing solves some of these problems, but "invariably this results in cost overruns because the builder does not share in the savings." *Id.* at 223. Government contracts law, of course, is all about trying to overcome these problems, but agency costs may be substantial for some types of government procurement. *See generally* William E. Kovacic, *Whistleblower Bounty Lawsuits as Monitoring Devices in Government Contracting*, 29 LOY. L.A. L. REV. 1799, 1806-07 (1996) (noting that while the government may overcome agency costs by allowing whistleblower lawsuits, these lawsuits entail agency problems of their own).

[62] Guell & Fischbaum, *supra* note 41, at 221.

manufacturers,[63] the government would invoke competitive forces, leading to production at a level that normally would be higher than the monopoly output level at a lower price. The inventors should be indifferent, assuming that the government gives them precisely the difference between the profits that they would have earned and the profits that they might still earn from being one producer of the drug among many. As Figure 1 illustrates, the patent buyout benefits society as a whole by eliminating deadweight loss, while leaving pharmaceutical companies indifferent. Indeed, pharmaceutical companies might even benefit, because free distribution of drugs might provide positive publicity for them, or at least less negative publicity than they currently receive for "price gouging."[64]

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[63] Guell and Fischbaum do not explain why only U.S. drug manufacturers would be entitled to produce the drugs, though this approach could satisfy a protectionist motive. An alternative nonprotectionist approach would be to distribute the patent to all manufacturers producing the drug for distribution in the United States. This solution would allow the inventor to obtain and enforce patents abroad, unless of course foreign countries also adopted a prize system. Guell and Fischbaum do recognize the international nature of the patent system and that the size of the U.S. economy may mean that the optimal solution for it is different from that for a small country:

> [A]n absence of a measurable effect of price controls on R&D in smaller markets would not necessarily provide support for price controls in the United States because these are clearly "beggar-thy-neighbor" policies, which allow other nations to benefit from high U.S. prices. If high U.S [sic] prices serve to motivate drug research globally, the existence of price controls in a "small country" would have minimal impact on the level of R&D investment in that country. Because the United States provides the largest national market for pharmaceuticals, price controls here would have a very different impact; it would induce a significant drop in R&D not only in the United States, but elsewhere as well.

Id. at 222. Of course, even a small country might rationally adopt a patent system to achieve reciprocity benefits for its own inventions. *But see* A. Samuel Oddi, *The International Patent System and Third World Development: Reality or Myth?*, 1987 DUKE L.J. 831 (arguing that membership in the international patent system may harm third-world nations).

[64] *See, e.g.*, Christopher Connell, *Drug Prices Rising Faster Than Inflation, Senators Complain*, AP, Feb. 3, 1993, *available at* 1993 WL 4525594 (discussing accusations that the drug industry was "price-gouging" consumers).

Figure 1. Economic effects of a patent buyout

A profit-maximizing patent holder will choose the monopoly price P_m and quantity Q_m. Rectangle A represents a monopoly rent, the profits that the patent holder receives as a result of the patent. The monopoly pricing produces a deadweight loss represented by triangle B, and consumer surplus with monopoly pricing is equal to triangle C. In a patent buyout, the government pays to the patent holder an amount equivalent to rectangle A, thus leaving the patent holder as well off as it would have been before. The patent is then placed in the public domain, and competition results in a price P_c and quantity Q_c. Consumer surplus is now A + B + C. The patent buyout thus increases consumer welfare by A + B for a cost of A, resulting in a total increase in social welfare equivalent to B.
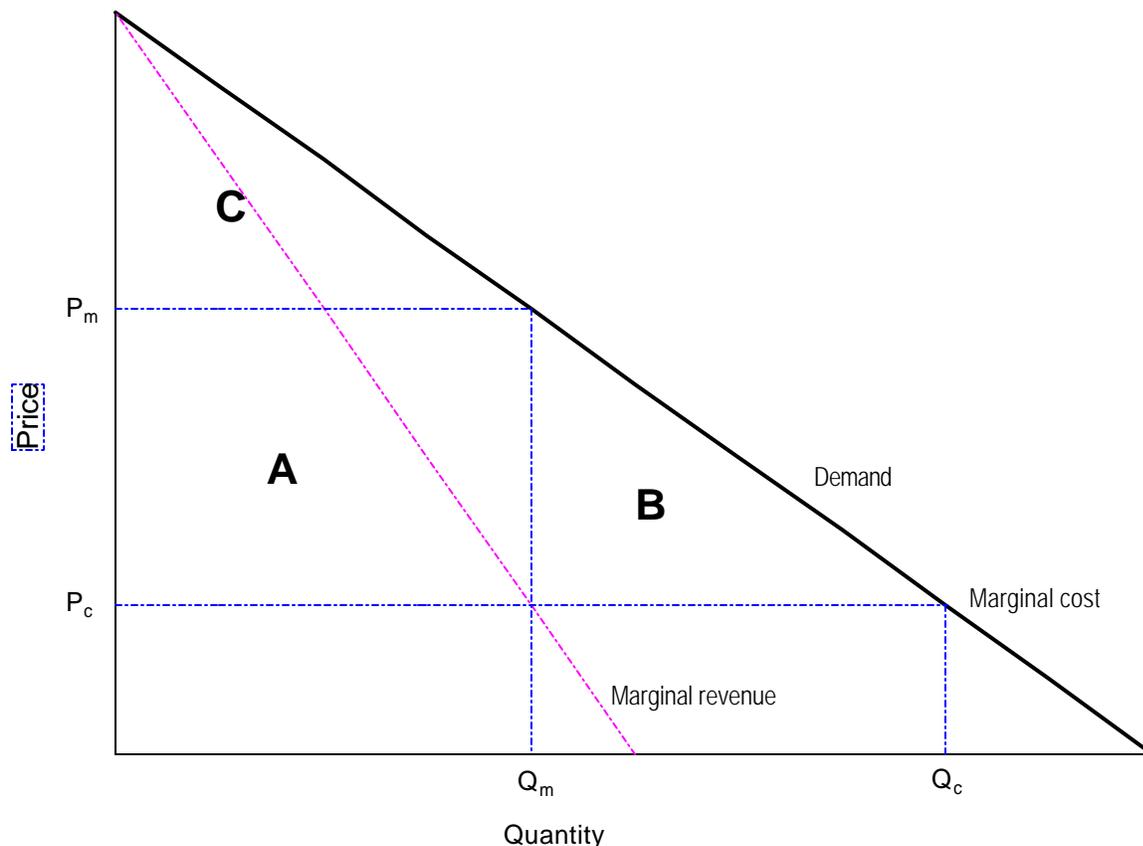
Guell and Fischbaum's primary contribution is in setting forth the analytic case for a prize system. It will be worthwhile, though, to consider just how Guell and Fischbaum propose implementing the scheme, while in fairness recognizing that the specific proposal is not the central point of their paper. Guell and Fischbaum suggest initially that the government confiscate patents, much as it confiscates other goods for public use and pays just compensation under the Takings Clause.[65] This is an analytically simple solution, placing aside the question of how to create an administrative agency that would determine which patents to take. It does not,

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[65] Guell & Fischbaum, *supra* note 41, at 225. There is a historical precedent for the government's taking of a patent. *See* City of Milwaukee v. Activated Sludge, Inc., 69 F.2d 577 (7th Cir. 1934).

however, explain just how the courts would determine the amount of compensation, and even Guell and Fischbaum do not have full confidence in the results of eminent domain proceedings, characterizing the process as one in which "wholly unqualified judges determine the 'just compensation' based on two competing claims of value."[66] As a result, Guell and Fischbaum advocate "the possibility of a market appeal," in which a drug would be marketed "in a specific test area," with the firm's "scaled-up profits" used as "an indicator of the firm's true monopoly profits had it kept the patent."[67]

This proposal has a number of problems. First, while the market appeal is designed to offset the danger of judges "biased against inventing firms,"[68] there is the possibility that judges, whether biased or not, sometimes might provide valuations that are higher than necessary.[69] To offset that, one might allow the government to use the market appeal too, but if that is so, then the eminent domain process essentially reduces to a form of nonbinding arbitration,[70] perhaps useful but essentially just a first act to the market appeal. Second, the market appeal will result in a delay in selling the product. Guell and Fischbaum explain, "Because the drug would be sold only within the test region, no one would leave the area to buy the drug at a cheaper price."[71] Thus, some consumers (including some who would be willing to pay the monopoly price)[72] would be excluded for a time from obtaining the product, producing a deadweight loss.

Third, and most significantly, it might be difficult to extrapolate from the results in the test market. Perhaps the particular geographic area in which the test market is conducted has different demographics from the nation as a whole. Moreover, the test period may not be representative. As Guell and Fischbaum themselves recognize, "the ultimate effectiveness of [a] new drug is uncertain,"[73] but they fail to recognize that a brief test market period may be inadequate. A drug may initially be popular, but later prove less effective than originally believed,[74] or it may take time for a drug to catch on among prescribing doctors.[75] Indeed, Guell

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[66] *Id.*

[67] *Id.*

[68] *Id.*

[69] Guell and Fischbaum contend that "[t]he purchasing agency would have an incentive to state the [patent value] accurately because a history of being proved wrong in test markets would lead judges to side more often with firms." *Id.* The purchasing agency, however, might systematically provide overly generous offers as a way of avoiding market appeals. Even if the purchasing agency tried to state the patent value accurately, however, the purchasing agency sometimes might give overly generous offers inadvertently, and neither side would appeal in such cases.

[70] Nonbinding arbitration may be useful, for example by encouraging settlement. *See, e.g.*, Steven A. Weiss, *ADR: A Litigator's Perspective*, BUS. L. TODAY, Mar./Apr. 1999, at 30, 30 ("From my experience, nonbinding arbitration is only useful when the parties have litigated for a while, discovery is mostly or completely finished, and the parties are trying to reach a settlement."). *See generally* Kathryn L. Hale, Note, *Nonbinding Arbitration: An Oxymoron?*, 24 U. TOL. L. REV. 1003 (1993) (exploring the usefulness of nonbinding arbitration).

[71] Guell & Fischbaum, *supra* note 41, at 225.

[72] Under current doctrine, the test market period would need to occur after or shortly before the patent application is filed. *See* Jay David Schainholz, Note, *The Validity of Patents After Market Testing: A New and Improved Experimental Use Doctrine?*, 85 COLUM. L. REV. 371, 371-72 (1985) (noting that market testing does not count as an experimental use permissible more than one year prior to filing a patent application). To minimize the period in which the drug would be available only in a test market, Congress might consider expanding the experimental use exception. Alternatively, the output-reducing effect of the test market could be mitigated by allowing the patent holder to sell the drug nationwide until the buyout is completed. Indeed, the test market could simply be a "test period" in which the drug were marketed nationwide. Such sales, however, would still be at the monopoly price, thus implying some welfare loss relative to a system that effected patent buyouts at the beginning of a patent term.

[73] Guell & Fischbaum, *supra* note 41, at 224.

[74] In an extreme case, a drug may be withdrawn because of unexpected safety problems. *See, e.g.*, Vanessa Fuhrmans & Gardiner Harris, *Bayer Withdraws Major Cholesterol Drug*, WALL ST. J., Aug. 9, 2001, at A3 (reporting on Bayer's withdrawal of Baycol, a cholesterol-lowering drug, after at least 311 deaths among patients taking the drug).

[75] Capital markets, however, often react strongly to unexpectedly slow drug sales, suggesting that initial sales may well be predictive of future sales. *See* Susan Pulliam & Thomas M. Burton, *Investors Focus on 'Scrip Sales' of New Drugs Like Lilly's*

and Fischbaum note that a drug ultimately may prove beneficial for other than its initially intended use,[76] but such uses may take more time to become apparent. Guell and Fischbaum urge that the pharmaceutical company be encouraged to advertise the drug and that the price of marketing efforts be taken into account in determining the profits from the drug. But advertising expenditures may be quite different for the initial introduction of a drug than they would be later.[77]

I do not mean to imply that these problems could not be overcome, or that they are so severe as to make Guell and Fischbaum's proposal inadvisable. A government agency might be able to develop detailed demographic models allowing it to extrapolate from a test market to the country as a whole. Similarly, the agency might rely on data about profits from pharmaceuticals in the past to estimate future advertising and sales of a drug from the initial sales in a test market. Moreover, one might argue, as long as the agency is not systematically wrong, the system might produce the appropriate invention incentives.[78] There is, however, the possibility that the agency will be systematically wrong, that it will adopt a formula or procedure for computing the value of a patent that is inaccurate in a predictable way. Such a systematic error might have a substantial effect on innovation incentives, either positive or negative, if it changes the expected returns to research and investment. While Guell and Fischbaum's proposal is a first step, they do not offer enough details or argument to justify a belief that the agency would be able to manage its task sufficiently well.

B. *Shavell and van Ypersele's Reward Formula*

The Shavell and van Ypersele proposal is in presentation nearly the polar opposite of Guell and Fischbaum's. While Guell and Fischbaum explain their proposal primarily with words, using a figure only to convey the concept of deadweight loss, the Shavell and van Ypersele proposal is based on and developed through a mathematical model. The motivation for the Shavell and van Ypersele project is the recognition that the "principal difficulty with reward systems … concerns the government's need for information to calculate rewards."[79] Following an earlier model by Brian Wright,[80] they worry particularly about asymmetric information. This

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Evista, and Punish Slow Takeoffs, WALL ST. J., Feb. 19, 1998, at C4 (discussing investors' consideration of "scrip sales," weekly reports on the sales of prescription drugs, particularly new ones).

[76] "In medical research the unintended beneficial qualities of medicines are often as important as the intended ones. Temin [1980], for example, relates how research on sulfa drugs led to whole new classes of therapeutic agents, including tranquilizers and antihypertensives." Guell & Fischbaum, *supra* note 41, at 224 (citing P. TEMIN, TAKING YOUR MEDICINE: DRUG REGULATION IN THE UNITED STATES (1980)). As this quotation reveals, not only might a particular drug have beneficial but possibly unforeseen uses, but also it might serve as a building block to another invention. A patentee can take advantage of this either by developing the subsequent invention or by licensing, but the test market approach would not help to calculate potential profits from such activities.

[77] One commentator has argued that determining the value of patents in the prescription drug contexts is complicated by the existence of insurance. *See* Rai, *supra* note 26, at 179 ("[T]he growing number of commentators who advocate publicly financed buyouts of important pharmaceutical patents as a means of eliminating deadweight loss ignore the demand-side reality that for the most part, individual consumers do not purchase individual drugs directly at the time they need them.") (footnote omitted). Guell and Fischbaum might respond to this criticism by noting that it does not matter from the perspective of the market test whether drugs are purchased by insurance companies or by consumers, though this response only highlights the problem that insurance companies' purchasing and reimbursement decisions in the test market might not be reflective of their later decisions. An alternative response would be to prevent insurance companies from providing the drug in the test market as a way of gauging consumer demand independent of moral hazard.

[78] This is quite similar to an argument that I will offer later. *See infra* text accompanying notes 402–403.

[79] Shavell & van Ypersele, *supra* note 18, at 526.

[80] Brian D. Wright, *The Economics of Invention Incentives: Patents, Prizes, and Research Contracts*, 73 AM. ECON. REV. 691 (1983).

focus is sound. If both the inventor and the government have the same estimate of the value of a patent, then a patent buyout at that value will be efficient even if it turns out that the estimate of the value of the patent is wildly inaccurate. The government is less risk-averse than a private party, and all that matters is providing equal value on average. What is worrisome is that the private party might have a better sense of the value of its patent than the government has. Systematic errors in calculating the value of patents might distort innovation incentives, perhaps enough to overwhelm the benefit from eliminating the deadweight loss associated with a patent regime.[81]

Shavell and van Ypersele model the asymmetric information problem by assuming that the inventor and the government have different information about demand for the product. In particular, the innovator knows the demand curve, but the government does not.[82] The government can identify only a family of demand curves to which the innovator's demand curve may belong, and it can calculate the probability that any of these demand curves is the actual demand curve.[83] Given these assumptions, Shavell and van Ypersele compare the surplus that would result in various possible regimes to the social surplus that would result from the "first-best outcome,"[84] in which a potential innovator invests the socially optimal amount in seeking to develop the innovation, and, if the innovation is successful, prices the product at its marginal cost.[85] The surplus will be less than this in a standard patent regime for two reasons, both familiar to the economic literature on patents.[86] The first reason is the deadweight loss from the patent holder's pricing the product at the monopoly level. The second follows from the first. Because deadweight loss is the portion of consumer's surplus in competition not transferred to producer's surplus,[87] the patent holder's profits will necessarily be less than the social surplus in the first-

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[81] Shavell and van Ypersele offer the following explanation as a prelude to the model:

> On one hand, the reward system is superior to patent in that deadweight loss due to monopoly pricing is avoided under rewards. On the other hand, the incentive to invest in research is imperfect under both systems, but in different ways. Under the patent system, the incentive to invest is always inadequate because monopoly profits are less than social surplus; but the incentive to invest is linked to actual social surplus because the innovator knows the demand for the potential innovation. Under the reward system, the incentive to invest is governed by the reward and thus is not systematically inadequate; yet the incentive to invest is not linked to actual surplus but only to the reward.

Shavell & van Ypersele, *supra* note 18, at 530 (footnotes omitted).

[82] Shavell and van Ypersele recognize that in practice neither the innovator nor the government will know the demand curve, and the innovator's information will merely be better than the government's. They explain, however, that the assumption of perfect knowledge on the part of the innovator is a useful simplification:

> The assumption that the innovator has perfect information about demand (since he knows t) and that the government does not is the simplest way to reflect the idea that the innovator possesses superior information about demand. A more realistic assumption is that the innovator's information about demand is not perfect but still is better than the government's, and were this the assumption, it will be obvious that the qualitative nature of our results would not be altered.

Id. at 532 n.25.

[83] Mathematically, the inverse demand function *d* reports the price as a function of the quantity of the product *q* and a parameter *t*. *See id.* at 531. The inventor knows the parameter *t*, but the government only knows a minimum and a maximum possible value of the parameter, denoted t_a and t_b, as well as the probability that any particular value within that range will be the actual value, represented by the probability density function $g(t)$.

[84] *Id.* at 532.

[85] Shavell and van Ypersele explain, "If there is an innovation, the first-best quantity, denoted $q(t)$, is such that the height of the demand curve is *c*, that is, $d(q(t),t) = c$." *Id.*

[86] *See* JEAN TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION 399-400 (1988). For an additional treatment, see SCHERER & ROSS, *supra* note 55, at 622-24.

[87] For a graphical illustration, see WALTER NICHOLSON, MICROECONOMIC THEORY: BASIC PRINCIPLES AND EXTENSIONS 574 fig.19.5 (5th ed. 1992). The illustration shows that monopoly pricing results in inputs that would have been devoted to the product being transferred to other, less productive uses in the economy.

best outcome. As a result, the innovator will invest less in research initially than is socially optimal.[88]

The first original contribution offered by Shavell and van Ypersele is a comparison of the reward and patent regimes in their model. If the government's information were identical to the innovator's,[89] the government could achieve the first-best outcome simply by paying the innovator the social surplus. The deadweight loss would be eliminated, as the invention passes into the public domain and is manufactured at marginal cost.[90] In addition, the prospective innovator would invest the socially optimal amount in seeking the innovation, because paying the innovator the full social surplus allows the innovator to internalize the benefits of the innovation.[91] With imperfect information, however, the government, with imperfect information, does not know the social surplus, and it can thus promise the inventor only what it expects the social surplus to be.[92] That is, the government calculates the probability of each possible social surplus, based on its knowledge of the probability distribution of the demand parameter, and it awards the inventor the average expected social surplus.[93]

Under this approach, the prize system will continue to eliminate the deadweight loss.[94] It will, however, lead to an inefficient amount of research. If the expected value of the social surplus for a particular innovation is lower than the actual social surplus, then the innovator will invest too little in the project. In such a case, the innovator recognizes that government will underestimate demand for the product and thus anticipates a smaller than ideal reward. If, however, the expected value of the social surplus is higher than the actual social surplus, then the innovator will invest too much in the project. In such a case, the innovator recognizes that government will overestimate demand for the product and thus anticipates a higher than ideal reward. Recall, however, that a patent regime also fails to optimize investment, producing systematically too little of it.[95] Thus, while Shavell and van Ypersele conclude as a formal matter that either the patent or the prize system may be superior to the other, the informal case for reward seems strong. Patent can dominate reward in their model only if the investment inefficiency in a prize system is so much greater than the investment inefficiency in a patent system that it outweighs the benefit of the prize system in eliminating deadweight loss.[96]

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[88] "Under the patent system, there are two sources of welfare loss relative to first-best welfare: insufficient investment in research; and insufficient quantity of the innovation product sold, with accompanying deadweight loss, due to monopoly pricing." Shavell & van Ypersele, *supra* note 18, at 534.

[89] Shavell and van Ypersele note that this is "contrary to our assumption." *Id.* Differently stated, this is the result that would obtain if $t_a = t_b$.

[90] *Id.* ("[T]he quantity produced is always optimal, $q(t)$, under the reward system.").

[91] *Id.* ("[T]he innovator would then choose $k(s^*(t))$, the first-best investment in research."). The notation $k(s^*(t))$ means that the innovator will invest an amount k corresponding to an anticipated profit of $s^*(t)$, the social surplus given demand parameter t, if the research successfully leads to an innovation.

[92] Shavell and van Ypersele demonstrate that providing a reward equal to the expected social surplus is optimal. *See id.* at 534-35.

[93] The calculus notation for the expected social surplus is $\int_{t_a}^{t_b} s^*(t)g(t)dt$. *Id.* at 535.

[94] *Id.* at 535 ("Under reward, there is no deadweight loss from insufficient production, whereas there is under patent.").

[95] *See supra* text accompanying note 88.

[96] Shavell and van Ypersele explain this as follows:

> [I]f the information that government has about demand is sufficiently good, then the reward system will dominate patent. Specifically, if the probability mass is sufficiently concentrated about $E(s^*)$, it follows … that reward will dominate patent. This is because the research investment under reward will tend to be superior to (and higher than) that under patent and deadweight loss from monopoly pricing will be avoided.

Shavell & van Ypersele, *supra* note 18, at 536.

Whether this is so depends on the relative efficiency in producing optimal investment of the patent and prize systems, as well as on the relative importance of calibrating research incentives and eliminating deadweight loss.[97]

Shavell and van Ypersele's most important insight is that an optional reward program can dominate patent. They suggest that the most intuitive way to understand this aspect of their model is to compare a relatively simple optional reward program to patent.[98] Under this simple program, the government calculates the lowest possible social surplus, i.e. the social surplus corresponding to the weakest possible demand function in the family of possible demand functions, and it offers this social surplus to the innovator in exchange for the patent. If the innovator turns down the offer, the optional reward program acts just like the patent regime, so the only cases that require analysis are those in which the innovator accepts the offer.[99] In these cases, deadweight loss is eliminated. Moreover, it must be that the reward is greater than monopoly profits would have been; otherwise, the innovator would not have opted for the reward. As a result, the amount of investment will be greater than what would have been generated by the patent system alone, which always creates too little investment. At the same time, the amount of investment will be less than or equal to the socially optimal amount of investment, because the reward offered is equal to the lowest possible social surplus. So, this relatively simple optional prize system eliminates deadweight loss and moves the amount of investment closer (though not all the way) toward the optimal amount, and it therefore must be superior to the patent system.

This simplest optional prize system is not necessarily the best optimal prize system. Increasing the reward to an amount somewhat above the lowest possible social surplus will induce more innovators to accept the optional reward. An increase in the optional reward will make a difference for a particular innovator when the reward offered becomes greater than monopoly profits. As long as the reward remains lower than the actual social surplus, then the increase in the reward for that innovator was worthwhile. Indeed, it will be worthwhile as long as the reward is lower than the sum of the actual social surplus and deadweight loss saved, less any loss from more inefficient investment relative to the patent system. Awards offered past this point for a particular innovator will result in a social loss, so erring on the high side in general will have some benefits (inducing innovators to accept the award where doing so is socially beneficial) and some costs (inducing inefficient research by innovators in cases where the reward is considerably greater than the amount of monopoly profits). Shavell and van Ypersele show how to solve this optimization problem, thus indicating how the government could calculate the "optimal optional reward"[100] based on the probability distribution of demand functions in a particular case.[101] The superiority of the simple prize system to the patent system means that the optimal optional prize system is *a fortiori* superior.

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[97] *Id.* ("[I]f the need for well-calibrated incentives to invest in research is sufficiently attenuated, then the reward system will dominate patent, because the factor of the elimination of deadweight loss from monopoly pricing will be of dominating importance.").

[98] *Id.* at 539.

[99] *Id.* ("[T]he patent system is equivalent to an optional reward system with $r = p(t_a)$ [lowest possible monopoly profits], because then the patent would always be chosen.").

[100] *Id.* (concluding that the optimal optional reward system must be superior to the patent system).

[101] Shavell and van Ypersele do not solve for the optimal reward, but they calculate the first derivative of social welfare in an optional prize system. *Id.* at 538. Setting this derivative to 0 and solving for *r* would produce the optimal reward. The formula for the optimal reward would be messy, but a computer program easily could be written to calculate *r* given variables including the family of demand functions and the probability distribution of those functions.

Shavell and van Ypersele extend their model to support two additional conclusions. First, a mandatory prize system might be superior to the optional prize system, but it might not be.[102] To see why, first consider why a mandatory prize system may be better than an optional one. In an optional prize system, some innovators will choose patent rather than reward even though reward would be socially optimal. The optimal optional reward will be lower than the government's estimate of social surplus,[103] which is what the government would pay in a mandatory system,[104] and this estimate in turn may be lower than the actual social surplus. When monopoly profits are greater than the optimal optional reward but less than the actual social surplus, the innovator would make the socially undesirable choice of patent, and if this would occur frequently enough, the mandatory prize system, by forcing the innovator to accept the reward, will be superior to an optional prize system. At the same time, we have seen that the mandatory prize system could be worse than the patent system.[105] Because the optimal optional regime is better than the patent system, in these cases the mandatory prize system would be worse than the optimal optional system.

Second, Shavell and van Ypersele show that the government could improve its performance in either the mandatory or optional prize system by basing rewards on the quantity of the relevant product sold. That is, after a patent were placed in the public domain, the government would wait to determine the quantity of goods sold in the market.[106] Observation of the quantity of goods is not by itself sufficient to deduce the innovator's demand curve; it allows for specification of one point on the demand curve.[107] Nonetheless, this information allows the government to improve its estimate of the demand curve, narrowing down the family of demand curves that the government might consider in the absence of sales information. This analysis recognizes that delay allows the government better to gauge the quality of an innovation (albeit without acknowledging what this Article argues may be a more important benefit of delay).[108] Indeed, Shavell and van Ypersele suggest that the government could revise rewards on an annual basis, "[a]s events unfold and information flows to the government."[109] Conceivably, the

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[102] *Id.* at 539.

[103] Asymmetric information provides an intuitive explanation for this discrepancy. When innovators choose whether to accept the reward, some will choose the reward in part because they expect their monopoly profits to be lower than the government would have guessed. This phenomenon pushes the optimal optional reward lower than the expected social surplus. The optimization of the optional reward in effect takes into account the problem of adverse selection. *See infra* Part II.C (discussing the adverse selection problem).

[104] *See supra* text accompanying note 93.

[105] *See supra* text accompanying note 96.

[106] This analysis depends on the assumption that "the government can observe quantity q sold and base rewards on this." Shavell & van Ypersele, *supra* note 18, at 540. Shavell and van Ypersele do not give any indication of whether they believe government in fact would be able to observe the quantity of goods sold, though presumably it could, with some error.

[107] This assumes that the government also would be able to observe price. Shavell and van Ypersele also suggest that the government could "estimate demand elasticities, [and] undertake surveys to determine the character and frequency of use of, for example, computer software, musical recordings, cinematic and television productions." *Id.* at 541-42. Presumably, although a government agency trying to estimate demand curves could use such information, it would be more complicated to develop a formula or algorithm for determining an award based on such additional variables. Independent of this comment, which does not include explanation of how the government would use the relevant data, Shavell and van Ypersele's model may seem to reflect an assumption that the government's task must be a mechanical one, even if that means that the government must overlook relevant information. *But see infra* Part III.A (arguing that allowing the government to consider a variety of types of information not reducible to a simple formula will not be problematic if innovators have no reason to think that the government will err systematically in considering such information).

[108] *See infra* Part III.B.2 (explaining that delay prevents patent holders from factoring in the predilections of known individual decisionmakers).

[109] Shavell & van Ypersele, *supra* note 18, at 542. Shavell and van Ypersele argue that the government "could appropriately supplement rewards, perhaps on an annual basis." *Id.* This statement may reflect an assumption that the government would not be

government's ex post information could be even better than the innovator's ex ante information, in which case a mandatory prize system necessarily would be superior to the patent system in Shavell and van Ypersele's model.[110]

The Shavell and van Ypersele proposal provides an elegant execution of economic modeling, and it elaborates intuitions about different prize programs. Nonetheless, there are several practical problems in using the Shavell and van Ypersele approach to design an actual prize system, even apart from problems to be discussed below that are general to all such attempts.[111] Shavell and van Ypersele acknowledge one caveat, that the "government's problem of determining rewards is made more difficult when the value of an innovation is in part that it leads to subsequent innovations."[112] If the government considers only sales data for a particular innovation, then it will ignore that a patent holder might have licensed the patent to someone who wished to use the innovation in a subsequent innovation.[113] There is a partial solution to this problem, if we are able to distinguish the initial innovation from subsequent innovations. The patent could be placed into the public domain for the limited purpose of allowing anyone to produce the specifically described invention, but the patent holder would retain the right to license use of the patent for subsequent innovations. This approach, however, could be cumbersome, and it reduces the benefit of placing the patent into the public domain.

Moreover, the problem is really just an example of a broader problem that Shavell and van Ypersele do not acknowledge: that an invention is not the same as a product.[114] A single product, say a computer, may be based on a variety of patents, including some held by the patent holder and some licensed from other patent holders. Similarly, one cannot assess the demand for a business method patent simply by assessing the demand for the product that the business method produces.[115] There may be some markets, such as for pharmaceuticals, in which the invention and the product are essentially the same,[116] although, as Arti Rai has pointed out in critiquing the Shavell-van Ypersele proposal, even in pharmaceutical markets, the existence of insurance complicates estimations of consumer surplus.[117] When inventions cannot be mapped

able to lower rewards by demanding that innovators give money back. If this assumption were correct, the government's optimal course would be to give initial awards based on pessimistic assessments of demand, with later supplements as the invention proved itself. Shavell and van Ypersele do not consider the possibility of having the government make a single reward determination well after the initial innovation.

[110] *Id.* at 542-43. Technically, of course, Shavell and van Ypersele's model does not allow for the possibility that the government has superior information, since the innovator has perfect information about the demand function. *See supra* note 82. Their analytic point holds, though, if the knowledge of the innovator were more realistically specified.

[111] *See infra* Part II.

[112] Shavell & van Ypersele, *supra* note 18, at 543.

[113] Shavell and van Ypersele point out that the reward system may solve some problems associated with other intellectual property systems, where "subsequent innovations may be stymied by refusal of holders of property rights to allow improvements." *Id.* Thus, this benefit may balance or offset any costs of a reward system attributable to the government's failure to account for the value of a patent for subsequent innovations.

[114] *Cf.* Kieff, *supra* note 26, at 713 (noting, in critiquing Shavell and van Ypersele, that "existence of market demand . . . does not establish that the invention itself would have been patentable").

[115] Consider, for example, Priceline.com's controversial patent on its "name your price" reverse auction system for purchasing plane tickets and other products. *See generally* Rui J. P. de Figueiredo, Jr., *Strategy, Structure and Regulation: Telecommunications in the New Economy*, 2000 L. Rev. Mich. St. U. Det. C.L. 253, 271 (discussing the patent). The relevant market is not the market for plane tickets, but how much Priceline and its competitors would be willing to pay to license the patent if someone else owned it.

[116] Even in these areas, though, the innovative product might be put to a number of different uses over time, as for example the government approves a medication for additional uses. Although a doctor can prescribe an FDA-approved drug for any use, a manufacturer can promote a drug only for approved uses. *See, e.g.*, Rhone-Poulenc Rorer Pharm., Inc. v. Marion Merrell Dow, Inc., 93 F.3d 511, 514 n.3 (8th Cir.1996) (noting that doctors may prescribe an approved drug for any use).

[117] *See* Rai, *supra* note 26, at 200. Rai explains:

one-to-one onto products, determining the demand for any particular invention may be extraordinarily difficult. The government would have to consider not only whether other companies would be likely to pay to license an invention, but also how much the patent holder selling a product based in part on the invention would have paid to license the patent, if the patent had been held by someone else.[118] In addition, the government might wish to assess the value of a patent in extracting settlements and licensing fees for competitors' products already incorporating the patented invention.[119] Importantly, none of this information will become clear over time, as the release of a patent into the public domain will prevent any licensing fees or settlements from being collected. We can wait to see sales of a particular computer, but that will not allow us, even with the most refined equations, to determine any better than initially the contribution of one innovation embedded in that computer.

Shavell and van Ypersele might have defended their proposal against the subsequent innovation argument and the broader argument by noting that neither affects their analytic case for the optional prize system. If government systematically undervalues patents, by failing to take into account the value of a patent with respect to licensing and the like, fewer innovators will accept the government's offers to buy out the patent. The optional prize system will still be better than the patent system—not as much better, but Shavell and van Ypersele do not quantify the benefits of adopting the system anyway. As long as the government limits itself to examining observed demand for the innovation itself, whether that demand is from consumers or other producers, the system will still work when the government plugs in the variables it knows. In reality, though, this observation may mean that the Shavell-van Ypersele model is useful only, or at least mostly, for markets in which the innovation and the product are essentially the same. When a sufficiently high percentage of the value of a patent derives from something other than sales of a product uniquely associated with the patent, inventors will categorically not accept the government's offers.

There is a different answer that might be offered in defense of the Shavell-van Ypersele approach. The government could make its best effort to take all of these factors into account in calculating the social surplus created by an invention. After all, Shavell and van Ypersele never suggested that the government knows the demand function, merely that it can estimate the probability that each of a number of demand functions is in fact the demand function. Demand may be difficult to estimate, but that merely means that there will be a wide variety of possible demand functions. The government still can do its best, and optional rewards will still dominate patent. When the range of potential demand functions is wide, however, government offers in the optional prize system will have to be low to prevent innovators who know that their innovations

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[I]n the context of pharmaceuticals, the Shavell/van Ypersele proposal has limitations. As contrasted with other goods, individuals do not generally purchase individual pharmaceuticals at the time they need them. Rather, they enroll ex ante in insurance plans that cover pharmaceuticals. These plans often do not differentiate their insurance product on the basis of the pharmaceutical products they offer. Even when plans do differentiate, it is at best a very rough differentiation (e.g., between plans with no drug coverage, plans with a closed formulary, and those with an open formulary).

Id.

[118] One technique used to determine how much a company would pay for its own products is known as transfer pricing, which is used for international tax purposes. *See generally* 1-2 TRANSFER PRICING HANDBOOK (Robert Feinschreiber ed., 2001); Terry Thompson, Comment, *Canada's Transfer Pricing Laws: Keeping Pace with an International Trend*, 11 TRANSNAT'L LAW. 311, 314-18 (1998) (providing an overview).

[119] *See, e.g.*, *BroadVision Settles Suit Against Art Technology*, BUS. J., Mar. 3, 2000, at 29 (reporting a settlement resulting in the payment of a licensing fee).

are relatively useless from cashing in on high offers.[120] But the optimal rewards may end up so low that no one with a valuable patent would accept them.

Part of the appeal of the Shavell-van Ypersele model may stem from the observation that from the beginning, the government *knows* a probability distribution of different demand functions. We are, however, given no information of how exactly the government calculates this probability distribution, and our confidence in relying on their model as a basis for a shift in public policy ultimately rests on how good a job we think that the government can do in calculating this probability distribution. Stripped of its mathematics, the Shavell-van Ypersele model reduces to a simple argument: Providing a reward for a patent eliminates deadweight loss. While rewards could improve innovation incentives, there is a risk that rewards that deviate substantially from actual social surplus could result in innovation incentives that are too low or too high. The case for a mandatory prize system depends on how much of a distortion in innovation incentives rewards produce, if any. In principle, though, the government can make offers to buy out patents that innovators can accept or reject, setting the offers to a low enough level that overall society will benefit more than it will lose from offers that are accepted. The government is most likely to be able to make adequate offers in areas in which an innovation and a product are essentially the same thing and the government can use sales figures to calculate demand.

That this is a simple argument does not detract from its truth or from Shavell and van Ypersele's achievement in modeling it formally. It does, however, suggest that the benefit of Shavell and van Ypersele's article is not that it produces a formula that the government can use to determine rewards. After all, as noted above, Shavell and van Ypersele do not give any indication of how to make the initial calculation of possible probability functions. If that is so, the additional insight offered by the Shavell-van Ypersele approach over, for example, the Guell and Fischbaum proposal is modest. Its main virtue may be in showing that, at least in certain markets, well-motivated economists could use relatively standard economic techniques to determine how large rewards show be. When they do so, and properly take into account that rewards must be lower than social surplus in the optional prize system,[121] an optional prize system will be beneficial. When they are particularly good at calculating demand, a mandatory prize system will be even better.

This reduction of the model, however, points out an additional problem, probably the most significant one, and the problem lies in the words "well-motivated." If Shavell and van Ypersele have shown that economic science provides tools that the government might use to determine appropriate rewards, that does not show that government in fact will do a good job of using those tools. One concern is that the government officials charged with the task might make various errors in calculating demand. Conceivably, a government official might produce a family of demand functions that does not even include the actual demand function. If the demand functions are all too low, then little harm done—just one more inventor sticking with the patent system.[122] But if there are a number of cases in which the demand functions are all systematically too high, the prize system could be quite expensive. The Shavell-van Ypersele optimization only works if the probability distributions are accurate.[123] If the government thinks that a low value is

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[120] *See supra* note 103 and accompanying text.

[121] *See supra* text accompanying notes 103-105.

[122] Shavell and van Ypersele note that "the fear that government would act suboptimally, and give unuly conservative rewards, would be less an issue under an optional reward scheme because innovators can always obtain intellectual property rights." Shavell & van Ypersele, *supra* note 18, at 544.

[123] Conceivably, the government might recognize that the probability distributions are systematically inaccurate and mandate

1% likely when a more competent evaluation would indicate that it is 90% likely, the reward program may be problematic.

The problem, however, is less likely to be the competence of the government employees than their motivations. Shavell and van Ypersele's model produces an image of objective bureaucrats doing their best, but this is an image that administrative law and public choice scholars have been skeptical of for over fifty years.[124] Suppose, for example, that the agency were "captured" by industry.[125] It might systematically offer extraordinarily generous buyouts by starting with generous estimates of the demand function. Or, we might worry that a particular presidential administration would have some agenda that it would advance through a reward program. In a mandatory reward regime, we might worry that an administration hostile to industry interests would buy out patents at very low prices. Or, we might worry that certain industries would do well at the expense of others in a particular administration. The creation of a reward regime might in effect allow presidential control over innovation, with research flowing chaotically depending on assessments of the agenda of the particular administration or agency and shifting abruptly with transitions in power.

As with my analysis of the Guell-Fischbaum approach, I do not mean to imply that the Shavell-van Ypersele approach must be rejected. To some extent, these problems might be averted by forcing the agency to rely on proxies in calculating social surplus, for example by specifying precise procedures for calculating the family of demand functions. At least, such constraints might be possible to devise for some industries. Much work would be needed, however, to determine what these proxies should be, and there is no guarantee that Congress would create the agency with the appropriate set of constraints, even if academic agreement on them could be achieved. Perhaps there are some areas in which concerns about distorted agency incentives might be less severe, but again more work would be needed to determine what those areas are. In fairness, Shavell and van Ypersele recommend only "serious study of the possibility of reward systems,"[126] not adoption of a system that they claim to have fully specified. Nonetheless, unless one can develop a way of overcoming these problems, the Shavell-van Ypersele approach can be considered only a preliminary blueprint.

C. *Kremer's Market Mechanism*

Michael Kremer's proposal is similar to Shavell and van Ypersele's in seeking to identify a means of objectively pricing patents so that the government can effect buyouts. Like Shavell and van Ypersele, Kremer suggests an opt-in approach rather than a mandatory reward regime. The mechanism he suggests, however, could not be more different. Instead of relying on government bureaucrats to calculate the optimal patent prize, Kremer suggests use of an ingenious market mechanism.[127] The mechanism, in simplified form, would work as follows.[128]

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some transformation to convert the economists' probability estimates into more appropriate estimates, which presumably would entail a wider range. It is difficult, however, to determine how systematic errors in probability distributions would be identified or corrected.

[124] For an early work alleging that administrative agencies might not act on behalf of an objective view of the public interest, see Samuel Huntington, *The Marasmus of the ICC: The Commission, the Railroads, and the Public Interest*, 61 YALE L.J. 467, 467-70 (1952).

[125] *See generally* MERRILL, *supra* note 22, at 1050-52 (discussing the rise of capture theory).

[126] Shavell & van Ypersele, *supra* note 18, at 545.

[127] Kremer's is but one of a number of recent proposals in a variety of legal fields to supplant existing institutions with institutions based on market mechanisms. *See* Michael Abramowicz, *The Law-and-Markets Movement*, 49 AM. U. L. REV. 327 (1999) (describing a number of recent proposals); Mark A. Cohen & Paul H. Rubin, *Private Enforcement of Public Policy*, 3

After a patent holder decides to apply the mechanism, bids for the patent would be solicited at a sealed-bid auction, with any private party permitted to bid. The government would then offer to purchase the patent at the price determined by the auction. If the patent holder accepts the offer, the government would execute a randomization function. With some probability (say, ninety percent of the time), the patent would be placed in the public domain. The rest of the time, the high bidder would be required to purchase the patent.

The chief virtue of Kremer's proposal is that it allows the government to harness private information. Private parties will submit bids at the auction because they recognize that there is some probability (ten percent) that they will be permitted to purchase the patent. Competitors and potential competitors of the innovator may have better information than the government about the patent's value.[129] As Kremer recognizes, the use of an auction is valuable not only because it gives government officials more information, but also because it constrains their discretion.[130] At least in the simplified version above, the governmental role would be minimal, limited to overseeing the auction, a task that experience suggests the government is capable of performing.[131] Even without any investigation at all, the government could rely on private parties' bids, because the private parties will be well incentivized. As in any sealed-bid auction, private parties will consider their own interests in bidding. If a private party bids too low, then it will not win the auction, making the entire effort a wasted expense; if the private party bids too much, then it may end up paying too much for the patent.

A potential limitation of the market mechanism that Kremer anticipates is that the value of a patent may be too low, because the social value of the patent may exceed the private value. Indeed, this problem animates Kremer's proposal, as he reviews a literature "suggest[ing] that social returns to innovation far exceed the private returns."[132] Rather than purchase patents at their private value, as revealed by the auction, the government could offer to purchase patents at the private value times some markup, which Kremer indicates might be between 2.5 and 3.33.[133]

YALE J. ON REG. 167 (1985) (urging the use of auctions to identify private enforcers of public policy); Jonathan Macey & Geoffrey Miller, *The Plaintiffs' Attorney's Role in Class Action and Derivative Litigation: Economic Analysis and Recommendations for Reform*, 58 U. CHI. L. REV. 1 (1991) (recommending using auctions in class action and derivative litigation); A.C. Pritchard, *Auctioning Justice: Legal and Market Mechanisms for Allocating Criminal Appellate Counsel*, 34 AM. CRIM. L. REV. 1161, 1166-70 (1997) (urging that right to serve as appellate counsel for convicted indigent defendants be auctioned off, with the high bidder receiving a contingency fee if successful).

[128] *See* Kremer, *supra* note 20, at 1147 & fig.I.

[129] *Id.* at 1146 ("While the value of potential inventions may be private information of the researcher before research is conducted, other firms in the industry are likely to have at least some information on the private value of the invention after inventions are patented.").

[130] *Id.* at 1138 ("Allowing government officials wide discretion to set payments to inventors ex post may lead to rent-seeking and to expropriation of investors after their research costs are sunk."); *see also id.* at 1138-39 ("One problem with allowing broad administrative discretion over the patent buyout price is that this may lead to purchases at confiscatory prices, and thus reduce incentives for innovation.").

[131] Government frequently holds auctions, for example to sell forfeited property. *See, e.g.*, 21 U.S.C.A. § 881(e)(1)(B) (West 2001) (providing for disposition of property in a "public sale"); *Shanxi's First Public Property Auction*, XINHUA ENG. NEWSWIRE, Dec. 11, 1997, available at 1997 WL 15760495 (describing a forfeiture auction in China).

[132] Kremer, *supra* note 20, at 1141 (citing M. ISHAQ NADIRI, INNOVATIONS AND TECHNOLOGICAL SPILLOVERS (Nat'l Bureau of Econ. Research Working Paper No. 4423, 1993); MANUEL TRAJTENBERG, ECONOMIC ANALYSIS OF PRODUCT INNOVATION: THE CASE OF CT SCANNERS (1990); Edwin Mansfield et al., *Imitation Costs and Patents: An Empirical Study*, 91 ECON. J. 907 (1981)); *see also* Timothy F. Bresnahan, *Measuring the Spillovers from Technical Advance: Mainframe Computers in Financial Services*, 76 AM. ECON. REV. 742, 753 (1986); Edwin Mansfield et al., *Social and Private Rates of Return from Industrial Innovations*, 91 Q.J. ECON. 221, 234 (1977). Kremer concludes that social rates of return to research and development are generally about 50 percent, in comparison with private rates of return of about 25 percent. In individual circumstances, social returns may be much higher. *Id.*

[133] *Id.* at 1142.

The government would purchase the patent at this high markup even in those cases in which it ends up selling the patent to a private party, thus ensuring the inventor the benefit of the markup in all cases, whether the patent is randomized to the public domain or not. The existence of this markup would provide a strong incentive for inventors to offer their patents to the market mechanism rather than retain their patent right and exploit it in the market.

The markup also helps solve problems associated with the "winner's curse,"[134] which refers to the tendency of winners of auctions to find that they have paid too much. First, Kremer worries that without the markup, no one would bid. After all, without a markup, if the inventor accepts a bid, it is presumably because the bid is higher than the actual value of the patent, which the inventor is likely in a better position to know than any of the bidders.[135] One solution would be to prevent the inventor from rejecting the highest offer, but this solution is not necessary given Kremer's approach. A sufficiently high markup will solve the problem, because with the government effectively subsidizing bids, bidders will recognize that an inventor might accept the offer even if the high bidder offered less than the patent value.

Second, the markup could be applied to a bid other than the highest bid to determine what the government must pay for the patent. The highest bid, after all, might be an outlier, perhaps reflecting the one firm that made a severe miscalculation in estimating the value of the patent.[136] The need for this crude system—Kremer recommends a "simple rule" in which the patent holder would be offered a "multiple of the third highest bid"[137]—is less clear than the need for a markup. Bidders, after all, have incentives to shave their bids in anticipation of the winner's curse,[138] and Kremer in any event would make the highest bidder the winner in cases in which the government sells the patent.[139] Presumably, the purpose is to save the government from the folly of an occasional irrational bidder, but the government is relatively risk-neutral, and there is no reason to think that the highest bids will be systematically too high. The purpose may also be to ensure that the patent holder receives a relatively accurate bid. But it is not clear that some multiple of the third bid will be more likely to be accurate than the highest bid.

This last criticism may seem petty, in part because Kremer attaches little importance to using the third bid.[140] It points, however, to a broader problem. Kremer recognizes, correctly, that

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[134] *See generally* Richard H. Thaler, *The Winner's Curse*, *in* THE WINNER'S CURSE: PARADOXES AND ANOMALIES OF ECONOMIC LIFE 50 (1992) (characterizing the winner's curse as an example of irrational market behavior); E.C. Capen et al., *Competitive Bidding in High-Risk Situations*, 23 J. PETROLEUM TECH. 641, 643 (1971) (providing an example of the winner's curse); Kenneth Hendricks & Robert H. Porter, *An Empirical Study of an Auction with Asymmetric Information*, 78 AM. ECON. REV. 865, 882 (1988) (assessing the extent to which individuals can learn to overcome the winner's curse).

[135] Kremer does not conclude that no one would bid, only that "patent owners would never sell their patents" because bids would be too low. Kremer, *supra* note 20, at 1149.

[136] *Id.* at 1148 & n.8.

[137] *Id.* at 1148.

[138] *See, e.g.*, Stuart E. Thiel, *Some Evidence on the Winner's Curse*, 78 AM. ECON. REV. 884, 884-86 (1988) (suggesting that bidders on construction contracts overcome the winner's curse by shaving their bids).

[139] The high bidder would pay the bid of the second-highest bidder. Kremer, *supra* note 20, at 1147. This is known as a Vickrey auction, after Nobel laureate William Vickrey, who developed it. *See* William Vickrey, *Counterspeculation, Auctions, and Competitive Sealed Tenders*, 16 J. FIN. 8, 20-23 (1961); *see also* James D. Dana, Jr. & Kathryn E. Spier, *Designing a Private Industry: Government Auctions with Endogenous Market Structure*, 53 J. PUB. ECON. 127, 135 (1994) (discussing this auction approach); *cf.* David Lucking-Reiley, *Vickrey Auctions in Practice: From Nineteenth-Century Philately to Twenty-First-Century E-Commerce*, J. ECON. PERSPECTIVES, Summer 2000, at 183 (demonstrating that Vickrey auctions were used among stamp collectors even before Vickrey was born). In such a second-price, sealed bid auction, each competitor will bid his own valuation of the good, without shaving her bid downward in the hope of still winning the auction at a lower price.

[140] Kremer states only that "it might be best for the government" to use such a rule. Kremer, *supra* note 20, at 1148. In addition, Kremer states, "If the government knew the prior distribution of valuations, it would be able to aggregate the information of all bidders to estimate the private value of the patent." *Id.* at 1147-48. One way to understand the intuition that the government should not simply average all bids in determining its offer to the inventor is to focus on very low bids. Someone may bid $1 on

the highest bid in an auction may not represent *the* proper valuation of a patent. But the development of an algorithm to determine the appropriate valuation is difficult, and merely using the third-highest bid is hardly a perfect solution. The problem is more severe, the less competitive the auction. If there are only three bidders on a patent, the third-highest bid will in fact be the low bid. It is certainly plausible that some auctions would generate very few bidders, for two reasons. First, there may be only a small number of firms ideally positioned to exploit the patent. Second, the high cost of investigation of a patent's prospects to determine what to bid will discourage some bidders. In all auctions, bidders risk that their investigation costs will buy them nothing, as someone else emerges the high bidder. The problem is more severe here, given that the government often places patents in the public domain instead of selling to the high bidder.

Imprecision, of course, is not fatal to Kremer's market scheme; even with a very small number of bidders, as long as the bidders have sufficiently strong incentives to bid accurately, we may still have more confidence in private bids than in government assessments. An additional concern, to which Kremer devotes considerable attention, [141] is the problem of collusion. A seller of a patent would have an incentive to bribe potential bidders to enter high bids. Suppose, for example, that Company *A* auctions off a patent that in fact is worthless. Company *A* might promise to pay Company *B* $200,000 to bid $1,000,000 for the patent. As long as the probability that the randomization function leads to a purchase is sufficiently less than 20% to overcome any risk aversion by Company *B*, Company *B* should accept the offer. If, for example, the probability that the private bid will be accepted is 10%, Company *B*'s expected payment for the worthless patent will be $100,000, and so its average profit from the transaction will be $100,000. The deal also benefits *A*, which will receive $1,000,000 90% of the time for a cost of just $200,000. Similar bribes, of course, might be possible with valuable patents to make them even more valuable. Once the government ignores the private bidding some percentage of the time, there will be opportunities for mutual gains from trade between patent owners and bidders.

Kremer offers several possible solutions to the collusion problem. [142] First, reliance on the third-highest bid, as described above, would make collusion more difficult by forcing a company to bribe three different bidders. [143] This provides a better argument for the third-highest-bid approach than Kremer offered earlier, but it may not be foolproof. If the three bidders cooperated, after all, relatively small bribes would be needed for the second and third bidders, since they would recognize that they would never have to pay for the patent. Second, the agency might respond to suspicions of overbidding by skipping the randomization function and forcing the high bidder to purchase the patent. [144] The problem, of course, is that the agency would need

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the off chance that no one else will bid, yet this $1 bid conveys very little information. More generally, some bidders may do less research than other bidders and correspondingly shave their bids by a greater amount than those other bidders because of the winner's curse. These low bids also convey relatively little information.

[141] *Id.* at 1157-62.

[142] For a different solution to collusion problems with market mechanisms, see Abramowicz, *supra* note 127, at 390-93.

[143] Kremer, *supra* note 20, at 1158 ("The original patent holder would therefore have to bribe three companies instead of one to ensure a substantial increase in the buyout price.").

[144] *Id.* Kremer also suggests that the agency should reduce the markup when it detects collusion. This would presumably require a costly hearing, as patent holders would argue that they had not in fact bribed bidders. While the decision to accept the high bid should be neutral to a patent holder and a bidder that have not overbid, lowering the markup or eliminating the patent holder's ability to decline to sell the patent is essentially a penalty. At the least, the government would have to provide adequate predeprivation protections to prevent such penalties from being applied inappropriately. *See generally* Matthews v. Eldridge, 424 U.S. 319, 335 (1976) (providing a three-part test for determining whether a governmental procedure violates the due process of law).

to be able to identify suspicious activity, and false positives would reduce the effectiveness of the regime by reducing the number of patents ultimately placed into the public domain. Third, "[t]he government could develop lists of suspect bidders by checking whether winning bidders made money, since systematic overbidders would incur big losses."[145] Once again, this is perhaps a sound approach, but a costly, time-consuming, and imperfect one.

Kremer's most developed proposal for combating collusion recommends the adoption of "ceiling prices."[146] Such prices would represent the maximum that could be paid for a patent and would be determined in several complementary ways. First, "[a] waiting period of several years could be required before patents were bought by the government, and ceiling prices could be set as a multiple of annual revenues prior to the patent buyout."[147] Second, "patents could be capped by total sales of the drug following the patent buyout, times an administrative estimate of the social value of the drug per dose or per patient."[148] Interestingly, these rules make Kremer's proposal closer to Shavell and van Ypersele's, with the attendant strengths and limitations of that approach. The government would monitor sales, both before and after the patent buyout, while at the same time using some method to extrapolate to the social value of the drug. The proposals, of course, are not identical. Shavell and van Ypersele would use such data to calculate a relatively low offer for the patent holder,[149] while Kremer would use sales data as a cap on market price. Nonetheless, the more government must make discretionary decisions, the less attractive Kremer's market mechanism becomes.

Perhaps the government could be successful in combating explicit collusion, either through one of Kremer's approaches or through some other approach, such as rigorous criminal enforcement of a ban on such collusion and bounties for private parties who expose collusive behavior.[150] Nonetheless, even if the government can eliminate all explicit collusion between patent holders and bidders, it still might face the problem of implicit collusion.[151] Consider two drug companies. One company might offer a large bid for the other company's patent in the hope that the other company will reciprocate, and if the companies are repeat players, they might start offering generous bids on each other's patents without even communicating directly with each other.[152] Again, the government might be successful in identifying such behavior, but it would be

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[145] Kremer, *supra* note 20, at 1158.

[146] *Id.* at 1159-62.

[147] *Id.* at 1159.

[148] *Id.* at 1160. Kremer also offers a third, slightly more elaborate proposal. *Id.* at 1160-61. Under this proposal, inventors would be paid *only* if the randomization function led the patent to be sold to the high bidder. In this case, the inventor would receive an amount equal to the monopoly profits earned by the high bidder, multiplied by the inverse of the probability that the patent would be sold to the high bidder. This proposal has two limitations. First, there would be a substantial risk that the patent holder would receive nothing. Presumably, a patent holder might try to insure against this risk, but the insurance could be expensive. Second, and more significantly, there would still be an incentive to manipulate the system *ex post*. Kremer notes that one might do so by "bribing the high bidder to boost sales artificially through tie-ins with other products." *Id.* at 1161. More generally, any falsification of sales figures would be profitable. Alternatively, the original patent holder might just buy lots of the product (or pay third parties to do so), especially if the probability of the patent being randomized to the high bidder is sufficiently low (and thus the inverse sufficiently high). Once again, the government could try to protect against these schemes, but it may not do so successfully.

[149] *See supra* text accompanying notes 103-105.

[150] For a related proposal in the antitrust context, see William E. Kovacic, *Antitrust Policy and Horizontal Collusion in the 21st Century*, 9 LOY. CONSUMER L. REP. 97 (1997).

[151] Implicit, or tacit, collusion presents a substantial challenge to antitrust lawyers. *See generally* Michael Freed et al., *The Detection and Punishment of Tacit Collusion*, 9 LOY. CONSUMER L. REP. 151 (1997) (reporting a conference on the problem of implicit collusion).

[152] The challenge is for the parties to solve the prisoners' dilemma, as each of the two companies would benefit most by having the other company help it without itself providing help to the other company. *See generally* DOUGLAS G. BAIRD ET AL., GAME THEORY AND THE LAW 31-35 (1994) (providing an introduction to the prisoners' dilemma). Here, the prisoners' dilemma would

especially difficult to police on the margins, where the companies' bids are high but not absurdly so. The government might combat collusion, either implicit or explicit, by reducing markup prices accordingly,[153] but this is a crude solution that will lead some markups to be too high and some markups to be too low.

Kremer does not recognize the possibility of this form of implicit collusion, but he does recognize another form. A company might make a routine practice of buying back its patents from the high bidders at a generous price. This would work only for a frequent player, especially if relatively few patents are randomized to the high bidder rather than to the public domain. A company that acquires such a reputation, however, would receive high benefits and thus benefit in all the cases in which the patent is randomized to the public domain. Kremer's solution is that "inventors would be prohibited from buying back the patent from the winning bidder."[154] The government might be able to enforce this successfully, but it does have costs. As Kremer recognizes elsewhere in his article, the original patent holder may be the lowest-cost producer,[155] so the proposal would mean that when patents are randomized to the high bidder, it will be owned not just by a monopolist but by an inefficient monopolist. The cost of such inefficiency might be reduced by lowering the probability that the patent is randomized to the high bidder, but this will decrease the number of bidders and increase the risk of collusion.

Collusion is not the only potential problem for Kremer's system. Just as Shavell and van Ypersele's model worked best when each innovation corresponded to a single product,[156] so too Kremer's proposal works most smoothly when the sales of each invention are independent of the sales of all other innovations. When one product is a substitute or a complement of another, incentives will be distorted. As an example of the complication that arises from substitutes,[157] Kremer explains that "people would bid less for the patent on Prozac if they expected that the patent on Zoloft would be put in the public domain."[158] After all, if the Prozac patent is randomized to a bidder rather than the public domain, but the Zoloft patent is randomized to the public domain, then Prozac will not be worth as much as it would have been if bidders believed that the Zoloft patent were also a monopoly product. If Prozac and Zoloft are perfect substitutes and can be manufactured for zero marginal cost, then the value of each in the auction will be discounted by the probability that the other will be placed in the public domain. Thus, if there were a 90% chance that both Prozac and Zoloft will be placed in the public domain by the market mechanism, then each would fetch only 10% as much as if the other drug did not exist.

Complementary products present the opposite problem. Suppose that a new drug cocktail for a disease consists of two independently patented drugs, Drug *A* and Drug *B*, which again can be produced for zero marginal costs. *A* and *B* are perfect complements,[159] so that a pill of *A* is

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occur over multiple rounds, making it potentially tractable. *See* David M. Kreps et al., *Rational Cooperation in the Finitely Repeated Prisoners' Dilemma*, 27 J. ECON. THEORY 245 (1982) (providing a model leading to cooperation in finite-period prisoners' dilemmas).

[153] *See* Kremer, *supra* note 20, at 1162 ("For example, if the optimal markup was three (as seems plausible), and if collusion were thought to raise prices by up to 50 percent, then the government could simply offer a markup of two.").

[154] *Id.* at 1159.

[155] *Id.* at 1150-52.

[156] *See supra* text accompanying notes 115-119.

[157] Economists define products as substitutes if they are "related such that an increase in the price of one will increase the demand for the other or a decrease in the price of one will decrease the demand for the other." EKELUND & TOLLISON, *supra* note 42, at G-20.

[158] Kremer, *supra* note 20, at 1154.

[159] Complements are "[p]roducts that are related such that an increase in the price of one will decrease the demand for the other or a decrease in the price of one will increase the demand for the other." EKELUND & TOLLISON, *supra* note 42, at G-4.

worthless without a pill of *B* and vice-versa. If these complements are auctioned independently, the private bids for the two independently will be greater than the value of the two together. A bidder for the *A* patent will reason, using the same probability for randomization as before, that there is a 90% chance that *B* will be placed in the public domain. Thus, if *A* is randomized to a bidder, there is a 90% chance that the owner will be able to extract the full monopoly profits for the combined cocktail. There is just a 10% chance that the owner will have to enter into some arrangement with the new owner of the *B* patent and thus receive only about half of the monopoly profits.[160] Thus, the bidder on patent *A*, if risk-neutral, will bid 95% of the value of the monopoly profits of the two drugs combined. Using precisely the same reasoning, the bidder on patent *B* will do the same. If both are randomized to the public domain, the government will pay 1.9 times monopoly profits, even before the markup. And the problem, of course, will be more severe with a three-drug cocktail.

Kremer offers a neat solution to the substitute and complement problems, but the solution is an imperfect one. The trick is to jointly randomize groups of such patents,[161] so that either all or placed in the public domain or all are randomized to private bidders. Doing this would solve the problem, since the distortions above arise only when one innovation is placed in the public domain while the other is not. The difficulty is that the government must identify substitutes and complements. Substitutes are easier,[162] since holders of substitute patents would have every incentive to present their patents for joint randomization, and, as Kremer points out, joint randomization of patents that are not really substitutes would do no harm.[163] The challenge, however, would be greater for complementary patents, since companies would have no incentive

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[160] Kremer gives a similar example, though in his example, the patents are auctioned at different times:

[C]onsider an example in which two complementary inventions each have private value 0.1π individually but have value π together, and suppose that the social value of the patents alone or together is twice their private value. If one patent is put in the public domain, then the reward for invention of the other patent will be 0.9π times the markup. This implies that under separate patent buyouts the developers of *each* patent can expect to receive approximately 0.9π times the markup, since bidders for the first patent will anticipate that the second patent is likely to be put in the public domain and by the time the second patent has been invented, the first patent will probably be in the public domain. This will create excessive incentives for creation of the pair of inventions, since the social value of the pair is only 2π.

Kremer, *supra* note 20, at 1156.

[161] *See id.* at 1154-55 (proposing joint randomization for substitute patents); *id.* at 1155-57 (proposing joint randomization for complementary patents).

[162] Professor Rai, however, notes, that in the pharmaceutical market, "[g]iven the pervasiveness of me-too pharmaceuticals . . . Kremer's proposed regime would effectively result in mandatory buyouts for many innovator patents." Rai, *supra* note 26, at 201.

[163] There is, however, a problem that Kremer does not recognize. Kremer explains:

Note that joint randomization does not require a bureaucracy to judge whether goods are substitutes. Any patent holder could claim that his or her patent was a substitute for a new patent, and request that it be jointly randomized with the new patent. Even if the new patent was not in fact a substitute for the old patent, jointly randomizing the old patent together with an unrelated new patent would create no harm and would have the advantage of possibly transferring another patent to the public domain.

Id. at 1155. The problem is that once a patent is randomized to a bidder, the bidder should not be able to place the patent through the system again. The reason is that bidders in the initial auction would anticipate being able to place the patent back up for auction and receive the markup. Suppose, for example, that the monopoly profits for an innovation will be $1,000,000 and the markup is two. In Kremer's system, if the patent if randomized to the high bidder, then the high bidder will pay the amount of the second highest bid and receive the patent; the original patent owner, meanwhile, will receive the benefit of the markup. But if the high bidder could then reauction the patent and receive the markup, then the initial bid would be around $2,000,000 rather than $1,000,000. Indeed, it would be higher, since the bidder would anticipate that the bidder in the next round would anticipate being able to reauction the patent, and so on ad infinitum. Happily, the problem is not a fatal one. The solution is simply to eliminate the markup for patents that are reauctioned. As this example reveals, however, the Kremer system cannot be relied on to place virtually all patents in the public domain, since the patents that are randomized to bidders will likely stay with bidders, rather than being repeatedly auctioned until being placed in the public domain. The example also shows that it may be difficult to anticipate all possible ways that a particular approach might be exploited.

to come forward.[164] Kremer suggests that the government would be able to identify "very strong complements,"[165] but the approach would require bureaucrats at least to recognize that a patent might be complementary to another,[166] and the method might not work for weaker complements.

The market mechanism's susceptibility to gaming, either through collusion or in the case of complementary patents, does not necessarily rule it out as a useful method for valuing patents. It is especially useful when other methods for valuing patents, such as those described in the preceding sections, would be ineffective. For example, when a patent holder would obtain value from the patent primarily by licensing it to other companies that would incorporate the patent into their own inventions, the market mechanism provides a useful means of obtaining an objective valuation. Nonetheless, the mechanism does not eliminate the need for human supervision, either in the form of a bureaucracy or through some sort of litigation, to identify instances in which gaming of the system might lead to inaccurate results. At the same time, the mechanism will be less useful when it is imperative to transfer a particular patent to the public domain with complete certainty, or when the existence of complementary patents complicates the valuation process.

D. *Lichtman's Coupon Scheme*

Perhaps the most startling article in the recent literature is Douglas Lichtman's *Pricing Prozac*.[167] Lichtman's proposal differs from those of the other three authors in that he does not suggest buying out patents. Indeed, Lichtman's article begins by discussing Kremer's proposal, and while complimentary of it,[168] Lichtman suggests that deadweight loss might be eliminated far more cheaply.[169] Under Kremer's proposal and the others discussed so far, the government would buy out the patent, thus paying in an opt-in regime at least the monopoly profits that the patent holder would have expected to receive. Lichtman argues that a full buyout is not necessary to eliminate deadweight loss. Instead, Lichtman suggests that the government subsidize the purchase of patented products such as pharmaceuticals. In essence, the government would give discount coupons to the consumers who would be willing to pay more than marginal cost for the drugs but would not be willing to pay the monopoly price. Astonishingly, Lichtman demonstrates that, under certain assumptions, a well-executed program might cost only one-eighth as much as a patent buyout.[170]

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[164] Indeed, a company would seek to market different components of the same product separately if multiple patents could be obtained. *See id.* ("It would also create an incentive for inventors to divide up inventions into multiple complementary patents.").

[165] *Id.* at 1157.

[166] Kremer explains that "[i]f a set of patents are complements, the sum of the bids for subsets will be less than the bids for the entire set." *Id.* The government thus must have sufficient suspicions of complementarity to allow bidding on a set of patents in addition to bidding on the individual members of the group. If patents are being auctioned at the same time, the government might allow bidders to bid on any combination of patents, resulting in joint randomization if the bid on whatever combination a bidder chooses is higher than the highest bids for the patents individually. This market solution, however, will not work, at least without substantial elaboration, when patents are auctioned at different times, which inventors of complementary patents accordingly would have an incentive to do.

[167] *See* Lichtman, *supra* note 21.

[168] *See id.* at 124 ("The proposal has much to recommend it. Unlike more conventional approaches, Kremer's suggestion balances the twin goals of encouraging private research and increasing the availability of new pharmaceuticals.") (footnote omitted).

[169] For Lichtman, the purpose of limiting the government's expense is to limit the deadweight loss associated with the distortionary effects of taxation. *See id.* at 124, 136; *infra* Part II.D.1 (discussing the distortionary effects of taxation).

[170] *Id.* at 135.

This demonstration is a tour de force, and before arguing that patent buyouts nonetheless might be superior to coupon schemes in some circumstances, I will trace Lichtman's argument. First, however, it may be worthwhile identifying a principle that provides an intuitive basis for why a coupon scheme can eliminate deadweight loss. It is a familiar concept from introductory microeconomics courses that there will be no deadweight loss from a monopoly if the monopolist can perfectly price discriminate.[171] A monopolist who does this charges each consumer who values the product at more than its marginal cost the maximum that this consumer will pay for the product. Even the consumer who values the product at just one cent above marginal cost is worth selling to if the sale does not affect the price paid by the other consumers. Perfect price discrimination eliminates consumer surplus, but it eliminates deadweight loss too.[172]

Just as a monopolist that can perfectly price discriminate eliminates deadweight loss, so too might the government use coupons to eliminate deadweight loss even if a monopolist charges the same price to everyone. Some consumers, of course, will be willing to purchase the product at the monopoly price, but some will not. For consumers that place some value on the product but not so much as to buy it at the monopoly price, a coupon can make the difference. For example, if the price of a drug is $5 and a consumer values it at $4, then the consumer will be willing to purchase the drug with a $1 coupon. If the government can give each consumer who values the drug at between marginal cost and the monopoly price just the right size coupon, then the government will have eliminated deadweight loss. Moreover, it will do so relatively cheaply. A buyout would require the government in effect to spend the full $5 to provide the consumer in the example above. "Give him just one dollar," Lichtman explains, "and you will, in effect, be increasing the producer's revenue by five dollars."[173]

The government's ability to do this is contingent on its ability to determine the size of coupons that individual consumers should receive. Moreover, Kremer argues in a footnote rejoinder to Lichtman,[174] the government must have *better* information than the monopolist. After all, if the monopolist knew how much each consumer valued the product, it presumably would be perfectly price discriminating itself, saving the government the trouble. Lichtman anticipates this argument in two ways. First, he suggests in a footnote that the government might be better positioned to give coupons than a monopolist would be to price discriminate. "Clues that are available to the government (tax returns, voluntary disclosures made for the purpose of qualifying for health and welfare programs, etc.) are, for good reason, not available more broadly."[175] In addition, "even where price discrimination is practical, such behavior is sharply restricted under both antitrust and patent misuse doctrine."[176] Second, Lichtman falls back on the

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[171] *See, e.g.*, NICHOLSON, *supra* note 87, at 574.

[172] In addition, because the monopolist will capture the full social benefit of the invention, the monopolist has the proper incentive to invest the appropriate amount in an innovation. *See supra* note 88 and accompanying text. *But see infra* text accompanying notes 272-275 (arguing that patents might promote excessive incentives to innovate).

[173] Lichtman, *supra* note 21, at 125.

[174] Kremer, *supra* note 20, at 1139 n.1 (stating that targeting subsidies "requires that the government have lots of information"). Kremer is able to respond to Lichtman because Lichtman's article was a response to an early version of Kremer's. *See* MICHAEL KREMER, PATENT BUY-OUTS: A MECHANISM FOR ENCOURAGING INNOVATION (Nat'l Bureau Econ. Research Working Paper No. 6304, 1997).

[175] Lichtman, *supra* note 21, at 133 n.133.

[176] *Id. But see* Kieff, *supra* note 26, at 727-32 (arguing that patent holders often reduce deadweight loss through price discrimination). Lichtman's allusion to antitrust is presumably a reference to the Robinson-Patman Act, 15 U.S.C. § 13(a) (1994), which makes it "unlawful for any person engaged in commerce . . . to discriminate in price between different purchasers of commodities of like grade and quality." Enforcement of the Act, however, has long been on the decline, in part because of the recognition that price discrimination may promote efficiency. *See* Rudolph J. Peritz, *The Predicament of Antitrust Jurisprudence:*

conclusion that a well-executed scheme would cost only one-eighth as much as a patent buyout. "[S]o long as one in every eight dollars is placed in the hands of an appropriate consumer, the consumer subsidy scheme will be the most effective option."[177]

The first of Lichtman's claims is difficult to assess without a detailed empirical analysis. On the one hand, government might have access to some data that a company either does not have access to or cannot take advantage of, but it is also true that the company may be able to price discriminate in ways that the government cannot. This observation, however, does not undercut Lichtman's proposal. A company's price discrimination and the government's distribution of coupons can be complementary, with the first eliminating some deadweight loss and the second eliminating some more or perhaps even all deadweight loss. Indeed, the existence of some price discrimination by patent holders strengthens Lichtman's argument by leaving the government with less to do on its own. Suppose a company can effect perfect price discrimination with a representative half of its consumers and cannot price discriminate at all with the other consumers. Then, a well-executed scheme to eliminate deadweight loss should cost only half as much as before, or one-sixteenth as much as the cost of a patent buyout if the government has perfect information about consumers' price preferences. And even if the government does not have perfect information, Lichtman's logic suggests that as long as one of every sixteen dollars is placed in the hands of a consumer who needs it, the scheme will be as cheap as a patent buyout.

Surely Lichtman is right that a one-in-eight "ratio seems exceedingly achievable" for pharmaceuticals,[178] and a one-in-sixteen ratio even more so. Thus, the strength of Lichtman's proposal ultimately depends on his second fallback argument. Lichtman is indeed correct under his stated assumptions that if the government has perfect information, then, ignoring administrative costs,[179] a coupon scheme will be one-eighth the price as a buyout scheme. I will argue, however, against his intuitively appealing inference that the coupon scheme must be judged as successful as a buyout scheme if only one in eight dollars is placed in the proper hands. This inference would be correct if the incorrectly allocated dollars are used on other products altogether—groceries or movie tickets, say. Such misuse, though, is presumably easy to prevent with coupons.[180] But it is not correct if the government awards coupons to people who will use them to purchase the drugs but who are not the people who would have received the coupons had the government executed the scheme perfectly. When someone who would purchase the product anyway receives a coupon, Lichtman's conclusion is incorrect. To justify

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Economics and the Monopolization of Price Discrimination Argument, 1984 DUKE L.J. 1205, 1210-11; *see also* Brookes Group Ltd. v. Brown & Williamson Tobacco Corp., 509 U.S. 209, 229-30 (1993) (requiring proof of generalized injury to competition in certain types of price discrimination cases). It is true, meanwhile, that some courts have found patent misuse based on price discrimination even in the absence of a finding of an antitrust violation. *See, e.g.*, Motorola, Inc. v. Kimball Int'l, Inc., 601 F. Supp. 62, 65 (N.D. Ill. 1984). The Federal Circuit, however, sharply limited the doctrine of patent misuse in *Mallinckrodt, Inc. v. Medipart, Inc.*, 976 F.2d 700, 708 (Fed. Cir. 1992), by holding that use restrictions beyond the scope of a patent grant would be evaluated under antitrust law's rule-of-reason analysis.

[177] Lichtman, *supra* note 21, at 136.

[178] *Id.* at 136.

[179] *See infra* Part II.D.2.

[180] In defending the proposition that the "opportunity for abuse is small," Lichtman argues that "[t]his would be especially true if subsidies were ultimately implemented in a very precise manner – a $5 non-transferable coupon given to consumer *A*, usable only toward this month's purchase of Prozac." Lichtman, *supra* note 21, at 136. I agree that we probably need not worry too much about the possibility that *A* will get around this limitation by, say, falsifying a receipt for Prozac. A greater concern might be that *A* would sell the receipt to someone who does not need it or that pharmacies might facilitate fraud, similar to problems that exist currently with food stamps. *Cf.* FOOD & CONSUMER SERV., U.S. DEPT. OF AGRIC., THE EXTENT OF TRAFFICKING IN THE FOOD STAMP PROGRAM (1995) (discussing the black market in the food stamp program). I will assume, however, that even this type of abuse could be addressed.

Figure 2. The coupon alternative to patent buyouts

As in Figure 1, a profit-maximizing patent holder will choose the monopoly price P_m and quantity Q_m in the absence of a buyout program or coupon scheme. Because marginal cost is assumed to be zero, the shaded area in the left panel represents the patent holder's profits. This is the minimum amount that the government would have to pay the patent holder to buy out the patent and leave the patent holder just as well off as with the patent system. In the absence of a buyout, the patent holder could make equal profits by selling at half the monopoly price to twice the number of consumers. The point representing this combination, however, is above the demand curve, because the lowest-valuing quarter of consumers do not value the patent at even this much. By providing just a large enough coupon to each of these consumers, the government in effect fleshes out the demand curve. The shaded area in the right panel is the cost of this program, and is one-eighth the size of the shaded area in the left panel.
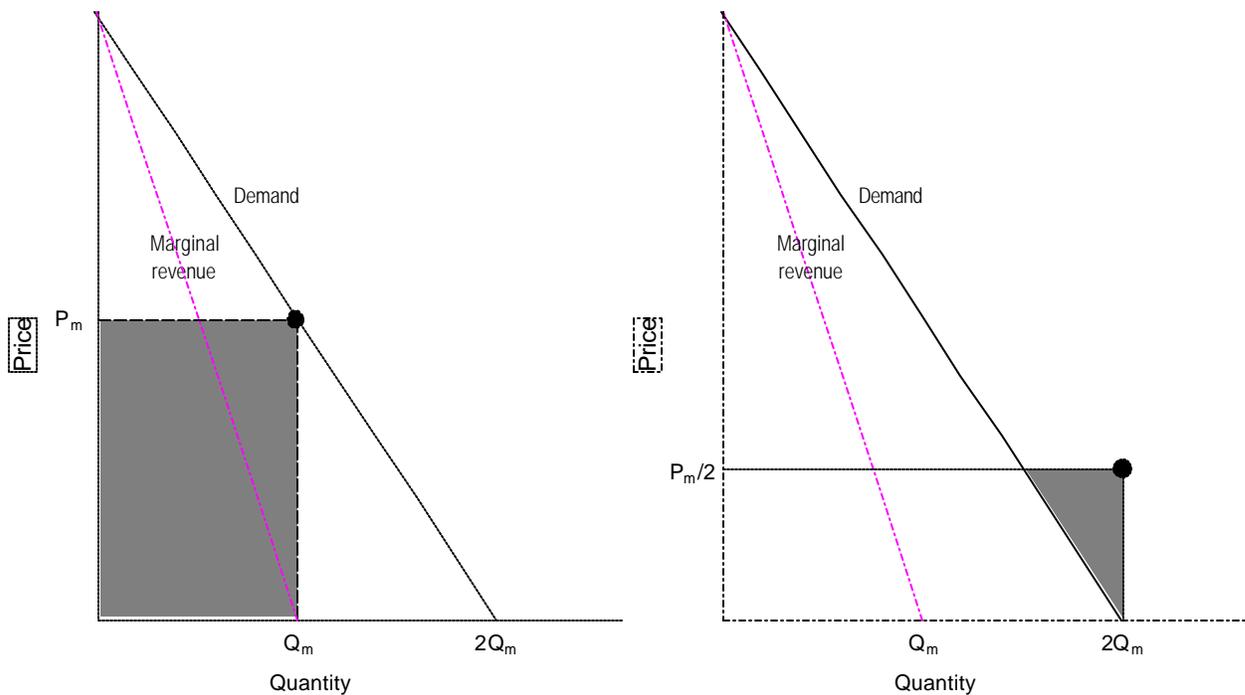
this fully, I will need to fill in more of Lichtman's argument and explain just how Lichtman calculates the one-eighth figure.

To understand Lichtman's calculation, consider Figure 2, which includes two panels nearly identical to figures in Lichtman's article.[181] Both panels assume a linear demand function and zero marginal cost of production.[182] Under these circumstances, a monopolist who can set only a single price will sell to half of all consumers who assign some value to the product,[183] because doing so maximizes monopoly profits, the shaded area in the left panel. Such a

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[181] *See* Lichtman, *supra* note 21, at 131 fig.1, 135 fig.4.

[182] *Id.* at 130.

[183] *Id.* at 132 n.21 ("When facing linear demand and zero marginal cost, a monopolist maximizes profit by selling to exactly half the consumers.") (citing PAUL A. SAMUELSON & WILLIAM D. NORDHAUS, ECONOMICS 583 (13th ed. 1989)). Lichtman's figures, unfortunately, are not drawn to scale, making it appear that the monopolist would be selling to more than half of consumers. I have tried to correct this problem in the diagram above.

monopolist would be equally well off if it could sell its product to all the consumers at half the monopoly price, as indicated in the right panel. The problem, of course, is that this point is above the demand curve. In the absence of government intervention, at that price, only three-quarters of consumers would buy the product.[184]

The government's task then is simply to give coupons to the remaining quarter of consumers (which is equal to half the number of consumers that would be served by the monopolist). Moreover, the government does not have to give a full coupon, equal to half the monopoly price, to every one of these consumers. If the government has perfect information, then it can give some consumers just a penny coupon, so that the average coupon needed amounts to just one-half of one-half of the monopoly price. Paying an average of one-fourth of the monopoly price to one-half the number of consumers who would be served by a monopolist is equivalent to paying one-eighth of monopoly profits. Indeed, the subsidy triangle in the right-hand panel is one-eighth the size of the producer's surplus box in the left hand panel. Voilà!

Lichtman's reasoning on this point is sound, original, and important. To assess the limitations on this observation, however, begin by considering what the monopolist would do if the government were able to effect its perfect coupon scheme. Assuming with Lichtman that the monopolist must set a single price, the monopolist should be indifferent between selling at the monopoly price and selling at the lower price that, with the coupons, will produce an identical profit. Thus, even if the government issues the coupons to the proper consumer, the monopolist could still choose the monopoly price. Presumably, the monopolist would not do so for reputational reasons, though the monopolist might if the government is not able to give all of the last quarter of consumers coupons. As soon as a single consumer who needs a coupon does not receive one, the monopolist will be better off selling at the monopoly price.

The example, however, reveals two things. First, the government cannot ensure cooperation from monopolists in pricing their drugs if they fail to execute the coupon scheme perfectly. Second, it is important for the government to ensure that all consumers who should qualify for coupons do in fact receive such coupons. In the absence of perfect information, however, a government intent on accomplishing this is likely to give coupons to some people who should not receive the coupons, and indeed it may become necessary to give coupons to all consumers. This in turn will lead monopolists not to cooperate in pricing. When relatively high-valuing consumers receive coupons, the monopolist is less likely to set the price to the lower value. Indeed, giving coupons to consumers who would have purchased the drug anyway may lead the monopolist to raise the price.

To see why the monopolist might raise its price in response to the award of coupons, consider the case in which the government gives all consumers of a particular drug a full coupon, that is the amount that would be needed to induce the consumer who least values the drug (but still values it more than zero, the marginal cost) to purchase it in a perfectly executed subsidy scheme. This is, of course, the only way that the monopolist can ensure that all of the consumers in the last quartile receive coupons. The government's generosity effectively shifts out the demand curve, as illustrated in Figure 3. A profit-maximizing monopolist will respond by raising the price and, even with the shifted out demand curve, serving only a few more consumers than before. The monopoly profits will be greater than previously, but the government will not have accomplished its aim. Many consumers still will not use their coupons because the coupon is

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[184] This follows from the assumption of linear demand. If at the monopoly price half of all consumers would buy the product, and all of the consumers would take the product if it were free, then at half the monopoly price, three-quarters of consumers will buy the product.

insufficient to allow them to meet the higher price, and the deadweight loss will be reduced only somewhat.

Figure 3. The effect of a universal coupon scheme

Providing coupons to all consumers shifts out the demand curve from the patent holder's perspective. The patent holder will respond by serving 25% more consumers at a price 25% higher than in the monopoly case. The deadweight loss triangle, shaded in both panels, is reduced from half the monopoly profits in the standard monopoly case to 9/32, a reduction of just 43%.
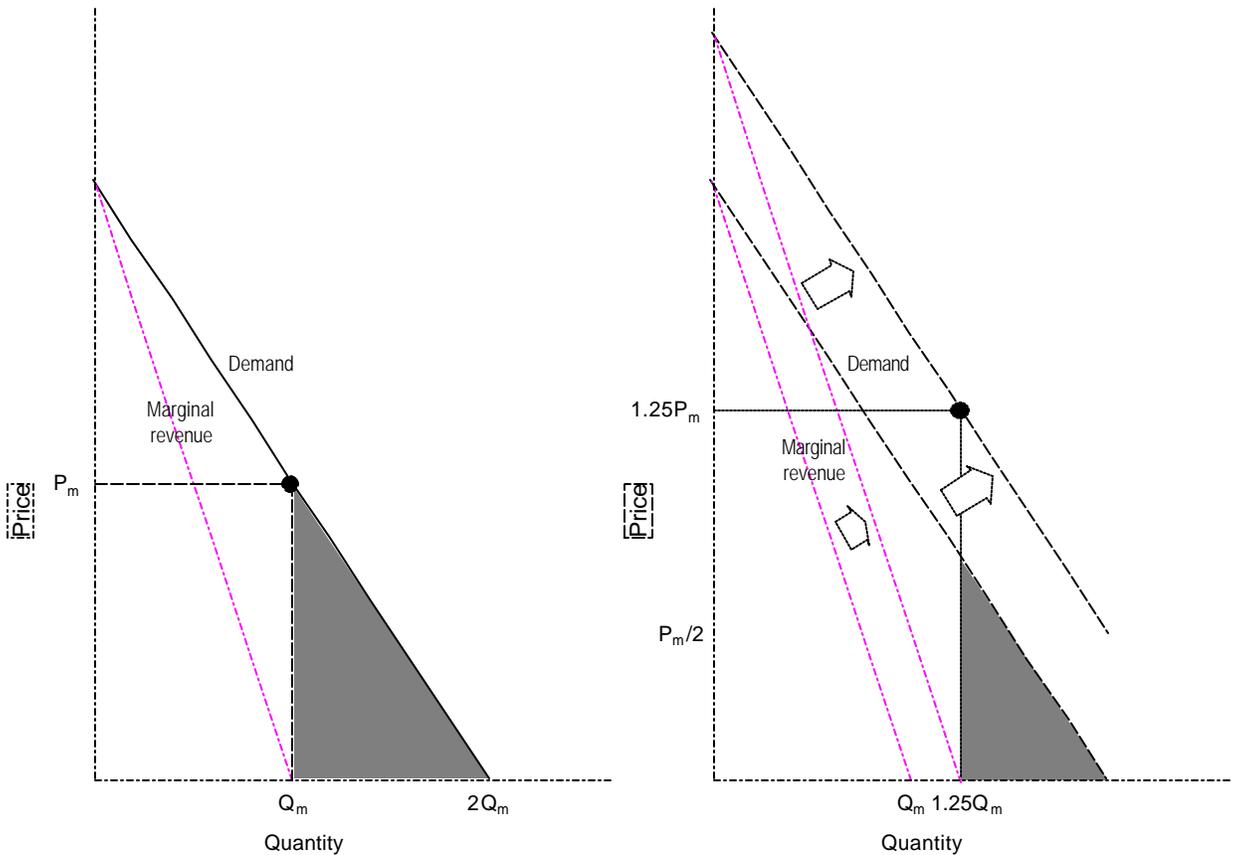
This example shows the fallacy in Lichtman's inference that the government can misspend seven dollars for every dollar it spends correctly and still achieve the same benefit that a patent buyout program would bring. Here, the government misspends seven dollars for every dollar that it spends correctly (including the excess from granting full rather than partial coupons to the lowest-valuing quarter of consumers), and much of the benefit of the program is lost. This is not a fatal flaw,[185] as the government might award coupons only to those consumers it believes to be in the bottom quartile and compensate by paying the monopolist a bonus for every coupon cashed. Thus, the government might pay the company $2 for a coupon worth $1 to induce the

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[185] The observation does, however, problematize Lichtman's argument, in an appendix, that the government might choose "to pursue a mixed strategy, allowing some of the deadweight loss to remain but eliminating the remainder by means of a consumer subsidy." Lichtman, *supra* note 21, at 138. A government pursuing such a mixed strategy would result in a profit-maximizing monopolist pricing at the monopoly price, unless the government adopted t he approach suggested above.

company to price its product at the low level where coupons will make an impact. As long as the government gives low-valuing consumers coupons with sufficient producer bonuses to make up dollar for dollar revenue lost from low-valuing consumers who do not receive the coupons, the patent holder will choose the lower price rather than the monopoly price.

Similarly, the government could increase the redemption value of just some coupons, those that will go to consumers that the government is most confident are in the last quarter of consumers. To what extent must the government increase the producer's redemption value of such coupons to make up for relatively high-valuing consumers who mistakenly receive coupons? The theoretical analysis is complex. Giving a coupon to a consumer will have no effect on the monopoly price if the amount that the patent holder would have to raise the price to increase its revenues from this consumer is less than the amount that the patent holder would lose from decreased output.[186] On the other hand, giving a coupon to some consumers may require the government to make up for this coupon more than dollar-for-dollar.[187] A further complication is that the amount that the government must make up for giving one coupon erroneously may depend on to whom else the government has erroneously awarded coupons. This makes it difficult to develop a simple formula for how much the government will have to make up in coupon bonuses for the producer to compensate for imperfections in the government's calculations.

To produce at least tentative calculations, I designed and executed a computerized simulation. The simulation featured 5000 consumers whose valuations ranged linearly from $0 up to $1.00. The simulated government was able to estimate the maximum amount that each consumer would pay for the product with some error. The simulation calculated the government's estimates by adding to each consumer a stochastic error term with a specified variance. For every consumer that the government estimated would be willing to pay less than $0.25—that is, for consumers that appeared to the government to be in the bottom quartile—the government granted a coupon equal to the amount that the government estimated would be necessary to induce the consumer to purchase the product at $0.25.[188] (Recall that $0.25 would be the price at which the government would seek to induce pricing in Lichtman's model to eliminate all deadweight loss if coupons are allocated correctly.) Thus, if the government estimated that a consumer would be willing to pay $0.05, the consumer would receive a $0.20 coupon.[189] In addition, for consumers whose willingness to pay the government estimated at less than $0.125, the government added a producer's bonus to the coupon. The producer's bonus

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[186] For example, awarding coupons of up to the difference between the monopoly price and the desired low price to only the very highest-valuing consumers, those in the first quartile, would have no effect on the monopoly price or producer welfare at all. Raising the monopoly price by up to that amount would not affect the amount that these high-valuing consumers will end up paying and would cause the patent holder to lose revenue from the second quartile. The only effect would be distributional.

[187] Take, for example, the consumer who values the product at one penny less than the monopoly price. If that consumer is given a one penny coupon, then the consumer will buy at the monopoly price. Thus, the monopolist's profits from selling at the monopoly price instead of at the lower price will rise by the full amount of the monopoly price. To make the lower price attractive, the government will have to make up for the full amount of the monopoly price.

[188] I also ran simulations in which the government gave all consumers in the bottom quartile slightly more than the government estimated would be necessary. This approach proved to be less cost effective than giving consumers exactly what it appeared they needed.

[189] Because of the stochastic error term, the simulated government estimated the maximum that some consumers would pay as a negative number. For these consumers, the government granted a $0.25 coupon. Presumably, consumers who in fact have negative reservation prices would not take the product even for free, so giving $0.25 coupons to all consumers who seem to have such negative reservation prices would be an appropriate policy. Consumers who really do not want the product presumably would throw the coupons out (assuming away the risk of arbitrage, *see supra* note 180), and consumers whom the government has misplaced in this category would be able to use the coupons.

would not change the price to the consumer but would result in a government payment to the patent holder at the specified price.

Figure 1 shows the results of the simulation.[190] The first column shows different values for the variance of the error term; lower variance means the government has a greater ability to estimate consumers' willingness to pay. The second column indicates, for that variance, the minimum producer's bonus needed in the simulation so that it would be more profitable for the patent holder to price the product at $0.25 than at $0.50. Finally, the last column indicates the total cost to the government of redeeming the coupons and paying bonuses to the patent holder at that level. Thus, the first row shows that if the government can estimate individual consumers' demand perfectly, then it need pay only a penny in producer's bonus to induce pricing at 0.25 rather than 0.50, and the total cost of the coupons to the government as a percentage of deadweight loss is 13%. Note that this is one-in-eight dollars, just as Lichtman's model predicts.[191] For higher variances, the government's total cost grows, with the cost of subsidies exceeding the cost of a patent buyout when the variance reaches approximately 0.4.

Table 1.   Simulation of Coupon Program Effectiveness Based on Quality of Government Information

Variance of error term (in dollars)	Minimum producer's bonus needed (in dollars)	Total cost to government as percentage of original deadweight loss
0	0.01	13%
0.01	0.35	24%
0.1	0.49	57%
0.4	0.62	102%
0.5	0.64	109%
1.0	0.67	128%
2.0	0.70	150%

This simulation analysis thus indicates that when the government has sufficiently good information for distinguishing high-valuing from low-valuing consumers, subsidies are indeed considerably cheaper than buyouts. Of course, the simulation hardly provides the final word on which approach is superior, even if it were possible to determine precisely what the variance of the error term would be for a particular product. The approach of giving producer's bonuses to just the bottom eighth of the population may not be optimal. In addition, to ensure pricing by the patent holder at the lower level, the government would have to give somewhat higher producers' bonuses. With real world products, moreover, demand may not be linear, and marginal cost may not be zero. Nonetheless, the analysis is sufficient to make clear that subsidies are preferable to buyouts in some situations, while buyouts are preferable to subsidies in others.

In the end, Lichtman's analysis might establish that the optimal regime is a cross between buyouts and coupons. Instead of seeking to induce pricing at a relatively low level, the government might negotiate directly with a patent holder to price the product at a certain level, and in exchange for this agreement, the government would provide the patent holder some

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[190] The computer file containing the simulation is available on request from the author.

[191] The percentage will be exactly 12.5% if the government does not pay any producer's bonus. As indicated above, however, this would leave the monopolist indifferent between pricing at $0.25 and $0.50. *See supra* text preceding note 185.

combination of cash and coupons for relatively low-valuing purchasers.[192] If the government and the patent holder manage to arrive at just the right price, the one that by itself would result in three-quarters of consumers being served if the demand curve is linear, and if the government can police the price agreement successfully, then Lichtman's conclusion that only one of eight dollars needs to be spent correctly will hold. This proposal, of course, has its own risks. The government might agree to too high a price, perhaps even a price above the monopoly price.[193] At least patent buyouts guarantee that the product will be priced at marginal cost,[194] while price ceiling agreements potentially could make no impact at all,[195] and unless the government is successful in identifying all who would benefit from coupons, will leave some potential consumers unserved. Depending in part on the government's ability to determine a satisfactory price ceiling, this negotiated coupon plan might be superior, or a pure buyout or induced coupon scheme might be.

II. HURDLES FOR PATENT PRIZE SYSTEMS

This part introduces additional complications for any prize system. These complications reveal that even if a prize system could determine with perfect accuracy the social value of an invention, it might be inadequate or incomplete. In each of the sections that follow, I explore one set of such complications and examine how they might differentially affect various proposals for prize systems. Section II.A addresses functions of the patent system beyond promoting innovation, while Section II.B considers whether prize systems might ameliorate or exacerbate existing limitations of the patent system, such as its tendency to promote wasteful patent races and "inventing around." Section II.C discusses the danger that an opt-in prize system would lead to prizes being granted for worthless inventions or inventions that would be developed in the absence of a prize system. Finally, Section II.D analyzes the costs of prize systems, including the costs of the prizes themselves, as well as administrative, litigation, and rent-seeking costs.

My aim is partly to establish a foundation for assessing the costs and benefits of any particular proposal, including the proposal that I will introduce in Part III. It is also, however, to extend the generalizations of Part I. The previous part has established that although an effective prize system could produce social benefits by eliminating deadweight loss and perhaps by increasing innovation incentives, the task of calculating prizes may be more difficult than commentators have suggested. Even the best formula or algorithm may be insufficient to ensure that optimal prizes are given, and the best approach to reducing deadweight loss in one situation may be different from that in another. In assessing the various proposals, I will make a preliminary case that I will extend explicitly in Part III.[196] The argument is that a flexible prize system, allowing and incentivizing inventors to adopt various techniques for avoiding

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[192] This would be an opt-in version of the system, giving the patent holder the right to turn the government down. A mandatory version would feature a combination of government price controls and coupons.

[193] The situation might be similar to that illustrated in Figure 2.

[194] *But cf. infra* notes 324–327 and accompanying text (noting that even if a product is placed in the public domain, the existence of a natural monopoly may prevent pricing at marginal cost).

[195] If prices are directly set, rather than the government's agreeing to price ceilings, the government agency conceivably could be used as a means of achieving cartelization by holders of patents for substitute products. *Cf., e.g.*, Curtis J. Milhaupt & Geoffrey P. Miller, *Cooperation, Conflict, and Convergence in Japanese Finance: Evidence from the "Jusen" Problem*, 29 LAW & POL'Y INT'L BUS. 1, 12 (1997) (defining a "regulatory cartel" as one "in which both the regulated and the regulators cooperate in order to enforce market segmentation, control entry, regulate output, and allocate the gains of the cartel's activities among the various participants"); Richard J. Pierce, Jr., *Antidumping Law as a Means of Facilitating Cartelization*, 67 ANTITRUST L.J. 725 (2000) (arguing that firms often use antidumping complaints as a means to facilitate industry cartelization).

[196] *See infra* Part III.A.

deadweight loss, may be superior to any system based on criteria and procedures set forth in advance in a statute, at least if any drawbacks of such flexibility can be overcome.

A. *Patent System Incentives Beyond Invention*

F. Scott Kieff offers the only sustained analysis of recent proposals for revolutionizing the patent system.[197] Kieff's analysis covers a great deal of ground, ranging from a critique of Ian Ayres and Paul Klemperer's interesting proposal to limit patent holders' rights in exchange for a lengthening of patent term,[198] to an assessment of Michael Heller and Rebecca Eisenberg's proposed modifications of the patent system to prevent excessive patenting from suppressing scientific research.[199] In one section of the article, Kieff argues against proposals to replace the patent system with a reward-based system, focusing particularly on the Shavell and van Ypersele proposal.[200] Kieff, however, approaches the task from a different vantage point than I have; instead of inquiring as to whether the proposals would make possible accurate valuations of patents, Kieff assumes that they would and then asks whether accepting the proposals would deprive patent law of other functions. This section considers the two such functions that Kieff identifies.

1. *Commercialization*

Kieff's first argument against prize systems is that even if they are successful in stimulating inventive activity, they may fail in encouraging entrepreneurs to commercialize the inventions.[201] Science in academic journals may be valuable in part because it contributes to our self-awareness in much the same way as research in the humanities,[202] but it is also valued because it leads to practical applications. If there were no incentive to convert pure science into applied science, then our innovative policy would be a failure indeed. The reward proposals discussed in Part I assume away this problem, expecting that release of a patent in the public domain will lead to the production of an invention at marginal cost. This, however, must be a simplification, as firms will enter an industry only if they expect to recover their fixed costs in

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[197] *See* Kieff, *supra* note 26.

[198] Ian Ayres & Paul Klemperer, *Limiting Patentees' Market Power Without Reducing Innovation Incentives: The Perverse Benefits of Uncertainty and Non-Injunctive Remedies*, 97 MICH. L. REV. 985 (1999), *cited in* Kieff, *supra* note 26, at 732.

[199] Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCI. 698 (1998), *cited in* Kieff, *supra* note 26, at 719-23. Kieff explores the issue further in F. Scott Kieff, *Facilitating Scientific Research: Intellectual Property Rights and the Norms of Science—A Response to Rai and Eisenberg*, 95 NW. U. L. REV. 691 (2001).

[200] *See* Kieff, *supra* note 26, at 705-17.

[201] *Id.* at 707-12.

[202] A problem in debates concerning the appropriateness and level of government funding of the humanities is the difficulty of ascertaining whether such funding has been successful. One commentator, for example, concludes that "the NEH has advanced scholarship in America" but cites in support of this claim only that the number of scholarly publications in the humanities "exploded in the period following the creation of the NEH," an explosion that might have had other causes. *See* Alvaro Ignacio Anillo, Note, *The National Endowment for the Humanities: Control of Funding Versus Academic Freedom*, 45 VAND. L. REV. 455, 462 (1992). Even if the effect of government funding on the level of academic research could be established, this would leave unanswered the social value of this increase in research. Developments in literary theory are presumably socially valuable for more than their instrumental value (itself almost impossible to ascertain), but quantifying the value of such a public good is largely subjective, given the absence of revealed preferences. Such difficulties, however, should not necessarily prevent government funding, and reward systems easily could be used to foster innovation in the humanities. One virtue of applying the proposal developed in Part III to such funding is that the proposal allows for largely subjective determinations without making funding determinations depend heavily on the preferences of any individual. *See infra* Part III.A.

addition to their marginal costs.[203] The paradox of reward proposals is thus that if they were truly effective in reducing the price of products to their marginal costs, then as long as there were any fixed costs, no one ever would produce the products.

This problem, of course, is one that is often solved, typically with what economists call imperfect competition;[204] we do, after all, have markets even in areas without intellectual property or other forms of monopoly protection. There may, however, be products and markets that would exist but for the inability to keep out imitators. As Kieff observes, "[s]econd movers generally enjoy numerous advantages over the first movers against whom they compete."[205] A first mover takes the risks associated with the uncertainty of demand and identifies solutions to both anticipated and unanticipated difficulties.[206] Suppose, for example, that Company *X* has developed a pharmaceutical product but is not yet sure whether it is safe and effective. *X* must decide whether to invest resources in conducting tests of the drug and seeking FDA approval.[207] If *X* anticipates that the drug is so cheap to manufacture that *X* would be able to sell the drug only at or just above marginal cost, *X* will have no incentive to invest the original resources.

The argument is an important one, and it bears a distinguished lineage. In perhaps the most important and famous modern article on patent law, Edmund Kitch offered a rationale for the patent system supplemental to the classical one that the system offers incentives to innovate.[208] Kitch compared patents to prospecting systems for mineral rights.[209] In such a system, a prospector who finds minerals on public land could stake a claim to the land and extract minerals from it. In the absence of such a system, no one might have an incentive to search for minerals on public land, because as soon as one found the minerals, others would join to dig out what they could. Kitch's metaphor of the patent holder as prospector has a number of important implications, some of which will be considered below,[210] but for present purposes, his most important observation is that "the patent owner has an incentive to make investments to maximize the value of the patent without fear that the fruits of the investment will produce unpatentable information appropriable by competitors."[211] Kitch concludes, "Only in the case of a patented product is a firm able to make the expenditures necessary to bring the advantages of

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[203] The dilemma is common to provision of all public goods. *See, e.g.*, Yoram Barzel, *The Market for a Semipublic Good: The Case of the* American Economic Review, 61 AM. ECON. REV. (COMMUNICATIONS) 665, 665 (1971) (discussing the difficulty of achieving zero marginal cost pricing of public goods).

[204] *See, e.g.*, EKELUND & TOLLISON, *supra* note 42, at 284 (defining "imperfect competition").

[205] Kieff, *supra* note 26, at 708.

[206] *Id.*; *see also* Michael L. Katz & Carl Shapiro, *Technology Adoption in the Presence of Network Externalities*, 94 J. POL. ECON. 822, 825 (1986) (providing a formal model suggesting the existence of a second-mover advantage in a market in which products may be "sponsored").

[207] The FDA approval process is an expensive one for pharmaceutical companies. *See, e.g.*, Richard A. Merrill, *The Architecture of Government Regulation of Medical Products*, 82 VA. L. REV. 1753, 1754 (1996) ("The expense of the studies FDA requires before granting approval—coupled with the substantial time spent conducting these studies and waiting for agency approval—is among the common explanations for the cost of new treatments."); Charles J. Walsh & Alissa Pyrich, *Rationalizing the Regulation of Prescription Drugs and Medical Devices: Perspectives on Private Certification and Tort Reform*, 48 RUTGERS L. REV. 883, 937-39 (1996) (arguing that the FDA review process is "hindered by its entrenched bureaucracy," which results in "duplicative" testing of new drugs and devices). The burdens attendant FDA approval have led to some proposals for self-regulation and privatization of the FDA process. *See generally* Vivian I. Orlando, *The FDA's Accelerated Approval Process: Does the Pharmaceutical Industry Have Adequate Incentives for Self-Regulation*, 25 AM. J.L. & MED. 543, 561-63 (1999) (discussing such proposals).

[208] Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977).

[209] *Id.* at 271-75.

[210] *See infra* notes 272-275 and accompanying text (noting the danger of rent dissipation by excessive development of the innovation).

[211] Kitch, *supra* note 208, at 276.

the product to the attention of the customer without fear of competitive appropriation if the product proves successful."[212]

Before considering the application of this insight to prize systems, it is worth noting that if patent law's concern is to ensure commercialization of inventions, then it is both overinclusive and underinclusive.[213] Patent law is overinclusive because sometimes first-mover advantages will outweigh second-mover advantages.[214] Studies indicate that being the first entrant in a field raises the product's reputation for quality.[215] A first-mover may solidify this reputation through brand advertising. The continued value of a brand like Tylenol, despite the existence of generic acetaminophen alternatives, attests to this phenomenon.[216] Patent law is underinclusive because commercializers of unpatentable inventions also face the prospect of copying.[217] Even an obvious commercial product might not be developed if second-mover advantages are sufficiently strong. These observations, of course, do not necessarily argue for the abolition or extension of patent protection, but they emphasize that the possible existence of second-mover advantages is not necessarily sufficient to overcome any advantages of a prize system alternative to patent.

Kieff appropriately does not claim that commercialization necessarily dooms any reward proposals, but he emphasizes that prize systems should take them into account. Critically, it may be appropriate for rewards to be deferred until after there has been some time for commercialization. For example, he acknowledges, the Shavell-van Ypersele approach might still work, especially if the reward is based on "data from actual sales,"[218] as they suggest would be desirable.[219] Kieff worries, though, that if "the moment of entitlement to the reward is pushed later along the commercialization timeline,"[220] the length of races to achieve and commercialize innovations will be inefficiently extended.[221] Moreover, he maintains, "[t]he shift down the commercialization timeline of the entitlement to the reward will also increase the uncertainty over who will be a reward recipient."[222] Such uncertainty might lead both of two firms arguably responsible for an innovation to refrain from commercializing it.[223]

These are important concerns, but they are not fatal. If multiple firms were unsure about which would ultimately receive the benefit of a reward, they would have strong incentives to

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[212] *Id.* at 277.

[213] Kitch devotes a section of his article to explaining how specific aspects of patent law reflect his theory. *Id.* at 267-71. Advancing considerably past Kitch's initial insights, Mark Grady and Jay Alexander offer a more robust positive economic theory of patent law. *See* Mark F. Grady & Jay I. Alexander, *Patent Law and Rent Dissipation*, 78 VA. L. REV. 305 (1992).

[214] *See* sources cited *supra* note 55.

[215] *See* William T. Robinson & Claes Fornell, *Sources of Market Pioneer Advantages in Consumer Goods Industries*, 22 J. MARKET RESARCH 305 (1985).

[216] *See, e.g.*, Lance W. Rook, *Listening to Zantac: The Role of Non-Prescription Drugs in Health Care Reform and the Federal Tax System*, 62 TENN. L. REV. 107, 119-20 (1994) ("Tylenol first began to be sold OTC during Dwight D. Eisenhower's administration. Nonetheless, its annual sales are $719.7 million, even though the same medication is widely and inexpensively available in generic form."). For a study of the diffusion of generic drugs into pharmaceutical markets, see Andrew Tat Tin Ching, Dynamic Equilibrium in the United States Prescription Drug Market After Patent Expiration (2000) (unpublished Ph.D. dissertation, University of Minnesota) (on file with author).

[217] As Douglas Lichtman argues, the absence of protection for such inventions is becoming increasingly problematic given the decreasing cost of copying technology. *See* Douglas Gary Lichtman, *The Economics of Innovation: Protecting Unpatentable Goods*, 81 MINN. L. REV. 693, 732 (1997).

[218] Kieff, *supra* note 26, at 710.

[219] *See supra* notes 106–110 and accompanying text (discussing Shavell and van Ypersele's proposal to consider sales data).

[220] *Id.* at 710-11.

[221] *See infra* Part II.B.1 (discussing patent races).

[222] *Id.* at 711.

[223] Moreover, anticipating this outcome may lead to less investment. *Id.* ("The desirable, invention-inducing power of the reward may decrease, or the undesirable rent-dissipating power may increase.").

cooperate. For example, they might enter into an agreement to commercialize the invention jointly and split the proceeds according to agreed-upon proportions.[224] Moreover, the problem may vanish if the prize system is an adjunct to the patent system. If the reward regime is opt-in, as Shavell and van Ypersele suggest might be optimal, inventors simply will not opt in if rewards are based on sales and they expect that the buyout of the patent would lead no firm to have an incentive to commercialize the invention. Similarly, if an investor retains a right to receive a patent before commercialization, with rewards then deferred until such time that the patents literally may be bought out, there will be no uncertainty in such a case about who will benefit from commercialization.[225]

Once the uncertainty problem is overcome, an innovator will have an incentive to commercialize in a prize system. As Kieff recognized, an innovator will have an incentive to commercialize before offering a patent into the public domain in exchange for a reward, because doing so will make the patent more valuable. Even after giving up a patent, though, an innovator will have an incentive to commercialize if the ultimate reward depends on the success of commercialization. Kieff notes correctly that "the size of the reward will have to increase to cover the costs of some commercialization activity in addition to inventive activity,"[226] but if the reward is based on sales, it automatically will do so. An innovator will have the same incentive to advertise and commercialize in such a regime as in the patent regime.[227] The ultimate reward will depend on the full investment, including both the research and the efforts at commercialization before and after the patent is placed in the public domain.

Although Kieff focuses his commercialization argument on a critique of the Shavell-van Ypersele proposal, the above discussion reveals that with appropriate design choices, the concern may be overcome with such an approach, because rewards depend on ultimate sales in a competitive market. It is a greater concern with proposals in which the value of the reward depends on the value of a patent to a monopolist. Under the Guell and Fischbaum approach,[228] the value of the reward would depend on profits in a test market, in which the patent holder would be permitted to advertise.[229] This might overstate the eventual value, since the patent holder would have little incentive to advertise after receiving an award based on the test market. If such advertising is important and socially beneficial,[230] their proposal may need revision. Similarly, in the Kremer approach, the winning auction bid would depend on how much a

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[224] Such a result would not be uncommon. *See, e.g.*, Joseph Kattan, *Antitrust Analysis of Technology Joint Ventures: Allocative Efficiency and the Rewards of Innovation*, 61 ANTITRUST L.J. 937, 944 (1993) ("[R]ivals may collaborate in a joint venture precisely because they wish to reduce the risk of being left behind in a technology race.").

[225] It is not clear whether this is the approach that Shavell and van Ypersele envisioned. *See* Shavell & van Ypersele, *supra* note 18, at 534 (referring simply to a "reward paid by government for an innovation").

[226] Kieff, *supra* note 26, at 711.

[227] Economists observe that the amount of advertising will be greater in a monopoly than in a competitive market. *See, e.g.*, SCHERER & ROSS, *supra* note 55, at 592-94. Producers in competitive markets sometimes seek to overcome this by lobbying for requirements that all producers contribute to joint marketing funds. *Cf.* United States v. United Foods, 121 S. Ct. 2334 (2001) (invalidating a program requiring all mushroom growers to contribute to a fund advertising mushrooms as a violation of the First Amendment, where the program was not ancillary to a more comprehensive program involving elements other than advertising).

[228] *See supra* Part I.A. This concern might be relatively slight in the pharmaceutical context with which they are specifically concerned, since the cost of producing pharmaceuticals is low. Note that Guell and Fischbaum assume that the patent buyout would take place only after a drug is approved and test-marketed in a limited location.

[229] *See* Guell & Fischbaum, *supra* note 41, at 225.

[230] Some commentators argue that advertising of pharmaceuticals may in fact be socially harmful. John Rizzo, for example, shows empirically that advertising tends to make consumers more price inelastic, thus leading them to pay more for drugs. *See* John A. Rizzo, *Advertising and Competition in the Ethical Pharmaceutical Industry: The Case of Antihypertensive Drugs*, 42 J.L. & ECON. 89 (1999).

monopolist would be able to earn from a patent.[231] It is thus possible that the original patent holder will receive the monopoly profits even though the innovation will not be commercialized in a competitive market. Even market-based rewards ideally should be contingent on a demonstration that the product will be or already has been commercialized.

2. *Screening*

Kieff also critiques the Shavell-van Ypersele proposal for failing to screen valid from invalid patents.[232] Measuring the sales of a product to determine demand for that product, Kieff correctly observes, "does not establish that the invention itself would have been patentable."[233] The problem stems in part from the difference between a product and an innovation. I noted earlier that the Shavell-van Ypersele proposal would have difficulty when a product arguably included a number of different innovations;[234] Kieff's point is that it may not be possible to determine whether a product reflects even a single innovation. In the patent system, by contrast, "[t]he same core legal rules that drive the patent system simultaneously provide the system with its own method for deciding which inventive activities are eligible to receive the benefit of a patent."[235] The patent system seeks to ensure that an invention is useful,[236] novel,[237] non-obvious,[238] and fully disclosed.[239] These would all be potentially relevant in a prize system as well, but they cannot necessarily be determined just by examining market conditions.

The problem, moreover, is one that cannot be solved merely by anchoring the prize system to the existing patent system. If inventors were required to obtain patents that they then would formally yield for a reward, then the existence of the patent would reveal that the Patent and Trademark Office believed that the invention met the criteria of patentability. The patent system, however, does not rely just on the Patent and Trademark Office, as the issuance of a patent provides only *prima facie* evidence of patent validity.[240] In the existing system, potential infringers have strong incentives to seek out evidence that might undermine a patent's validity, for example by "scouring public and private sources around the world" for prior art,[241] or even identifying prior art in their own files of which the patent holder might not have been aware.[242] Finding evidence that proves the invalidity of a patent will allow activity that otherwise would be

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[231] *See supra* text accompanying notes 127-128.

[232] Kieff, *supra* note 26, at 712-17.

[233] *Id.* at 713.

[234] *See supra* notes 115-119 and accompanying text

[235] Kieff, *supra* note 26, at 714.

[236] 35 U.S.C. § 101 (1994) (allowing patents for "new and useful improvements thereof"). In *Diamond v. Diehr*, 450 U.S. 175 (1981), the Supreme Court seized on the usefulness requirement to limit the potential scope of patentable subject matter, finding that abstract ideas are not "useful" in the sense specified by § 101. *See also* In re Alappat, 33 F.3d 1526 (Fed. Cir. 1994) (en banc) (analyzing § 101).

[237] 35 U.S.C. § 102(a) (requiring that for a patent to be obtained, the invention not be "known or used by others . . . before the invention thereof by the applicant for patent").

[238] *Id.* § 103(a) ("A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.").

[239] *Id.* § 112 ("The specification shall contain a written description of the invention . . . in such full, clear, concise, and exact terms as to enable any person skilled in the art . . . to make and use the same . . . .").

[240] *See id.* § 282 ("A patent shall be presumed valid."); Pennwalt Corp. v. Akzona Inc., 740 F.2d 1573, 1578 (Fed. Cir. 1984) (requiring clear and convincing evidence to overcome the presumption of validity).

[241] Kieff, *supra* note 26, at 713.

[242] *Id.* at 712-13. A practioner's guide to defending an infringement action suggests, "Don't forget to review your client's own files for pertinent prior art." David A. Dillard & Gary J. Nelson, *Presentation of Invalidity Defenses*, 493 PLI/P 519, 534 (1997).

infringement, and preparing a case that might lead to invalidation may allow a competitor to enter into an agreement to license the patent at a relatively low rate.[243] In a prize system, once a patent is released into the public domain, there will be no incentive for anyone to argue for its invalidity.

Patent validity, however, need not be the sine qua non for receipt of a prize. The criteria that a prize system employs could be different from those in the patent system. Some classes of patentable inventions might be excluded from a prize system, perhaps because prizes for those classes might be too difficult to calculate.[244] At the same time, prizes might be offered for some innovations or activities that would not qualify for patent protection. The purpose of providing such prizes could not be to reduce deadweight loss from patents, but prizes could be used to reward other useful activities. Prizes, for example, might be useful to encourage commercialization of products that otherwise would not be commercialized.[245] If patent and copyright laws provide inadequate protection and thus production of innovation in, say, fashion,[246] a prize system conceivably could be used to fill in the gaps. The first designer to repopularize bell-bottoms, thus stimulating a market that otherwise would not have existed, would receive a prize when other labels followed suit. Perhaps we would not want a prize system in this area; innovation in fashion arguably is a social cost rather than a social benefit, leading everyone to wasteful replacement of wardrobes. The case for and against providing incentives for this form of innovation, however, may be different in a world of patents than in a world of prizes.

Similarly, a prize system might well differ from a patent system in not producing black-and-white validity judgments at all. A patent either is or is not valid, or at least a court hearing a validity challenge must make one determination or the other on every patent claim.[247] It may be useful for patent law to make binary judgments even if the world exhibits shades of gray. Innovations may be more or less nonobvious, but it is presumably impractical for the patent office to grant two-thirds of a patent.[248] It might not be so impractical to provide partial prizes

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[243] On the relationship between threats to sue and patent licensing, see Jin-Li Hu, Choosing Litigation and Patent Licensing: An Inquiry into the Relationship Between the Legal System and R&D (1995) (unpublished Ph.D. dissertation, SUNY Stony Brook).

[244] *See infra* Part III.E (arguing that patent prize systems should be designed for specific purposes rather than to cover all patents).

[245] Commercialization might not occur in the absence of a prize because of second-mover advantages, even if the product idea were not innovative. *See supra* text accompanying notes 205-207. Indeed, to make Kitch's comparison of patents and prospecting complete, a prize system might be an alternative to prospecting systems, at least if the only aim is to ensure adequate incentives for prospecting. *But cf. infra* text accompanying notes 256-260 (discussing other virtues of the prospecting approach).

[246] I choose fashion because fashion patterns generally cannot be copyrighted. *See* Whimsicality, Inc. v. Rubie's Costumes Co., 891 F.2d 452, 455 (2d Cir. 1989). For a critique of the current regime as inconsistent with general principles of copyright law, see Leslie J. Hagin, *A Comparative Analysis of Copyright Laws Applied to Fashion Works: Renewing the Proposal for Folding Fashion Works into the United States Copyright Regime*, 26 TEX. INT'L L.J. 341 (1991).

[247] Different courts, of course, might come to different conclusions. Indeed, in a recent empirical analysis of over 10,000 patent cases, Kimberly Moore concluded that patent holder win rates differed considerably by district. *See* Kimberly A. Moore, *Forum Shopping in Patent Cases: Does Geographic Choice Affect Innovation?*, 79 N.C. L. REV. 889, 916-20 (2001). For example, the infringer won 70% of cases in the District of Massachusetts and only 32% of cases in the Northern District of California, a discrepancy which was highly statistically significant. *Id.* at 917 tbl.8. Such discrepancies suggest that the probability of victory depends greatly on the identity of the judge, and even with a particular judge it is possible that there is some randomness in outcomes.

[248] The notion of two-thirds of a patent may not be as absurd as it sounds, given the possibility of varying the patent term length on a patent-by-patent basis. Most scholars who have tried to determine the optimal patent length, however, have not considered making patent life determinations on a case-by-case basis. *See, e.g.*, WILLIAM D. NORDHAUS, Invention, Growth, and Welfare 76-86 (2979); C. Michael White, *Why a Seventeen Year Patent*, 38 J. PAT. OFF. SOC'Y 839 (1956). The current approach to patent terms is sometimes called "variable," since the term is 20 years from the date of filing, but the patent term does not depend on the novelty of the invention. *Cf.* Mark A. Lemley, *An Empirical Study of the Twenty-Year Patent Term*, 22 AIPA Q.J. 369, 385 tbl.1

when an innovation would be close to the patentability line. In addition, it may be impractical for the patent office to consider whether and when an innovation likely would have been developed and commercialized in the absence of the applicant's discovery, a criterion that some have suggested that the patent office should apply.[249] The benefits and costs of including such an analysis in a prize system might be different, depending on the form that the prize system would take. In a modification of the Shavell-van Ypersele proposal, for example, government officials might try to estimate the portion of sales of a product that would not have existed but for the claimed innovation.

These considerations, of course, do not undermine the need for a prize system to have some sort of screening mechanism to separate worthwhile innovations from others, but reveal that the mechanism need not necessarily be the patent system itself.[250] Ultimately, a prize system must have some means of distinguishing worthwhile from other inventions, but the success of the patent system in distinguishing innovative products from retreads does not imply that no other system could accomplish the same task. Sometimes, anchoring a prize system to the patent system may be the simplest and best approach. Even though Kieff persuasively shows that the issuance of a patent cannot be sufficient, he acknowledges that Kremer's approach avoids the objection, because bidders "will be sure not only to acquire information about the market demand for the information claimed in the patents but also about patent validity."[251] Other prize systems will need to adopt some other approach, one that will assure that decisions on prizes take into account all considerations relevant for that system, ranging from the innovativeness of the inventions to the accuracy of claims about sales data and consumer demand.

B. *The Common Pool Problem*

So far, we have explored two vices of the patent system, its tendency to impose deadweight loss and its resulting dampening of innovation incentives, and two virtues, its effectiveness in encouraging commercialization of innovations and in screening prospective patent recipients to ensure sufficient innovativeness. This alignment of pluses and minuses is misleading, however, most importantly because the patent system can produce both benign and malign innovation incentives. Both types of incentives are associated with what is known as the "common pool" problem, discussed frequently in the context of fisheries.[252] As H. Scott Gordon noted, in "sea fisheries the natural resource is not private property; hence the rent it may yield is not capable of being appropriated by anyone."[253] That is, even though a fishery conveys some social benefit, the competition for the benefit will produce a fully offsetting cost.[254] To switch

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(1994) (providing a numerical assessment of mean patent length with fixed and variable terms). A recent commentator has argued that patent term should vary depending on factors such as the interest rate at the time the patent is issued. *See* FRANK PARTNOY, FINANCE AND PATENT LENGTH (Univ. San Diego Law & Econ. Research Paper No. 19, 2001).

[249] *See* sources cited *supra* note 57.

[250] Kieff acknowledges that a prize system need not require a patentable invention. For example, he states, that the Shavell-van Ypersele system "may be indifferent between new technologies and revived ones." Kieff, *supra* note 26, at 713. Kieff worries, though, that "[e]very market having large demand would generate droves of reward claimants each asserting to have made some contribution." *Id.* For a discussion of the danger of frivolous claims, see *infra* text accompanying note 549.

[251] *Id.* at 715.

[252] The term "common pool" itself is an old one, referring to the analogous situation of common pools of oil shared by multiple drillers. *See, e.g.*, R.F. Kahn, *Some Notes on Ideal Output*, 45 ECON. J. 1, 18 (1935).

[253] H. Scott Gordon, *The Economic Theory of a Common-Property Resource: The Fishery*, 62 J. POL. ECON. 124 (1954).

[254] Gordon explains:

    [S]ince average cost is the same for all grounds and the average productivity of all grounds is also brought to equality
    by the free and competitive nature of fishing, this means that the intramarginal [fishing] grounds also yield no rent. It is

metaphors, if I promise that I will distribute $100,000 among all who come to a particular stadium, the total time costs of those who come will amount to about $100,000.[255]

This problem animated Kitch's comparison of the patent system to a prospecting system.[256] Kitch, as we have seen, revealed that a patent would give a patent holder incentives to commercialize an invention that otherwise might not be developed because of second-mover advantages.[257] In the absence of patent protection, no one will have any incentive to search for a common pool if finding the pool will not allow the finder to exploit it. Kitch, moreover, recognized that the patent system also was a solution to the problem of how to manage a pool once it is found. Just as a prospector will have incentives to limit the number of people who can mine for a mineral, so too will a patent holder have an incentive to limit the number of inventors who can seek to improve upon the original patent.

Emphasizing that "a patent 'prospect' increases the efficiency with which investment in innovation can be managed,"[258] Kitch notes that "the patent owner [is] in a position to coordinate the search for technological and market enhancement of the patent's value so that duplicative investments are not made and so that information is exchanged among the searchers."[259] Though Kitch does not develop the point fully,[260] a patent holder owns the pool and therefore is in a position to prevent competing factions from emptying the pool. Once a particular innovation is developed, it might be clear that improvements to it would produce an estimated $100,000 in additional benefit exploitable by the developers, but if that is so, about the same amount will be spent if there is competition to secure pieces of this social benefit. A patent holder, by contrast, can ensure that the marginal benefit of expenditures is equal to the marginal cost.

So far, this shows simply another benefit of the patent system. Patents, however, do not entirely solve the common pool problem, for two reasons. First, in solving the ex post common pool problem, patents may create an ex ante common pool problem, as multiple inventors compete for the right to own the patent in the first place. Second, because a patent is not infinitely broad, competitors may "invent around" the patent, developing cumbersome alternatives to the initial patent. The following sections explore these problems and consider their implications for prize systems. While these are problems associated with the existing patent system, various prize proposals might exacerbate them. At the same time, a prize system may strengthen its case by ameliorating the problems.

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entirely possible that some grounds would be exploited at a level of *negative* marginal productivity. *Id.* at 131-32.

[255] Rent dissipation, however, need not use up the entirety of the $100,000, if different people would suffer different costs from attending the event. Suppose, for example, that there are 51,000 individuals for whom the time cost of the event is $1, and for everyone else, it is $2. With perfect information, the 51,000 will attend and each receive slightly less than $2, for a surplus of almost $1 each. Nobody else will attend. A similar effect could exist with any common pool problem. Because some people with relatively low costs will necessarily participate, fewer of those with higher costs may participate than would be necessary to consume the common pool entirely. Risk aversion may also limit the extent of rent dissipation. *See* Arye L. Hillman & Eliakim Katz, *Risk-Averse Rent Seekers and the Social Cost of Monopoly Power*, 94 ECON. J. 104 (1984) (providing a formal model of the effect of risk aversion on rent seeking).

[256] Indeed, Kitch begins his article by citing an essay by Yoram Barzel that "points out that the exploitation of technological information has much in common with fisheries, public roads, and oil and water pools—all resources not subject to exclusive control." Kitch, *supra* note 208, at 265 (citing Yoram Barzel, *Optimal Timing of Innovations*, 50 REV. ECON. & STAT. 348 (1968)).

[257] *See supra* notes 208-217 and accompanying text.

[258] Kitch, *supra* note 208, at 276.

[259] *Id.*

[260] The point is developed in Grady & Alexander, *supra* note 213, *discussed infra* notes 268-270 and accompanying text.

1. *Patent Races*

That the patent system might solve one common pool problem at the expense of another was noticed shortly after Kitch published his initial article. Characterizing Kitch's argument, Donald McFetridge and Douglas Smith acknowledged that "[t]he patent as a prospect prevents competitive dissipation of these private returns by homogeneous rival inventors,"[261] for example by allowing the patent holder to prevent "premature commercial introduction" of the product.[262] The "surplus-increasing" effect of patents, however, "is dissipated in a resource-using rivalry for the patent itself."[263] The basic intuition is simple. If a patent holder is given ownership of a common pool of a certain value, the incentive to become a patent holder increases by the same amount. Therefore, the same "homogeneous rival inventors" who would have competed in improving an invention will compete in the initial development of it, dissipating the patent rents.[264]

In a reply to the McFetridge-Smith critique, Kitch noted that potential inventors might overcome the common pool problem by making agreements amongst themselves to limit excessive innovation.[265] Offering a Coasean efficiency story, Kitch observes that with zero transactions costs, "the rent dissipation problem disappears."[266] Although transactions costs are positive, Kitch argues that they will be lower "[a]t the early stages of innovation,"[267] and patent law appropriately solves the common pool problem later, where private ordering is less likely to achieve a satisfactory solution. A separate possibility, developed by Mark Grady and Jay Alexander, is that patent law seeks to provide a balance between the common pool problems.[268]

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[261] Donald G. McFetridge & Douglas A. Smith, *Patents, Prospects, and Economic Surplus: A Comment*, 23 J.L. & ECON. 197, 198 (1980).

[262] *Id.* The focus on premature commercial introduction, as opposed to excessive research and development of improvements, follows from Barzel, *supra* note 256.

[263] McFetridge & Smith, *supra* note 261, at 198.

[264] Surprisingly, full rent dissipation is possible even if in equilibrium, only one firm innovates. For a formal model with this result, see Partha Dasgupta & Joseph Stiglitz, *Industrial Structure and the Nature of Innovative Activity*, 90 ECON. J. 266, 284-87 (1980).

[265] Edmund W. Kitch, *Patents, Prospects, and Economic Surplus: A Reply*, 23 J.L. & ECON. 205 (1980).

[266] *Id.* at 205. Kitch supports this argument with the following quote from Barzel:
> The fact that many information situations have the potential for waste does not necessarily mean that waste actually occurs. If, in the aggregate, these actions produce a negative product, arrangements that successfully restrain them or reduce their impact will generate a positive return. An implicit, but crucial, assumption of the model is zero costs of transacting.

Yoram Barzel, *Some Fallacies in the Interpretation of Information Costs*, 20 J.L. & ECON. 291, 292 (1977), *quoted in* Kitch, *supra* note 265, at 205.

[267] Kitch, *supra* note 265, at 206. Kitch supports this argument by claiming that "the number of firms with the necessary comparative advantage to exploit the inventive possibility will be small and the uncertainties attached to each possibility make it easier to agree upon a division of activities, since the value of what any one firm is either giving up or gaining is unclear." *Id.* This argument is not persuasive. The number of firms that might exploit a possibility presumably will be smaller after an innovation is initially made. Moreover, uncertainty about relative prospects may make agreements more difficult to achieve, particularly if each firm is overconfident about its own prospects. Such overconfidence might occur frequently, given the existence of overconfidence and overoptimism biases. *See* Christine Jolls, *Behavioral Economics Analysis of Redistributive Legal Rules*, 51 VAND. L. REV. 1653, 1659 & n.22 (1998) (citing an unpublished bibliography listing over 200 articles on unrealistic optimism). *See generally* David Dunning et al., *A New Look at Motivated Inference: Are Self-Serving Theories of Success a Product of Motivational Forces?*, 69 J. PERSONALITY & SOC. PSYCHOL. 58 (1995) (assessing the source of self-serving biases); Neil D. Weinstein, *Unrealistic Optimism About Future Life Events*, 39 J. PERSONALITY & SOC. PSYCHOL. 806 (1980) (providing an early study of such biases); Russell B. Korobkin & Thomas S. Ulen, *Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics*, 88 CAL. L. REV. 1051, 1091-95 (2000).

[268] Grady & Alexander, *supra* note 213. For a useful summary of the theory, see Matthew Erramouspe, Comment, *Staking Patent Claims on the Human Blueprint: Rewards and Rent-Dissipating Races*, 43 UCLA L. REV. 961, 976-79 (1996). For comments and criticisms, see Donald L. Martin, *Reducing Anticipated Rewards from Innovation Through Patents: Or Less Is More*, 78 VA.

Thus, the developer of "an invention likely to inspire a number of slightly modified duplicates" will tend to receive a broader patent than one whose invention does not signal likely improvements,[269] because in the former case the danger of the ex post common pool problem is greater than in the latter case.[270]

Regardless of how effectively the patent system achieves a balance between the two common pool problems, however, patent races will occur. Patent races present three related problems. The first is excessive innovative activity.[271] This may seem a strange concern given the concerns of prize system proponents that the patent system produces too little inventive activity. Shavell and van Ypersele, for example, show that any given inventor will invest too little because they will not anticipate that they will be able to capture the full social benefit of their innovations.[272] The problem is that Shavell and van Ypersele assume a single inventor pursuing a particular prospect, rather than multiple inventors competing.[273] These two models are ultimately reconcilable. The common pool from the perspective of potential inventors will be smaller in a patent system as a result of patent holders' inability to capture social benefits above monopoly profits,[274] but the competition among multiple inventors will lead to the consumption of a greater portion of this smaller pool than if one inventor owned the entire pool.[275]

The two effects thus pull in competing directions. On one hand, the ability of a patent holder to appropriate only monopoly profits and not the full social benefit will decrease the amount of research activity. On the other hand, the concern of each competitor with the private rather than social marginal benefits and costs of its research endeavours will tend to lead to excessive research activity. Even if the two effects happen to cancel out, producing just the right amount of investment in social innovation, there remains a second problem with patent races, that research efforts may be duplicative. When many different inventors work independently toward the same goal, society's resources may be inefficiently channeled. Kitch himself recognized this danger in the ex post common pool problem with his observation that a patent owner can ensure that "duplicative investments are not made,"[276] but the problem in research leading to patent awards is equally significant. The problem is similar to one often noted in connection with securities markets, that securities analysts will have incentives to engage in

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L. REV. 351 (1992); Robert P. Merges, *Rent Control in the Patent Districts: Observations on the Grady-Alexander Thesis*, 78 VA. L. REV. 359, 376-77 (1992); and A. Samuel Oddi, *Un-Unified Economic Theories of Patents—The Not-Quite-Holy Grail*, 71 NOTRE DAME L. REV. 267, 284-85 (1996).

[269] *Id.* at 318.

[270] Grady and Alexander develop their positive economic theory by arguing that the scope of patentable subject matter and the requirements of patentability are best explained by the desire to minimize rent dissipation. *Id*. at 322-49.

[271] As Professor Rai notes, though without elaboration, "the greater the reward associated with patent rights, the greater the possibility of patent races that produce excessive or duplicative investment." Rai, *supra* note 26, at 199.

[272] *See, e.g.*, *supra* notes 87-88 and accompanying text.

[273] Shavell and van Ypersele do briefly acknowledge the problem of patent races. *See* Shavell & van Ypersele, *supra* note 18, at 542-43. They conclude simply that "[b]ecause the race to be first is a factor that afflicts both [patent and reward] systems, and because the information needed to address it under either seems to be of the same character, consideration of the race to be first does not seem to bear on the comparison between reward and patent." *Id.* at 543.

[274] For an early formal model suggesting that there will be too little research and development activity for this reason, see Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS 609 (R.R. Nelson ed., 1962).

[275] The result of competition may thus be technical progress that is *greater* than the social optimum. *See, e.g.*, Partha Dasgupta et al., *Invention and Innovation Under Alternative Market Structures: The Case of Natural Resources*, 49 REV. ECON. STUD. 567 (1982).

[276] Kitch, *supra* note 208, at 276.

excessive and duplicative research because the private value of such research is greater than the social value.[277]

A third problem with patent races is that they may reinforce inefficient industrial structures. Richard Gilbert and David Newbery have argued, for example, that a monopolist will expend resources on wasteful research and development simply as a means of protecting its market position, even if potential rivals in a patent race might be more efficient.[278] The problem is most prominent in an asymmetrical race, in which the monopolist has more at stake than any other inventors.[279] In such a race, a potential competitor may be deterred from even participating, "because the strategic interactions between the players are such that the incumbent would outdo any reasonable effort made by the challenger in order to stop the challenger being first to reach the finishing line."[280] Anticipating a lack of competition, the monopolist will proceed at the pace it would have taken in the absence of any competition.[281] This outcome may be desirable, as redundant research is eliminated. Whether one favors it depend in part on one's confidence in Joseph Shumpeter's observation that monopolists are necessary for innovation but ultimately will be overcome by a process of "creative destruction."[282]

Even in a patent regime, patent holders may avoid some of the harmful consequences of a patent race by disclosing some or all of their research activities. In a pathbreaking recent article,[283] Gideon Parchomovsky argues that "in many patent races the superior strategy for one or more of the competing firms would be to prevent other firms from winning the race by publishing their research findings."[284] A laggard in a patent race might not have developed sufficient research findings to support a patent, but these research findings may be sufficient to make a competitor's minor improvements over them insufficient for patenting. By preemptively publishing, the laggard may help its "financial ability to engage in other research projects in the future" and allow the laggard to "use the information it published in future projects at no cost."[285]

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[277] The seminal article making this point is Jack Hirshleifer, *The Private and Social Value of Information and the Reward to Inventive Activity*, 61 AM. ECON. REV. 561, 563-66 (1971). *See also* Lynn A. Stout, *Are Stock Markets Costly Casinos? Disagreement, Market Failure, and Securities Regulation*, 81 VA. L. REV. 611, 667-71 (1995) (providing a useful discussion of Hirshleifer's argument). As Jules Coleman similarly explains, "From an individual's perspective, the value of new information, and hence of investing in generating it, derives from *technology*, gains from allocating resources more efficiently, and *distribution*, wealth transfers that follow from the price change." JULES COLEMAN, RISKS AND WRONGS 151 (1992). Hirshleifer offers a brief but incomplete application to patent law, noting that even in the absence of a patent regime, inventors might be able to profit by speculation, so that, for example, Eli Whitney might have sold cotton futures. *See id.* at 570-72.

[278] Richard J. Gilbert & David M.G. Newbery, *Preemptive Patenting and the Persistence of Monopoly*, 72 AM. ECON. REV. 514, 518 (1982). For a critique of the model, arguing that the possibility of licensing will undermine "preemptive patenting," see Stephen W. Salant, *Preemptive Patenting and the Persistence of Monopoly: Comment*, 74 AM. ECON. REV. 247 (1984). Salant argues that "[i]f such transactions are permitted, entrants who can develop technologies more efficiently than the incumbent *always* win the patent race, preemptive patenting *never* occurs, and—while production will again be monopolized—there is no more reason to expect that the incumbent will acquire the entrant's patent than that the entrant will acquire the incumbent's patent." *Id.* at 247.

[279] *See, e.g.*, Christopher Harris & John Vickers, *Patent Races and the Persistence of Monopoly*, 33 J. INDUS. ECON. 461 (1985).

[280] *Id.* at 461. Harris and Vickers acknowledge that challengers will not always be deterred, for example because they may have some offsetting advantage relative to the monopolist. *Id.*

[281] For a model showing that the winner of a patent race will proceed as if the only player in the race, see Christopher Harris & John Vickers, *Perfect Equilibrium in a Model of a Race*, 52 REV. ECON. STUD. 193 (1985).

[282] JOSEPH SHUMPETER, CAPITALISM, SOCIALISM AND DEMOCRACY 83-84 (3d ed. 1950) (referring to innovation as part of a process of "creative destruction" in which on dominant leader eventually is overcome).

[283] Gideon Parchomovsky, *Publish or Perish*, 98 MICH. L. REV. 926 (2000).

[284] *Id.* at 927.

[285] *Id.* at 930.

The possibility of preemptive publication may even lead the leader in a patent race to publish first, what Parchomovsky refers to as "the double preemption twist."[286]

Parchomovsky's thesis is controversial. Douglas Lichtman, Scott Baker, and Kate Kraus argue that because American patent law awards a patent to whoever is the first to conceive of an invention, laggards in a patent race are unlikely to publish preemptively.[287] The same principle, however, leads them to observe that leaders in a patent race may strategically disclose information before filing a patent application, because "while such disclosures hurt the leader, they also benefit him by driving laggards out of the race and in that way decreasing the chance that one of those laggards will leapfrog the leader and win the patent."[288] Rebecca Eisenberg, meanwhile, has argued that preemptive disclosure is more likely by potential users of an innovation, such as pharmaceutical companies hoping to use DNA sequences, than by competitor producers.[289]

Regardless of the ultimate resolution of this debate, strategic disclosure does not eliminate the patent race problem, for two reasons. First, while strategic disclosure may prevent some duplicative research effort prospectively, it does not eliminate any research redundancy occurring prior to the strategic disclosure itself. Second, Parchomovsky recognizes that the net social welfare effects of strategic disclosure may be equivocal. On one hand, Parchomovsky argues that strategic disclosure "circumvents the troublesome tradeoff" that leads to patents but also to deadweight loss.[290] At the same time, however, "[t]he availability of preemptive publication reduces the expected average payoffs of the race participants and may consequently diminish, in some cases, the ex ante incentive to engage in R&D."[291] If strategic disclosure were to occur and prevent patents in all cases, the patent system's incentives to innovate would be eliminated altogether.

The possibility of early disclosure of patents is thus a promising antidote to one of the patent system's ills, but one that the patent system itself may be unable to promote fully. Prize systems, however, may offer an answer. Conceivably, a prize system could be used to compensate parties for releasing information even if that information would be insufficient for patentability.[292] If researchers have the option of obtaining a reward by releasing preliminary information, research could become more of a cooperative process than a competitive one.[293] As long as the eventual reward for an innovation is distributed among contributors to it based on information released by those contributors, researchers will have incentives to release information immediately, rather than waiting to achieve the threshold of completeness that the patent system requires.

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[286] *Id.* at 950-51. The benefit of doing so is that the patentee may then file for a patent within one year of publication. *See* 35 U.S.C. § 102(b) (1994).

[287] Douglas Lichtman et al., *Strategic Disclosure in the Patent System*, 53 VAND. L. REV. 2175, 2178-79 (2000).

[288] *Id.* at 2179.

[289] Rebecca S. Eisenberg, *The Promise and Perils of Strategic Publication to Create Prior Art: A Response to Professor Parchomovsky*, 98 MICH. L. REV. 2358 (2000).

[290] Parchomovsky, *supra* note 283, at 944.

[291] *Id.* Parchomovsky also argues that strategic disclosure may lead to inefficient expenditures by race participants on "monitoring competitors' research activities," which, while "not entirely wasteful, … is an additional cost that will slow down the development of new products and processes." *Id.* at 944-45.

[292] *See supra* notes 244-246 and accompanying text.

[293] Calandrillo makes a distinct but related point. "Kitch's discussion of the patent system implies that the negative effects of socially wasteful duplicative effort can be mitigated if property rights (or rewards) are bestowed relatively early on in the process so as to shorten the period of simultaneous investment by multiple parties." Calandrillo, *supra* note 19, at 353.

This step may not eliminate the redundancy of a patent race altogether, because it might create a number of smaller research races. Thus, researchers would compete for the prize for each part of a larger project. Different researchers, however, might be able to specialize in different parts of a project that could lead to only a single profitable patent, either by explicit agreement or by implicit cooperation.[294] Moreover, a prize system might penalize researchers who fail to cooperate by reducing the overall level of the prize to just enough so that only one team of researchers (or whatever number of teams provides an optimal balance between the goals of fostering competition and reducing redundancy) would have an incentive to work on it. This is analogous to imposing a sufficiently large tax on oil extraction so that the optimal amount of oil extraction from a common pool occurs, or to letting the person who picks low-lying fruit keep only half the apples so that a second person will have an incentive to climb a ladder rather than fight for the more accessible apples. Alternatively, a prize system might reduce the level of the prize if the party that should have bowed out of the patent race turns out to win it, though this approach would require some way of identifying the rightful team, which might well not be the first team to begin the research.

Some proposals for patent rewards would be more conducive to encouraging cooperation by sharing prizes and discouraging redundancy by reducing prizes than others. It would seem difficult to integrate this approach with Kremer's system, for example, because the patent holder in his system receives the full social value of the patent. It is more plausible as an adjunct to the Shavell-van Ypersele approach, as the government agency responsible for rewards could calculate the overall demand for an innovation and then distribute rewards among all contributors. The task of determining how much to give to each contributor is not a trivial one, however, and the task of determining an appropriate penalty for failure to cooperate or reduction in the optimal size of a prize is still more difficult to model. Anticipation of inefficient choices in distributing rewards among participants might hamper efficient allocation of research spending.

In the end, shared rewards and reduced prizes in common pool situations may be more appropriate in some contexts than in others. Shared rewards, for example, may be superior to rewards that give the entire prize in a patent race to a single winner when the amount of duplication in research is likely to be high and when determining relative contributions is relatively straightforward. Winner-take-all prizes may be superior in other situations, as well as when patent race competitors may be able to eliminate some of the problems of a patent race through private bargaining.[295] The proposals for patent prize systems explored in Part I cannot be faulted relative to the existing patent systems for causing redundant research. But they can be faulted for failing to exploit an opportunity to overcome a weakness of the patent system. An ideal prize system would allow for shared rewards in contexts in which shared rewards are more efficient than the alternative.

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[294] Such division of the market potentially could raise antitrust concerns. *See, e.g.*, United States v. Topco Assocs., 405 U.S. 596 (1972) (striking down as per se illegal a division of territories by members of a cooperative association). Antitrust law, however, is often sensitive to efficiency justifications. *See* Timothy J. Muris, *The Federal Trade Commission and the Rule of Reason: In Defense of* Massachusetts Board, 66 ANTITRUST L.J. 773, 775 (1998) (characterizing an FTC decision not as claiming "that conduct is never per se illegal" but as saying "that the courts should always listen to justifications"). Congress in any event could specify in the legislation creating a prize system that such agreements are permissible.

[295] *See, e.g.*, Parchomovsky, *supra* note 283, at 948-50 (discussing the effect of private bargaining on a patent race).

2. *Inventing Around*

The problem of inventing around has much in common with the problem of patent races. Imagine a patent race in which two different companies are seeking to achieve the same practical goal—say, developing a cure to a disease. Now, change the hypothetical in two different ways. First, the companies are pursuing different means, for example by pursuing medicines based on different perceived vulnerabilities of an infectious agent.[296] Second, one company has already won the race, having received a patent on its invention and commercialized its invention, charging monopoly profits. If the other company continues its work, it may be said to be trying to "invent around" the first company's patent, trying to produce the same benefit but in a new way. The phenomenon of inventing around is thus the same as the phenomenon of a patent race except that one participant has already won the race and the other participant is seeking to achieve the same goal in another way. Inventing around presents similar problems of excessive and functionally redundant innovative activity as patent races.

Some commentators have treated the problem of inventing around as benign. The Federal Circuit has even trumpeted inventing around as a benefit of the patent system, reasoning that patent protection stimulates innovation by encouraging inventing around.[297] Accordingly, inventing around is permitted, although under the doctrine of equivalents, infringement cannot be avoided by insignificant changes to the patent.[298] This may reflect an appropriate balance in patent policy,[299] but commentators have been skeptical of the claimed social benefits of inventing around. Louis Kaplow, for example, notes that "[s]uch invention provides no social benefit if the new invention is no better than the first."[300] Even if there is a possibility that the new invention might be better than the original one, the private benefit to the new inventor might be considerably greater than the social benefit and thus social resources might be channeled inefficiently toward reinventing the wheel and away from other research.[301] In addition, while

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[296] For example, the HIV virus might be attacked through protease inhibitors as well as vaccines seizing on different mechanisms. Even though protease inhibitors have shown promise in allowing many individuals infected with HIV to live normal lives, work continues on an AIDS vaccine, in part because of the high cost of protease inhibitor treatment. *See* Philip A. Leider, Comment, *Domestic AIDS Vaccine Trials: Addressing the Potential for Social Harm to the Subjects of Human Experiments*, 88 CAL. L. REV. 1185, 1190-95 (2000) (discussing the need for a vaccine despite recent advances in treatment).

[297] *See, e.g.*, Hilton Davis Chem. Co. v. Warner-Jenkinson Co., Inc., 62 F.3d 1512, 1520 (Fed. Cir. 1995) ("The ability of the public successfully to design around—to use the patent disclosure to design a product or process that does not infringe, but like the claimed invention, is an improvement over the prior art—is one of the important public benefits that justify awarding the patent owner exclusive rights to his invention."), *rev'd*, 520 U.S. 17 (1997); State Indus., Inc. v. A.O. Smith Corp., 751 F.2d 1226, 1235-36 (Fed. Cir. 1985) ("One of the benefits of a patent system is its so-called 'negative incentive' to 'design around' a competitor's products, even when they are patented, thus bringing a steady flow of innovations to the marketplace.").

[298] The court has explained the distinction this way:

Although designing or inventing around patents to make new inventions is encouraged, piracy is not. Thus, where an infringer, instead of inventing around a patent by making a substantial change, merely makes an insubstantial change, essentially misappropriating or even 'stealing' the patented invention, infringement may lie under the doctrine of equivalents.

London v. Carson Pirie Scott & Co., 946 F.2d 1534, 1538 (Fed. Cir. 1991).

[299] On the relationship between the doctrine of equivalents and inventing around, see Paul N. Katz, *The Doctrine of Equivalents and Its Impact on "Designing Around,"* 4 FED. CIR. B.J. 315 (1994). One reason to allow inventing around is that otherwise there might be a perverse incentive to seek out nonobvious solutions to problems when obvious solutions were possible. Patent law would be more difficult to administer if a patent's validity depended on whether there were *any* obvious solutions to the relevant problem, rather than on whether the particular means of solving the problem was nonobvious.

[300] Louis Kaplow, *The Patent-Antitrust Intersection: A Reappraisal*, 97 HARV. L. REV. 1813, 1869 (1984).

[301] *See, e.g.*, Donald F. Turner, *The Patent System and Competitive Policy*, 44 N.Y.U. L. REV. 450, 455 (1969). A potential counterargument is that funds allocated to inventing around would not necessarily have been allocated to other research and development activities. If research and development has large social benefits that inventors are unable to internalize, inventing around conceivably could on average have benefits larger than costs. Encouraging inventing around, however, is a crude means

inventing around ultimately may result in lower prices to consumers, "there might be a serious diminution in incentive to come up with the [original] invention in the first place."[302]

Despite theoretical models suggesting that the possibility of licensing should make inventing around rare,[303] empirical evidence indicates that inventing around is widespread[304] and costly.[305] A prize system, at least on initial inspection, promises to ameliorate the problem. If a patent is placed in the public domain, then there will be no incentive to invent around that. To be sure, there will remain an incentive to invest research funds in possible improvements, for example in pharmaceutical products that have fewer side effects or that serve different segments of the population, though the incentive will be less than before. Private incentives should be aligned more closely with social ones, as inventors will pursue research if and only if it improves upon what is already in the public domain.

There are, however, two significant concerns. First, a prize system may increase the incentive to invent around a patent that has not been placed in the public domain, for example because the original inventor decided not to opt in to an optional prize system. If a prize system pays an inventor more than the monopoly profit than she could earn on an invention,[306] as suggested by some of the reward proposals, the incentive to invent around will be greater than it otherwise would have been. Anticipating this outcome, the original inventor may invest less in research, anticipating a reduction in appropriable benefits from innovating. As Kremer has noted, allowing the original inventor to opt for the prize system once the substitute product is invented may provide one solution.[307] The solution is an imperfect one, though no worse than the existing patent system. The creation of a perfect substitute, for example, would mean that the original and subsequent inventors each would receive half of the prize. Thus, wasteful inventing around will still occur, and this inventing around will decrease ex ante incentives to innovate.

An alternative, though messier, solution would be to provide smaller or no rewards for those who have invented around. For example, if the inventor of a perfect substitute sought a reward, no reward would be appropriate, because there would be no social benefit from the research. Although placement of the perfect substitute into the public domain would lower prices for consumers and eliminate deadweight loss, it would hurt the original inventor and thus decrease that inventor's innovation incentives, which the patent system presumably optimized. A partial substitute, such as a product that was better in some ways than the original, would receive some reward, but a lesser one. Assuming it is possible to calibrate rewards based on such criteria, the prize system at least will not increase incentives to invent around, though many inventors presumably would respond by not opting out of the patent system, if given the choice. The patent prize proposals discussed in Part I, however, would need modification to allow such calibration.

Second, while placing a product in the public domain eliminates the incentive to invent around, it may lead to inefficient excessive research into improvements on the initial invention. We are now full circle back to the common pool problem and to the observation that if an

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of encouraging research and development.

[302] Kaplow, *supra* note 300, at 1870.

[303] *See, e.g.*, Martin J. Adelman, *The Supreme Court, Market Structure and Innovation:* Chakrabarty*,* Rohm*, and* Haas, 27 ANTITRUST BULL. 457, 464 (1982).

[304] *See* Edwin Mansfield et al., *Imitation Costs and Patents: An Empirical Study*, 91 ECON. J. 907 (1981).

[305] For figures on the costs of inventing around, see Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, *in* 3 BROOKINGS PAPERS ON ECON. ACTIVITY 783 (Martin N. Baily et al. eds., 1987).

[306] Or, more accurately in this context, more than the *duopoly* profit that the inventor would earn, since the inventor will have to compete with the original patent holder.

[307] *See* Kremer, *supra* note 20, at 1154-55; *supra* text accompanying notes 161-163.

improvement on the initial invention is promising, there may be excessive research that dissipates the rent achievable from such improvements.[308] Patents allow the monopolist to limit the amount of subsequent innovation, but placing patents in the public domain eliminates this ability. Conceivably, the inefficiency from excessive investment in improvements could offset or even swamp the efficiency benefits of the prize system for a particular innovation. The only proposal that does not suffer from this problem is Lichtman's coupon scheme, though we have seen that this approach may be inferior to patent buyouts in some instances.[309] Thus, the common pool problem once again indicates that an ideal prize system would lead to patent buyouts in some instances and coupon schemes in others. And even where a patent buyout is optimal, an ideal patent buyout scheme would calibrate prizes so that any economic loss from excessive investment is deducted from prizes.

C. The Adverse Selection Problem

While the common pool problem affects both patent and prize systems, the creation of a regime in which inventors may choose between patent protection and prizes, as the prize system proposals reviewed earlier suggest,[310] presents a new problem, that of adverse selection.[311] Inventors presumably will choose the system that will offer them the highest returns, taking into account as well the relative uncertainties of remuneration in both systems.[312] Inventors may choose prizes because they believe, possibly on the basis of information not available to the administrators of the prize system, that their returns from the prize system will be unusually high relative to the patent system. The result is similar to what George Akerlof observed of the used car market, that the selection effect will produce a high number of "lemons."[313] The following sections explore two ways that a prize application might be a lemon.

1. Prizes for Commercially Unattractive Inventions

The most obvious aspect of the adverse selection problem is that prizes might be paid to inventors with commercially unattractive inventions.[314] As with all adverse selection problems,

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[308] *See supra* text accompanying note 260.

[309] *See supra* notes 191–192 and accompanying text.

[310] All of the proposals discussed in Part I are opt-in, though Shavell and van Ypersele note that a mandatory system might have advantages over an optional one. *See* Shavell & van Ypersele, *supra* note 18, at 539-40; *supra* notes 102–105 and accompanying text.

[311] "Adverse selection" is a phrase common in the insurance context. *See* KENNETH S. ABRAHAM, DISTRIBUTING RISK: INSURANCE, LEGAL THEORY, AND PUBLIC POLICY 15 (1986) (defining "adverse selection" as "the process by which low-risk insureds tend to purchase less coverage, and high-risk insureds tend to purchase more coverage than they would if prices were more accurate").

[312] Uncertainty in a prize system would not be fatal to it, though a high variance of outcomes might reduce the effective prize to inventors. *See infra* notes 402-403 and accompanying text.

[313] George A. Akerlof, *"The Market for 'Lemons': Quality Uncertainty and the Market Mechanism*, 84 Q.J. ECON. 488 (1970).

[314] Commercially unattractive inventions are not inherently problematic, if the inventions have public goods properties that would prevent them from being privately exploited. One criticism of current U.S. technology policy is that it sometimes allows private parties to both receive government grants and then obtain patents on the resulting products. *See* Bayh-Dole Act, Act of Dec. 12, 1980, Pub. L. No. 96-517, 94 Stat. 3015-3028 (codified as amended at 35 U.S.C. §§ 200-211, 307 (1994)) (allowing businesses to obtain patents on government-sponsored research). *See generally* Peter S. Arno & Michael H. Davis, *Why Don't We Enforce Existing Drug Price Controls? The Unrecognized and Unenforced Reasonable Pricing Requirements Imposed Upon Patents Deriving in Whole or in Part from Federally Funded Research*, 75 TUL. L. REV. 631 (2001) (urging enforcement of legal requirements that inventions supported by federal funding be sold at reasonable prices); Rebecca S. Eisenberg, *Public Research and Private Development: Patents and Technology Transfer in Government-Sponsored Research*, 82 VA. L. REV. 1663 (1996)

the greater the degree of asymmetric information, the more severe the problem.[315] To consider an extreme example, suppose that the inventor of a drug has private information that the drug will alleviate the symptoms it targets for only the first year of use, but this information has not been made public.[316] Because the administrator of the prize system does not have access to this information, the prize awarded presumably will be higher than it otherwise would be, given the importance of this information. It is possible that the effect of high prizes will be benign, if they simply provide generally increased incentives to engage in research and development activities. The excess prizes, though, consume social resources that might be targeted more effectively. Conceivably, moreover, anticipation of such high prizes might distort research investment, with funds channeled toward areas in which possession of asymmetric information is relatively likely.

There are two basic strategies that a prize system can use to address the problem. The first is to take it into account by offering lower prizes than otherwise would be given. Just as buyers of used cars implicitly take into account the lemons problem by recognizing that used cars often have more problems than comparably aged cars not sold on the used car market,[317] the administrator might give lower prizes based on the possibility of asymmetric information than it otherwise would give. Though Shavell and van Ypersele do not discuss the adverse selection problem directly, their model implicitly takes it into account, awarding smaller prizes than they would otherwise because inventors' asymmetric knowledge about demand will make those with poor prospects more likely to take the prize.[318] Similarly, the government could examine market test results skeptically in calculating a patent buyout price in the Guell and Fischbaum scheme. Kremer's approach, meanwhile, automatically would result in lower prizes, because auction bidders, like used car buyers, would recognize the problem of adverse selection,[319] though if competitors have better information than the government, the depression might be relatively minimal. Lowering rewards would be more difficult for Lichtman's coupon scheme, which requires that the coupons be great enough to enable low-valuing users to purchase the product and to incentivize the monopolist to offer it at a low price.

The second strategy is to wait for more information before awarding a prize. This approach is integral to Shavell and van Ypersele's suggestion that the government might adjust rewards on an annual basis, basing adjustments on revised calculations of demand from actual sales data.[320] Waiting would be more difficult with the Guell and Fischbaum approach, since eventually the market test must end so that actual sales of the drug can begin. As Kremer describes his proposal, money would be paid immediately after the auction, thus eliminating the

(arguing that allowing patentability of government-sponsored research may interfere with technological progress). In theory, such a regime can be justifiable if the research can be partly exploited by private parties but government grants are needed to complement already existing private research incentives to overcome public goods problems. *See, e.g.*, Richard E. Romano, *Aspects of R&D Subsidization*, 104 Q.J. ECON. 863 (1989) (developing a theoretical model in which the government sometimes increases social welfare by subsidizing private investment leading to grants of patents).

[315] On the connection between adverse selection and asymmetric information in the securities context, see Bernard S. Black, *The Legal and Institutional Preconditions for Strong Securities Markets*, 48 UCLA L. REV. 781, 804-05 (2001).

[316] This may be unlikely given rigorous FDA disclosure requirements. *See* 21 U.S.C. 355(b)(1)(A) (1994) (requiring "full reports of investigations which have been made to show whether or not such drug is safe for use and whether such drug is effective in use").

[317] For an explanation of the lemons problem concluding that "consumers do not overpay," see Timothy J. Muris, California Dental Association v. Federal Trade Commission: *The Revenge of Footnote 17*, 8 SUP. CT. ECON. REV. 265, 288 (2000).

[318] *See* Shavell & van Ypersele, *supra* note 18, at 539; *supra* text accompanying notes 100-101.

[319] In addition, Kremer emphasizes that the markup would lessen the adverse selection problem by giving even inventors with commercializable inventions incentives to accept prizes. *See* Kremer, *supra* note 20, at 1142; *supra* text accompanying notes 134-135.

[320] *See* Shavell & van Ypersele, *supra* note 18, at 542; *supra* text accompanying notes 108-110.

benefit of delay. Finally, Lichtman's proposal does not allow for delay. The government must be able to determine in advance the size of coupons and to whom they should be awarded. Similarly, in the suggested modification to his proposal in which the government would agree with the patent holder on a set price,[321] the government must be able to calculate this price in advance.

In making these comparisons, my intention is not merely to add to the dizzying list of considerations needed to compare prize system proposals. Rather, it is to show that the list *is* dizzying, as would be any final empirical comparison of different proposals, even taking into account only the adverse selection consideration addressed in this section of the article. The analysis also suggests that sometimes, it might be worthwhile for some combination of approaches to be used. For example, Kremer's proposal might be modified so that the high bid is just one factor, along with the success of the product once placed in the public domain, used to determine compensation for inventors. Similarly, the government administering a coupon scheme might allow the patent holder to set its own price, promising to pay an eventual cash prize dependent on the results achieved, or might set the ultimate value of the coupons to the patent holder ex post. These considerations suggest again that there will be a benefit to flexibility in administering a prize system, a benefit that we ultimately will balance against any costs of flexibility.[322]

2. *Unnecessary Prizes*

The above reasoning suggests that we should be wary when someone chooses a prize over a patent because that may indicate that the inventor did not believe that patent protection would be valuable. Even if the government can address this by estimating the value of patents, some prize applicants might have decided not to price their products monopolistically even if the patents were valuable. In the extreme case, a patent holder might have released the patent to the public domain even in the absence of a prize system; in a less extreme case, a patent holder might license a patent at a relatively low cost. A patent holder might do this for reputational reasons, for example because the patent owner might expect criticism for fully exploiting its patent.[323] Some such patent holders, however, might apply for prizes anyway, meaning that tax dollars will be spent on what otherwise would not have been a government-sponsored program.

The flip side of the dilemma is that a company might release a patent to the public domain because doing so will not prevent the company from achieving monopolistic pricing. If the company had a patent on a complementary product as well, the company might decide to exploit the combined set of patents through high prices for one rather than for both.[324] Giving a prize to the company for releasing the patent that it otherwise would not have exploited may not

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[321] *See supra* notes 192-195 and accompanying text.

[322] *See infra* Part III.A.

[323] This is hardly naïve speculation. Some pharmaceutical companies, for example, have allowed their patents to be used for free in third world countries without payment. *See, e.g.*, Rachel L. Warns, *Drug Makers Drop South Africa Suit over AIDS Medicine*, N.Y. TIMES, Apr. 20, 2001, at A1 (reporting that the pharmaceutical industry bowed to "mounting public pressure" by dropping a lawsuit that sought to prevent uncompensated use of patents on AIDS drugs); Helene Cooper et al., *Patents Pending: AIDS Epidemic Traps Drug Firms in a Vise: Treatment vs. Profits*, WALL ST. J., Mar. 2, 2001, at A1 (discussing drug companies' dilemma about whether to allow generic copies of their drugs in poor countries). For conflicting editorial views on patent enforcement by drug companies in poor countries, compare *South Africa's AIDS Victory*, N.Y. TIMES, Apr. 20, 2001, at A18, with Robert M. Goldberg, *Fight AIDS with Reason, not Rhetoric*, WALL ST. J., Apr. 23, 2001, at A22.

[324] This observation is central to Kremer's concern that companies might be overcompensated for complementary patents under his system. *See* Kremer, *supra* note 20, at 1155-57; *supra* text accompanying notes 159-160.

be necessary. Similarly, a patent holder might be a natural monopoly producer of the product it has patented,[325] or it might be able to credibly threaten potential entrants into a market with either predatory pricing[326] or litigation.[327] If so, then the patent holder gives up nothing by releasing the product into the public domain, and paying the patent holder for doing so will fail to reduce deadweight loss.

The welfare consequences of awarding patent prizes to the benevolent patent holder (albeit not so benevolent as to suggest that the government keep its own money) are equivocal. It may make sense to award prizes for innovations that a company for publicity reasons would decide not to exploit, as a way of ensuring that there are continued incentives for the development of research into such areas. On the other hand, the positive reputational effect of releasing a product into the public domain without a prize may be sufficient by itself to stimulate research in some cases, so the government may end up subsidizing some research that would have been performed even in the absence of the prize system. The welfare consequences of paying prizes in the case of the inevitable monopolist are less equivocal. It is possible that the prizes will provide companies an additional incentive to invest in research and development,[328] but such prizes will be of no help in limiting deadweight loss. Moreover, companies that have nothing to lose from placing a patent in the public domain will be more likely than others to seek prizes.

The first three proposals discussed in Part I are not directly responsive to the problem. The Guell and Fischbaum proposal, for example, would base a prize on monopoly profits extrapolated from a test market, but the prize recipient would be able to continue to charge monopoly prices in other markets. In the Kremer market proposal, a bidder may bid a great deal for monopoly rights, which would allow exclusion of the original patent holder, even if the original patent holder would continue to dominate the market if the product were randomized to the public domain. Even the Shavell and van Ypersele proposal, while considering subsequent sales data, is based on calculation of the demand curve, rather than the supply curve. To address

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[325] A natural monopoly is "[a] monopoly in which the relation between industry demand and cost structure makes it possible for only one firm to exist in the industry." EKELUND & TOLLISON, *supra* note 42, at 255. Some commentators and courts have analogized all patents to natural monopolies, urging that patent holders be regulated in a manner similar to the price regulation techniques used for utilities. *See generally* John W. Schlicher, *If Economic Welfare Is the Goal, Will Economic Analysis Redefine Patent Law?*, J. PROPRIETARY RTS., June 1992, at 12, 15-16 (discussing such theories). If a patent were placed in the public domain, however, there might or might not be a natural monopoly for the corresponding product, depending largely on the startup costs for building a plant to produce the product.

[326] Whether predatory pricing is in fact a viable strategy for avoiding competition is a much-debated question in the economics literature. *Compare* JOHN R. LOTT, JR., ARE PREDATORY COMMITMENTS CREDIBLE?: WHO [sic] SHOULD THE COURTS BELIEVE? (1999) (arguing with empirical evidence that profit-maximizing firms rarely engage in predatory pricing), *with* Peter H. Huang, *Still Preying on Strategic Reputation Models of Predation*, 3 GREEN BAG 2D 437 (2000) (reviewing LOTT, *supra*) (presenting empirical analysis supporting the existence of predatory pricing). A significant early work offering a model in which predatory pricing might occur is Paul Milgrom & John Roberts, *Predation, Reputation, and Entry Deterrence*, 27 J. ECON. THEORY 280 (1982) (offering a model in which predatory pricing might occur).

[327] Intimidation through litigation is rarely sanctionable under the antitrust laws, as a result of the *Noerr-Pennington* doctrine, unless the litigation is a "sham." *See generally* Eastern R.R. Presidents Conference v. Noerr Motor Freight Inc, 365 U.S. 127 (1961) (finding action by trucking companies to obtain favorable governmental action not illegal under antitrust laws); United Mine Workers v. Pennington, 381 U.S. 657 (1965) (holding that joint efforts to influence government are not illegal even if intended to eliminate competition); James B. Perrine, *Defining the "Sham Litigation" Exception to the* Noerr-Pennington *Antitrust Immunity Doctrine: An Analysis of the* Professional Real Estate Investors v. Columbia Pictures Industries *Decision*, 46 ALA. L. REV. 815 (1995) (exploring the "sham" exception to the doctrine).

[328] Other schemes, such as tax breaks for research-and-development expenses, might be better targeted. *See generally* Stephen A Jones, *The Danforth-Baucus Proposal to Restructure the Research and Development Tax Credit: Providing a More Reliable Incentive for Commercial Experimentation*, 42 TAX LAW. 1089, 1093-97 (1989) (considering the strengths and weaknesses of R&D tax credits).

the problem, all of these proposals would have to be modified to allow some ex post check that the product's placement into the public domain has had a meaningful effect.

The problem, though, would not affect the Lichtman proposal at all. After all, the Lichtman proposal imagines that a single seller would continue to sell the product. If a single producer has a natural monopoly, eliminating deadweight loss demands that the government provide appropriate incentives to the producer, rather than use a mechanism that would allow others to join the market. Thus, ironically, Lichtman's proposal, which was least flexible in addressing the adverse selection problem discussed in the previous section, is best insulated from the adverse selection problem addressed in this section. This observation underscores the difficulty of identifying a single best proposal. Moreover, the severity of the problem discussed here might vary from market to market, applicable more to industries with high fixed costs and to products with high marginal costs of production. This emphasizes again the virtues of a system that encourages different approaches depending on which is the most efficient in the particular context.

D. Costs of a Prize System

A prize system cannot be assessed merely by examining the prizes ultimately rewarded and determining whether those awards will tend to encourage or discourage innovative activity. The costs of operating any prize system must also be considered. The government will incur costs from paying prizes, of course, but it also may incur costs in the administration of the prize system. Indirect costs incurred by inventors also are relevant. These include the costs of any litigation that results from disputes over prizes, as well as money that investors will spend in political rent-seeking activities. The patent system, of course, may result in costs in some of these categories, and prize system costs will be additional to the patent system's unless the prize system lessens the costs of the patent system. This section considers the implications of these various types of costs for a prize system.

1. Financing Costs

For government prizes to substitute for monopoly power in rewarding innovation, the government must pay money for innovations. At first glance, the government necessarily comes out ahead. When giving putative patent holders what would have been their monopoly profits, the government saves consumers this amount, plus what would have been deadweight loss to boot. A dollar spent thus achieves more than a dollar in benefits, thus seeming to pass a rudimentary cost-benefit analysis.[329] The problem with this analysis is that, under the traditional economic wisdom,[330] a proper evaluation of a social program should count a dollar as more than

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[329] Some commentators might argue that because patents on products like drugs involve health, cost-benefit analysis is an inappropriate, commodificationist tool. *See, e.g.*, ELIZABETH ANDERSON, VALUE IN ETHICS AND ECONOMICS (1993). Several scholars in recent years have defended cost-benefit analysis against this line of critique. *See* Matthew Adler, *Incommensurability and Cost-Benefit Analysis*, 146 U. PA. L. REV. 1371 (1998); Matthew D. Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165, 194-225 (1999); Lewis A. Kornhauser, *On Justifying Cost-Benefit Analysis*, 29 J. LEGAL STUD. 1037 (2000); *see also* Cass R. Sunstein, *Cognition and Cost-Benefit Analysis*, 29 J. LEGAL STUD. 1059 (2000) (arguing that cost-benefit analysis is best justified as a tool for helping to overcome biases due to cognitive heuristics).

[330] Concern with the relevance of the distortionary effect of taxation for funding of public goods dates at least to ARTHUR C. PIGOU, A STUDY IN PUBLIC FINANCE 33-34 (3d ed. 1947). Some of the most important subsequent work, however, ignored the problem. Paul Samuelson, most notably, simply assumed a lump sum tax that would impose no economic distortion. *See* Paul A. Samuelson, *The Pure Theory of Public Expenditure*, 36 REV. ECON. & STATS. 387 (1954).

a dollar, because government funds cost money to raise. Taxation causes economic distortions.[331] Taxing apples will lead consumers to eat fewer apples and more oranges; taxing income may lead taxed entities to make less of it.[332] In addition, greater levels of taxation lead to increased expenditures on tax avoidance, such as through hiring of accountants and tax lawyers.[333] Governments can finance expenditures with deficit spending instead of taxation, but this has its own problems.[334] The possibility of various means of fundraising cannot escape the need to consider the distortionary cost of each additional dollar in federal spending.

The distortionary effect of taxation is integral to Lichtman's analysis. Recall that Lichtman showed how a coupon scheme might achieve the same decrease in deadweight loss as a patent buyout at a fraction of the cost.[335] One might ask, though, why the difference in costs matters. The reduced costs to the government in Lichtman's scheme come at the expense of consumers, who provide the rest of the funds needed to make up what would have been monopoly profits, so the total amount being paid by the government plus consumers remains the same. The answer is that the government's expenses are of greater concern because of tax distortions. Lichtman guesses that the deadweight loss attributable to tax collection is 30 cents on the dollar.[336] Because the deadweight loss from monopoly under his assumptions would be 50 cents on the dollar, a patent buyout would save 20 cents per dollar relative to the patent system, but a properly implemented consumer subsidy of only about four cents per dollar.[337] The precise estimates that he uses are not relevant. As long as there is some distortionary effect of taxation, a program that results in less government expenditure, even at the expense of consumer expenditure, should be preferred.

A recent literature, however, emphasizes that while the tax system as a whole is distortionary, some increases in taxes may not be.[338] One reason is that while taxation may distort relative prices, once an economy is already distorted by taxes, the adoption of a new tax conceivably might bring relative prices more closely into line.[339] If, for a simple example, the investment tax credit is distortionary, then repeal of the credit may both raise revenue and

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[331] A policy-induced economic distortion is a government policy that causes individuals to alter what would otherwise be their preferred behavior. For a useful vocabulary and typology of distortions, see Richard S. Markovits, *The Allocative Efficiency of Shifting from a "Negligence" System to a "Strict-Liability" Regime in Our Highly-Pareto-Imperfect Economy: A Partial and Preliminary Third-Best-Allocative-Efficiency Analysis*, 73 CHI.-KENT L. REV. 11, 30-33 (1998).

[332] An income tax causes distortions in individuals' allocation of time between work and leisure, while a consumption tax also distorts individuals' allocation of income between savings and consumption. *See* Daniel N. Shaviro, *An Efficiency Analysis of Realization and Recognition Rules Under the Federal Income Tax*, 48 TAX L. REV. 1, 24-25 (1992) (concluding that a consumption tax nonetheless may be less distortionary than an income tax).

[333] *See, e.g.*, DAVID F. BRADFORD, UNTANGLING THE INCOME TAX 175 (1986) (emphasizing the high costs of such tax avoidance). Higher taxes also might induce more tax evasion. *See, e.g.*, Nehemiah Friedman et al., *A Simulation Study of Income Tax Evasion*, 10 J. PUB. ECON. 107 (1978) (offering a simulation in which higher tax rates produce more tax evasion). *See generally* FRANK A. COWELL, CHEATING THE GOVERNMENT: THE ECONOMICS OF EVASION (1990).

[334] A seminal article exploring the benefits and costs of deficit financing is Robert J. Barro, *On the Determination of Public Debt*, 87 J. POL. ECON. 940 (1979).

[335] *See supra* Lichtman, *supra* note 21, at 135; *see also supra* text accompanying notes 190-191 (arguing that a coupon scheme sometimes might be more expensive than a patent buyout).

[336] Lichtman, *supra* note 21, at 133 & n.26 (citing Barton H. Thompson, Jr., *The Endangered Species Act : A Case Study in Takings & Incentives*, 49 STAN. L. REV. 305, 355 (1997), which estimates the deadweight loss from a marginal increase in taxes to be between 17 and 56 cents per dollar raised). Thompson in turn obtains these numbers from Charles L. Ballard et al., *General Equilibrium Computations of the Marginal Welfare Costs of Taxes in the United States*, 75 AM. ECON. REV. 128 (1985). Later work by Ballard, however, has called these conclusions into question. *See infra* notes 338–341 and accompanying text.

[337] Lichtman, *supra* note 21, at 135 & tbl.5.

[338] For an overview of this literature, see Charles L. Ballard & Don Fullerton, *Distortionary Taxes and the Provision of Public Goods*, 6 J. ECON. PERSPECTIVES 117 (1992).

[339] *See, e.g.*, Jean Drèze & Nicholas Stern, *Policy Reform, Shadow Prices, and Market Prices*, 42 J. PUB. ECON. 1 (1990).

improve efficiency.[340] This analysis, however, is presumably relevant only if a proposal for a prize system were accompanied by a specific tax proposal. The second reason is generally applicable to income taxes. It is that an increase in income taxes may lead workers to work more rather than less,[341] if the income effect of the tax (the tendency of workers to work more because the lower wage decreases demand for normal goods, including leisure time) outweighs the substitution effect (the tendency of workers to work less because the tax decreases the opportunity cost of leisure).[342] Intuitively, a worker who is paid less may work more to maintain a given standard of living.[343]

For at least two reasons, the recent literature should not encourage complacency about the distortionary effects of taxation. First, the literature generally places aside the tax system's administrative and compliance costs,[344] the latter of which in particular plausibly might be impacted by tax rate increases. Second, the literature does not explicitly consider that the provision of a public good itself may have a negative effect on labor supply. People care about their income because their level of income will affect their ability to purchase goods. If suddenly a number of goods become free (or much cheaper), income will be less significant. To take a reductionist example, suppose the only two goods in the economy were food and prescription drugs. If prescription drugs suddenly became free, then there would be a reduced incentive to work, because the money previously spent on drugs might make a smaller contribution to utility if spent entirely in the food category. How strong this effect is in a real economy depends on the context.[345]

In the absence of a consensus that in our actual tax system increases in taxes will decrease tax distortions, it thus would be hazardous to disregard the concern about the potentially distortionary effect of increased income taxes. At the least, it seems a reasonable premise that government programs costing less should, all else being equal, be preferred to government programs costing more. One possible response to the distortionary effect might be to tax specifically those who benefit from a patent prize system in a particular context. As Louis Kaplow shows, if a public good is funded by a tax allocated to the benefit each individual

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[340] *See* Ballard & Fullerton, *supra* note 338, at 129 (citing Don Fullerton & Yolanda K. Henderson, *The Marginal Excess Burden of Different Capital Tax Instruments*, 71 REV. ECON. & STATS. 435 (1989)). Another example is that of "a Pigouvian, externality-correcting tax." *Id.* (citing Charles L. Ballard & Steven G. Medema, The Marginal Efficiency Effects of Taxes and Subsidies in the Presence of Externalities: A Computational General Equilibrium Approach (1991) (unpublished manuscript, available from Michigan State University)).

[341] *See* Joseph E. Stiglitz & Partha S. Dasgupta, *Differential Taxation, Public Goods, and Economic History*, 38 REV. ECON. STUDS. 151, 159 (1971); *see also* Ballard & Fullerton, *supra* note 338, at 122-24.

[342] On income and substitution effects, see NICHOLSON, *supra* note 87, at 135-37. For a review of the literature suggesting that the elasticity of labor supply may be negative for certain groups of earners, see Gary Burtless, *The Work Response to a Guaranteed Income: A Survey of Experimental Evidence*, *in* LESSONS FROM THE INCOME MAINTENANCE EXPERIMENTS (Alicia H. Munnell ed., 1987).

[343] Whether this is true for a particular worker may depend on the current income of that worker, if the labor supply curve is "backward-bending." *See generally* GEORGE J. BORJAS, LABOR ECONOMICS 43 (1996) (explaining backward-bending labor supply curves).

[344] *See* Ballard & Fullerton, *supra* note 338, at 118-19 ("Although these costs are doubtless important, they have generally been ignored by the economists studying the marginal cost of public funds since the 1970s.").

[345] A relevant part of the context is whether individuals care more about their ability to purchase goods because these goods are inherently valuable to them or because these goods are valuable to them primarily because others possess them. Robert H. Frank has argued that the answer depends on the goods at issue and has used the terms "nonpositional goods" (in which category he includes education and health care) and "positional goods" to refer to the respective types. *See, e.g.*, ROBERT H. FRANK, LUXURY FEVER: WHY MONEY FAILS TO SATISFY IN AN ERA OF EXCESS *passim* (1999); *see also* Robert H. Frank & Cass R. Sunstein, *Cost-Benefit Analysis and Relative Position*, 68 U. CHI. L. REV. 323, 370-71 (2001) (exploring the significance of the distinction for cost-benefit analysis). Frank's identification of health care as a nonpositional good suggests that free distribution of drugs would not have as great a negative effect on the supply of labor as it would if it were a positional good.

receives from it, then there is no tax distortion from it.[346] Of course, if a patent buyout were funded by an excise tax, the tax would defeat the purpose of the buyout, raising the price of the product back to the monopoly price.[347] On the other hand, the government might fund a patent prize system by relying on proxies indicating who would benefit from it. For example, to fund a patent prize system designed to buy out patents on agricultural technology, the government might tax all farmers, regardless of whether they subsequently decided to purchase products containing the technology. Such taxes often will be politically unattractive, however, because in the absence of excellent proxies, they will result in heavy levies being imposed on some individuals who do not benefit at all.

Prize systems thus ordinarily would likely be funded from general tax receipts, with some presumed tax distortion effect. In comparing any particular prize system proposal, however, an individualized evaluation of any redistributive benefit from the proposal should accompany an analysis of the distortionary tax effect. Louis Kaplow observes that a prime reason that income taxes are distortionary relative to a hypothetical lump sum tax is that they are progressive.[348] "But if this assumption is to be made," Kaplow argues, "the distributive benefit of the more progressive tax/expenditure system should be included in the final account."[349] Even apart from the point that redistributive benefits should be counted at least insofar as they offset distortionary costs,[350] redistributive benefits are potentially relevant to an assessment of a patent prize system. Although many commentators urge that redistribution should generally be accomplished through the income tax,[351] patent prize proposals may accomplish redistribution other than Robin Hood reallocation of resources from the rich to the poor. For example, a patent prize system for prescription drugs might redistribute from the healthy to the sick, and it might accomplish this goal more efficiently than an alternative tax provision aimed at this goal could.[352]

Two general points, potentially offsetting, flow from the above analysis. First, Lichtman's observation that cheaper means of eliminating deadweight loss should be preferred is

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[346] Kaplow explains this intuition by imagining an individual for whom a public goods program produces benefits exactly equal to one percent of income, where the program is funded by a one percent tax:

> For each additional dollar an individual might earn, he will have one cent less than otherwise available for private consumption, 69 cents instead of 70 cents. However, the individual will benefit in an amount worth one additional cent due to the availability of the public good, raising his aggregate marginal benefit from earning a dollar back to 70 cents. That is, his net utility benefit from earning an additional dollar will be precisely what it was before—without the public good and the tax adjustment. Because each individual's net benefit from any level of labor effort is thus unchanged, labor supply will be unaffected and each individual's utility will be the same as it was before.

Louis Kaplow, *The Optimal Supply of Public Goods and the Distortionary Cost of Taxation*, NAT'L TAX J., Dec. 1, 1996, at 513, 515.

[347] *See* Shavell & van Ypersele, *supra* note 18, at 544 (noting that "commodity taxation . . . is essentially equivalent to granting intellectual property rights"). The patent buyout program must pay the patent holder monopoly profits. Thus, if the program is to be funded by purchases of the product, each purchaser must pay monopoly profits divided by the number of purchasers. The number of purchasers will be the same as the equilibrium under monopoly, since the next marginal potential consumer would not be willing to pay the excise tax required.

[348] Kaplow, *supra* note 346, at 521.

[349] *Id.*

[350] In a separate work, written with Steven Shavell, Kaplow has emphasized the importance of concerns about the distribution of income to welfare economics. *See* Louis Kaplow & Steven Shavell, *Fairness Versus Welfare*, 114 HARV. L. REV. 961, 989-98 (2001).

[351] *See, e.g.*, *id.* at 993 ("[W]hen legal rules do have distributive effects, the effects usually should not be counted as favoring or disfavoring the rules because distributional objectives can often be best accomplished directly, using the income tax and transfer (welfare) programs.").

[352] Ann Alstott has analogous argued that institutional constraints on the tax system may make the earned income tax credit a less appealing alternative to welfare programs than it might at first appear. *See* Ann L. Alstott, *The Earned Income Tax Credit and the Limitations of Tax-Based Welfare Reform*, 108 HARV. L. REV. 533 (1995).

probably a useful generalization, but with the awareness that the importance of the effect can be exaggerated. Second, more expensive alternatives nonetheless should be considered if they produce redistributive benefits. Even if a buyout program were eight times more expensive than a coupon scheme, and I have shown that this will be unlikely,[353] it might be desirable for the government to adopt the costlier proposal. The difference in social cost, which depends on the distortionary effect on taxation, will likely in any event be considerably less than the difference in the government's costs. Of course, redistributive benefits may vary from program to program, or even patent to patent. A patent buyout for a "lifestyle drug" might be viewed as having neutral or even negative redistributive consequences.[354] Once again, these observations suggest skepticism about a one-size-fits-all patent buyout program.

2. *Administrative Costs*

In addition to paying prizes themselves, the government would need to pay the costs of running the administrative agency overseeing the prize system. Consideration of these costs may seem to make more attractive proposals that invest little discretion in the agency. We have seen, however, that none of the proposals can be implemented in a truly mechanical way, if basic problems are to be overcome. The test market results from Guell and Fischbaum's proposal would need to be considered individually before being extrapolated to other geographical areas and into the future.[355] Shavell and van Ypersele derive a formula, but an administrative agency would be needed to consider an individual patent's contribution to a product.[356] Similarly, in Kremer's proposal, the agency would need to identify complementary products.[357] While Lichtman identifies on an economic chart which consumers should receive coupons, the procedure for figuring out who these consumers are almost surely necessitates great administrative discretion. Finally, if the government agency is to consider many of the factors considered in this Part, it is difficult to imagine a statute specifying just the right mechanical procedure to follow.

Thus, if the government were to consider adopting a proposal that binds an agency to calculating prizes in some predetermined way, such as one of the ways suggested by the proposals discussed in Part I, it would presumably be for some reason other than administrative cost. Once bureaucrats are involved in making some individualized considerations for particular prize applications, the cost savings from formalizing the overall process seem unlikely to be great. A process that specifies the means by which government officials should consider each of a hundred factors easily could be more expensive than one that orders the officials simply to consider all relevant factors. The empirical comparison is uncertain, of course, but there is little theoretical reason to favor complex mechanical formulas to open-ended decisionmaking on cost grounds. Even if a mechanical formula could be devised, the government agency at least would

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[353] *See supra* text accompanying notes 186-191.

[354] In the United Kingdom, critics of the National Health Service have argued that it should not devote resources to Xenical, an anti-obesity pill that they claim is a lifestyle drug. *See* Valerie Hannah, *Drug Giant Under Investigation over Side Effects of Cholesterol Pill*, HERALD (Glasgow), Sept. 5, 2001, at 3, *available at* 2001 WL 26585561. Of course, there is considerable debate about which drugs are lifestyle drugs. Dave Hill, *Viagra Nation*, INDEPENDENT (London), July 15, 2001, at 22, *available at* 2001 WL 23539167 (quoting a doctor as saying that calling Viagra a lifestyle drug is "deeply insulting to those men and their partners who find this condition very distressing").

[355] *See supra* notes 73-77 and accompanying text.

[356] *See supra* notes 115-119 and accompanying text.

[357] *See supra* notes 165-166 and accompanying text.

need some latitude to verify the correctness of data submitted to it, such as industry sales figures used to justify a claim for a large prize, thus reducing the benefits of automation.

While Congress would surely need to consider the costs of operating an administrative agency to distribute patent rewards, there is little reason to think that some proposals for structuring an agency will be cheaper than others. A government truly intent on reducing costs might offer a fixed allocation to the agency, perhaps even making part of the agency employees' compensation contingent on finishing the job assigned.[358] Perhaps of greater import is the effect of different proposals on the Patent and Trademark Office, whose costs are not trivial,[359] without even considering the cost to firms of prosecuting patents before the Office. Proposals that require applicants to obtain patents before buyouts will not affect the operation of the Office. Proposals, by contrast, that would allow compensation for innovations without demanding receipt of a patent could save the government administrative costs. There would be benefits to requiring prize applicants to obtain patents, particularly verification of nonobviousness and adequacy of disclosure, though the patent administrative system is designed to provide such verification functions only in conjunction with the patent litigation system.[360] For some patents, these benefits would likely be worth the cost in the prize context, while for others, they might not be. A patent system that did not require applicants to obtain patents conceivably could result in net administrative cost savings.

3. Litigation Costs

Reasonable people might disagree about how large a prize an applicant should receive, and such disagreement might be resolved through some type of litigation process. For example, an applicant disappointed with a prize might be allowed to sue the agency in federal court,[361] and the agency itself might offer some form of appeals process.[362] Alternatively, a prize system might encourage private whistleblowers to reveal fraud in prize applications.[363] Regardless of the form of the system adopted,[364] the costs of such litigation, including both the cost to the parties and the cost to the executive and judicial branches, are social costs that offset any benefits of the prize system. Whether these costs are worthwhile depends on the benefits litigation offers, for example in improving the accuracy of the prize system, in preventing excessive rewards based on faulty data, or even in assuring the due process rights of prize applicants.[365]

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[358] Agencies often miss statutory deadlines. While one commentator has responded by proposition the abolition of such deadlines, *see* Alden F. Abbott, *The Case Against Federal Statutory and Judicial Deadlines: A Cost-Benefit Appraisal*, 39 ADMIN. L. REV. 171 (1987), an alternative approach would be to create compensation-based incentives.

[359] The Commissioner of Patents and Trademarks recently complained that the PTO's final fiscal year 2000 budget of $871 million was too low. *See Remarks of Q. Todd Dickinson at PTO Day Annual Conference on Patent & Trademark Office Law and Practice*, 82 J. PAT. & TRADEMARK OFF. SOC'Y 219, 226 (2000).

[360] *See supra* Part II.A.2 (explaining the importance of having a system for screening valid from invalid patents).

[361] If the organic statute establishing the prize agency did not establish a standard for review, the courts would presumably apply the relatively deferential substantial evidence test in reviewing agency decisions. *See* 5 U.S.C. § 706(2)(E) (1994) (setting forth the "substantial evidence" test); *cf.* Dickinson v. Zurko, 527 U.S. 150, 152 (1999) (requiring the Federal Circuit to evaluate fact-finding by the Patent and Trademark Office using the substantial evidence test rather than the clearly erroneous test used to assess fact finding by district courts).

[362] A model might be the appeals process used by the Social Security Administration. *See* 42 U.S.C. § 405 (1994).

[363] The design of a suitable whistleblower system itself is not a simple matter. *See* John C. Coffee, Jr., *Rescuing the Private Attorney General: Why the Model of the Lawyer as Bounty Hunter Is Not Working*, 42 MD. L. REV. 215 (1983) (critiquing the operation of whistleblower programs).

[364] *See infra* Part III.I (discussing one approach to structuring litigation).

[365] I am skeptical of the need to be concerned for the due process rights of prize applicants, aside from the formal need for any proposal to pass constitutional muster. The reason for my skepticism is that the dignitary rights of inventors are less important

Because the authors of patent prize proposals have not described whether and what type of litigation over patent prizes would be permitted, comparison of their proposals is difficult. Some may have simply assumed that decisions by the agency charged with granting patents would be so formulaic as to be uncontroversial. We have seen, though, that no patent prize system can be entirely mechanical; judgment calls must be made.[366] Even patent prize systems that provide a formula to be used for calculation of a prize will need factfinders to determine the value of variables to be plugged into the formula. More mechanical proposals, in any event, need not necessarily produce greater litigation than more unstructured proposals. For example, if a statute implementing Lichtman's coupon proposal gave an agency a lump sum to spend on coupons for prescription drugs, current law would allow little latitude for challenges.[367] A statute permitting litigation over the size of prizes surely could lead to large litigation costs, but the size of such costs will depend more on the rules governing litigation than on the rules governing prizes.

Different patent proposals, however, may differ in the extent to which they reduce litigation associated with the existing patent system. If a prize system produces patent buyouts placing the patents in the public domain, there ordinarily will be no need for a prize recipient to enforce its patent with infringement litigation.[368] Although a patent buyout system might not substantially reduce litigation in some situations, for example when only one of several related patents is placed in the public domain, the overall potential savings are considerable.[369] Prize systems that encourage release of information about innovations without requiring acquisition of patents also might reduce litigation, though litigation could ensue should someone else subsequently obtain a patent arguably derivative of the earlier innovation.[370] Proposals that encourage price reduction by patent holders, by contrast, would not necessarily reduce litigation. Thus, consideration of the effects on future litigation adds yet another variable to the mix needed to compare various approaches. And again, the optimal solution may depend on the properties of the particular innovation, as some innovations may be less likely than others to produce the type of confusion or ambiguity that would lead to litigation.

4. Rent-Seeking Costs

We have already seen that a patent system can dissipate rents, as potential patent holders compete to win a patent race,[371] and can prevent dissipation of rents, by consolidating ownership of improvements on an invention in a single monopolist.[372] In these examples, the "rent" is either the monopoly profit that a patent holder can capture or the social wealth that competitors can

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than, say, the dignitary rights of Social Security applicants. *Cf.* Jerry L. Mashaw, *The Supreme Court's Due Process Calculus for Administrative Adjudication in* Matthews v. Eldridge*: Three Factors in Search of a Theory of Value*, 44 U. CHI. L. REV. 28 (1976) (criticizing the Supreme Court for not considering the importance of dignitary rights in defining due process).

[366] *See, e.g.*, *supra* notes 355–357 and accompanying text.

[367] *See, e.g.*, Lincoln v. Vigil, 508 U.S. 182, 193-94 (1993) (holding that decision on how to spend a lump sum appropriation was "committed to agency discretion by law" and therefore unreviewable).

[368] *See* Calandrillo, *supra* note 19, at 333 (noting criticisms that the patent system, unlike reward systems, produce "litigation and accompanying administrative costs").

[369] The average patent infringement case costs an estimated $1.2 million to litigate. *See* Dee Gill, *Defending Your Rights: Protecting Intellectual Property Is Expensive and Often Crucial*, WALL ST. J., Sept. 25, 2000, at 6 (referring to an unidentified "industry survey").

[370] Even if unpatented, however, information released would be relevant as prior art to defeat a subsequent patent. *See* 35 U.S.C. § 103(a) (1994) (detailing the prior art requirement).

[371] *See supra* Part II.B.1.

[372] *See supra* notes 258–260 and accompanying text.

capture, and competition tends to erode the benefit. There is another, more familiar type of rent-seeking that can be associated with a patent system or with a prize system: rent-seeking through regulation.[373] Given the possibility of receiving a government benefit, whether a patent or a prize, private companies might invest resources toward influencing the government's decision. Such activity in itself is socially wasteful, and it may generate additional waste as government officials compete for such resources or because the rent-seeking activity causes some distortion in the economy, for example by altering innovation incentives.[374] These costs offset the social benefits of the patent or prize system, and if the costs entailed in a prize system are sufficiently high, they might outweigh the benefits of a prize system relative to a patent system.

The problem of rent-seeking should neither be ignored nor exaggerated. On the former point, as just one example, several studies have shown that political contributions by companies seeking protectionist legislation have a significant effect on legislators' votes.[375] The patent system itself is arguably a good example of the latter point. Considerable resources are expended, of course, on patent prosecution and patent litigation.[376] The relative independence of the Patent and Trademark Office, however, makes direct lobbying unlikely, though industry as a whole may affect the selection of high-ranking agency officials.[377] Similarly, and interestingly, it is rare for a company to lobby Congress to enact legislation extending a patent term, and when such efforts are made, they are at least ostensibly based on the ground that there is some fairness reason for an extension.[378] Given the potential benefits from an extension, this lack of activity suggests a perception that Congress ordinarily will not grant one, probably because legislators view the patent system as the exclusive means of obtaining monopoly power in exchange for innovation.[379]

Patent prize systems similarly might escape the most blatant rent-seeking abuses. Once an agency is established to award prizes, Congress presumably would be skeptical of requests for

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[373] For an overview of rent-seeking in general and this form of rent-seeking in particular, see DENNIS C. MUELLER, PUBLIC CHOICE II at 229-38 (1989).

[374] *See* James M. Buchanan, *Rent Seeking and Profit Seeking*, *in* JAMES M. BUCHANAN ET AL., TOWARD A THEORY OF THE RENT-SEEKING SOCIETY 3, 12-14 (1980) (discussing these socially costly effects of rent-seeking).

[375] *See* ROBERT E. BALDWIN & CHRISTOPHER S. MAGEE, IS TRADE POLICY FOR SALE? CONGRESSIONAL VOTING ON RECENT TRADE BILLS (Nat'l Bureau of Econ. Research Working Paper No. 6376, 1998); Cletus C. Coughlin, *Domestic Content Legislation: House Voting and the Economics of Regulation*, 23 ECON. INQ. 437 (1985); Suzanne C. Tosini & Edward Tower, *The Textile Bill of 1985: The Determinants of Congressional Voting Patterns*, 54 PUBLIC CHOICE 19 (1987); *see also* MUELLER, *supra* note 373, at 242 (discussing various studies).

[376] *See supra* note 369; *see also* Albert F. Bower, *The Independent Inventor: In Which a Practitioner Shares Some Highly Practical Advice for Safe-Guarding the Products of Intellectual Labor*, DEL. LAW., Mar. 1989, at 24, 25 ("A major cost in patenting is incurred in preparing and filing the application, mainly because of the attorney time required to make an adequate disclosure.").

[377] Richard L. Revesz, *Specialized Courts and the Administrative Lawmaking System*, 138 U. PA. L. REV. 1111, 1149 (1990) (noting that interest groups may be able to control the selection of officials and judges in relatively specialized agencies and courts).

[378] *See, e.g.*, Shailagh Murray, *Senate Mulls Bill to Extend Drug Patents*, WALL ST. J., Aug. 5, 1999, at A3 (noting that proponents of Schering-Ploug's attempt to obtain legislative extension of the patent for Claritin "argue the extensions are only fair, considering delays in the federal approval process for the drugs"); *see also* Charles R. Babcock, *Patent Fight Tests Drug Firm's Clout: Claritin Maker Goes All Out in Congress*, WASH. POST, Oct. 30, 1999, at A1 (noting Schering-Plough chief executive's claim that the company just wants a fair hearing). Critics, of course, will dispute the fairness reason. *See, e.g.*, http://www.citizen.org/congress/drugs/factshts/indexclaritin.htm (last visited Sept. 10, 2001) (criticizing Schering-Plough's attempt).

[379] Even if Congress does grant such an extension, the courts might strike it down. *See* Robert Patrick Merges & Glenn Harlan Reynolds, *The Proper Scope of the Copyright and Patent Power*, 37 HARV. J. ON LEGIS. 45, 65 (2000) (arguing that courts should scrutinize term extensions, especially if the extensions benefit only a small number of inventors, as potentially violative of the Copyright and Patent Clause).

prizes outside the system.[380] Greater concerns are the potential for lobbying over the appointment of agency officials and the potential for seeking to influence statutory formulas in ways beneficial to individual companies and industries. These concerns suggest a tradeoff. On one hand, more mechanical proposals entail the risk that special interests may succeed in influencing Congress to adopt an inferior formula or algorithm because it is particularly likely to benefit them. We have seen the danger that a poorly motivated government official could apply a formula in a perverse way, but this danger may be secondary to the possibility of government's adopting a bad formula that prevents even a well-motivated bureaucrat from efficiently distributing prizes. On the other hand, more flexible proposals may increase rent-seeking designed to influence who will make agency decisions. The challenge is to avoid both dangers.

III. DESIGN PRINCIPLES FOR PATENT PRIZES

This Part develops a proposal for a patent prize system by considering a variety of design issues. This organization is designed in part to emphasize that one need not agree with my assessments on every issue to produce a prize system that would improve social welfare by decreasing deadweight loss. Indeed, even a proposal that flouts every one of my recommendations, such as a developed version of one of the proposals in Part I, might well offer an improvement over the status quo. The existence of deadweight loss implies that even a very inefficient prize system conceivably might be an improvement. Nonetheless, some of the design issues are more central to my thesis than others, and I have tried to present those that I view as most important—and most counterintuitive—first. Though all of the recommendations can be considered independently, some of them are complementary. For example, my argument for an unconstrained agency becomes more persuasive once my subsequent argument for delay is accepted, because delay helps avoid many of the problems associated with unconstrained agencies. Similarly, my argument for an independent rather than an executive agency is particularly persuasive if the earlier argument for an unconstrained agency is accepted.

While my proposal will be developed gradually, I will offer in the next few paragraphs an overview that encapsulates all of my central recommendation: Congress, by statute, would establish a government agency to distribute patent prizes as a complement to the existing patent system. The agency would receive substantial flexibility in making awards, guided by only a brief specification of the purpose of the prizes.[381] The statute, however, would not result in the immediate formation of the agency.[382] Applicants for government largesse would receive only a claim that would be resolved at some later date, years away, after the agency is created. In the interim, the government would appropriate funds for the project, presumably a relatively small amount of money at least in the early years of the program, and invest those funds.[383] Applicants for prizes could obtain immediate payment by selling their rights to prizes to third-party investors, in which case the purchasers would be as entitled to a prize as if they had themselves performed the acts to be rewarded.[384]

Once formulated under the terms of the statute creating the system, the agency would make decisions on what prizes to grant to individual applicants. Prizes would be available for any actions that applicants took years earlier to reduce the monopoly effects of the patent system,

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[380] *See supra* note 39 and accompanying text.

[381] *See infra* Part III.A.

[382] *See infra* Part III.B.

[383] *See infra* Part III.C.

[384] *See infra* Part III.D.

including placing patents in the public domain, lowering prices, and providing coupons either for the applicant's own products or for a third party's. The statute likely would not cover all patents, but would specify a particular area of inventive activity (such as prescription drugs for seniors) for which the fund is to be used.[385] The agency would distribute the fund among all applicants, not just to a single or small group of top applicants,[386] though the agency would have discretion to deny an applicant a prize altogether.

The agency itself would be independent rather than executive, ideally with selection of the agency's members made by the judiciary rather than by the President.[387] To provide a counterweight to extravagant claims, the agency would use adversary proceedings.[388] An adversary could be selected by the prize agency or by means of an auction, with the adversary provided a financial incentive to seek to ensure that the applicant receives as little money as possible. For example, both the applicant and the adversary might be given an opportunity to suggest a fair prize, with the adversary receiving in exchange for the auction payment a percentage of the difference if its suggestion were chosen. The applicant and adversary would be permitted to settle for a prize between their suggestions, though in the absence of settlement the decisionmaker would be required to choose between the applicant's and adversary's suggestions.[389]

Even in its most developed manifestation, this proposal is considerably simpler than any of the proposals sketched in Part I would need to be in order to be workable. Nonetheless, it is in several aspects unconventional, and I will now proceed to justify its various features.

A. *Constrained vs. Unconstrained*

It is natural to seek certainty in legal affairs,[390] and it may seem even more natural in the design of a prize system.[391] Scholars have often claimed that the patent system aspires to certainty,[392] with uncertainty decreasing confidence in inventors' abilities to recoup their

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[385] *See infra* Part III.E.

[386] *See infra* Part III.F.

[387] *See infra* Part III.G.

[388] *See infra* Part III.H.

[389] *See infra* Part III.I.

[390] Concern with certainty dates at least to Blackstone's treatment of the law of custom. Blackstone explained that for a custom to be enforceable despite contrary common law, the custom (among other requirements) had to be certain. *See* 1 WILLIAM BLACKSTONE, COMMENTARIES *78; *see also* David J. Bederman, *The Curious Resurrection of Custom: Beach Access and Judicial Takings*, 96 COLUM. L. REV. 1375, 1389 (1996) (noting that Blackstone's focus on certainty was influenced by earlier commentators).

[391] Achieving certainty indeed was a primary aim of Polanvyi's early patent prize proposal. Polanvyi criticized patent law, stating, "Hard cases occur of course under the operation of every law; but the patent law seems to form a veritable labyrinth of hazards for the interests governed by it." *Id.* at 70. Polanvyi continues that patent law "is essentially deficient." He explains:

> [I]t aims at a purpose which cannot be rationally achieved. It tries to parcel up a stream of creative thought into a series of distinct claims, each of which is to constitute the basis of a separately owned monopoly. But the growth of human knowledge cannot be divided up into such sharply circumscribed phases. Ideas usually develop gradually by shades of emphasis, and even when, from time to time, sparks of discovery flare up and suddenly reveal a new understanding, it usually appears on closer scrutiny that the new idea had been at least partly foreshadowed in previous speculations.

Id. at 70-71. I am skeptical of Polanvyi's claim that patent law is inherently more ambiguous than other areas of law. Nonetheless, Polanvyi is convincing in showing that a patent system, no less than a prize system, is in some ways an artificial construct without complete correspondence to intuitively appealing principles. This helps rebut the argument that patent law is inherently more natural than a prize system because in the former, inventors simply have a monopoly over their own discoveries. The task of determining patent scope may be as artificial as the task of determining monetary awards for individual discoveries.

[392] For a recent and articulate defense of the importance of certainty in patent law, see Erik S. Maurer, Note & Comment, *An Economic Justification for a Broad Interpretation of Patentable Subject Matter*, 95 NW. U. L. REV. 1057, 1095 (2001) ("[T]he risk of committing Type I error by subjectively narrowing the interpretation of patentable subject matter justifies the current,

investments.[393] The patent system offers a mostly decentralized way of encouraging inventors to pursue whatever projects are most likely to increase social wealth, and skepticism about benevolent government's ability to match the invisible hand is well placed. If a prize system is to match the patent system, it might seem that the government must provide some form of guarantee. A sufficiently rigid formula or algorithm can serve this purpose, assuring the inventor of profit for innovation. Without such a guarantee, the government might do a poor job in distributing prizes, awarding unmeritorious inventions over meritorious ones. Why invest billions of dollars on a project when some bureaucrat capriciously might decide that the invention is not sufficiently beneficial for society?

Given the intuitive appeal of this argument, it is hardly surprising that commentators on prize systems seem to be engaged in a search for the best approach. The argument, however, overstates both the certainty that the patent system provides[394] and the importance of certainty in a prize system.[395] Some of the uncertainty in the patent system itself is embedded in requirements that inevitably will require some judgment. Though concepts like nonobviousness receive detailed treatment in case law,[396] no matter how much explanation of the concepts is provided, application ultimately requires some human judgment.[397] As in law generally, the existence of litigation suggests that litigants sometimes have different predictions about the law, whether about patent validity or about patent scope.[398] There can be more or less uncertainty and more or less litigation, but the high reversal rate in patent cases suggests that there are at least some difficult cases.[399]

More importantly, even in the absence of any doubt as to the validity and scope of a patent, inventors face considerable uncertainty about the commercial success of the innovation. A product may face unexpected competition, regulatory hurdles, or consumer indifference. These

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broad, and objective interpretation adopted by the courts and the PTO."). As Thomas Landry points out, the creation of the Federal Circuit reflects a belief that certainty and predictability in patent law are even more important than in other areas. *See* Thomas K. Landry, *Certainty and Discretion in Patent Law: The On Sale Bar, The Doctrine of Equivalents, and Judicial Power in the Federal Circuit*, 67 S. CAL. L. REV. 1151, 1152 (1994); *see also* Harry F. Manbeck, Jr., *The Federal Circuit—First Ten Years of Patentability Decisions*, 14 GEO. MASON U. L. REV. 499, 503 (1992) (arguing that "[t]he added certainty provided by the Federal Circuit is beneficial to both patent applicants and the PTO itself, since it allows for reliable decisions by all concerned in the patent application process").

[393] Interestingly, the goal of certainty is often equated with the economic goals of the patent system. For example, David Cohen notes that "economic concerns were of little importance in the formation of German patent law," explaining that in Germany "legal certainty is only one factor to be balanced against the needs of justice for the inventor." David L. Cohen, Comment, *Article 69 and European Patent Integration*, 92 NW. U. L. REV. 1082, 1126 (1998).

[394] For articles arguing that the patent system is not as certain as might appear, see Landry, *supra* note 392, at 1159-1203, which provides case studies of patent doctrines, and Craig Allen Nard, *Certainty, Fence Building, and the Useful Arts*, 74 IND. L.J. 759, 763-64 (1999), which argues for greater deference to the PTO as a way of creating greater certainty.

[395] For a recent article questioning the importance of certainty in patent law, see Ayres & Klemperer, *supra* note 198. Ayres and Klemperer argue that the level of innovation can be kept constant if the government compensates for less certainty in patents by offering longer patents. *See id.* at 989-93.

[396] *See, e.g.*, Para-Ordnance Mfg., Inc. v. SGS Importers Int'l, Inc., 73 F.3d 1085, 1093-94 (Fed. Cir. 1995) (detailing secondary considerations to be considered in considering whether an invention was obvious).

[397] The Federal Circuit has itself recognized the futility of creating a wholly objective test, holding that objective evidence of nonobviousness is not necessarily required for patentability. *See* Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc., 807 F.2d 955, 960 (Fed. Cir. 1986).

[398] Economic analyses of settlement predict that cases will settle unless parties are mutually optimistic about outcomes. *See, e.g.*, Lisa Bernstein, *Understanding the Limits of Court-Connected ADR: A Critique of Federal Court-Annexed Arbitration Programs*, 141 U. PA. L. REV. 2169, 2225-26 (1993); George Loewenstein et al., *Self-Serving Assessments of Fairness and Pretrial Bargaining*, 22 J. LEGAL STUD. 135, 135 (1993). *See generally* John P. Gould, *The Economics of Legal Conflicts*, 2 J. LEGAL STUD. 279, 281-86 (1973) (providing an economic model of litigation and settlement).

[399] For a comprehensive study demonstrating that district courts err in a large number of patent cases, see Kimberly A. Moore, *Are District Judges Equipped to Resolve Patent Cases?*, 15 HARV. J.L. & TECH. 1 (2001).

uncertainties may damper innovation somewhat, but probably not too much. The magic of capital markets allows companies to make speculative bets. Because the public holds a diverse array of securities, the risk of the failure of any one product produced by one company is insignificant, for that failure will be balanced by other successes.[400] A product that has a 50% chance of producing a billion dollars profit and a 50% chance of being worthless will not be worth quite five hundred million dollars, because even companies and shareholders are somewhat risk averse.[401] For holders of a diversified portfolio, however, the costs of risk are quite small. And so, companies invest in research and development despite uncertainty about ultimate commercialization prospects, even placing aside uncertainty about the results of research and development.

Even gross uncertainty in a prize system is thus unlikely to have a substantial effect on innovation. Lichtman recognizes, "It does not matter if one innovator is over-compensated and another is under-compensated, as long as the average payment is approximately correct."[402] The possibility that what would have been a company's billion dollar drug may end up producing zero or two billion will have little effect on the company's incentive to produce the drug. A decision by the prize agency might come more quickly and suddenly than a decision in the marketplace, thus producing potentially large stock volatility,[403] but the prospect that a drug might turn out to be a failure sooner rather than later is not troublesome. Reduced uncertainty may have some benefits; we would not, after all, be indifferent to companies' gambling millions on roulette, even with fair odds. These benefits, though, are modest, an insufficient basis to make a strong policy case for constraint over a discretion.

The greater concern with giving an agency wide flexibility in distributing prizes is that the government might make errors. For example, the agency might ignore market data about the importance of patents yielded into the public domain, instead seeking to reward companies that have helped the agency pursue its own agenda. Perhaps the government would seek to reward the developer of a technology that promises to reduce air pollution in automobiles even if that technology has deficiencies that make it unattractive commercially.[404] An agency might be inclined to give large awards to a company producing an innovation that has received favorable attention in the popular press, even if the innovation suffers from obvious deficiencies. Government has a poor record at picking "winners" in industrial policy,[405] and if there is reason to suspect that an agency systematically will pursue an agenda instead of rewarding innovation, that suspicion will distort investment.

I will not develop a full answer to this concern until the next section. But a preliminary answer is that errors in prize decisions usually do not matter. The decisions that matter from a

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[400] *See, e.g.*, Paul G. Haskell, *The Prudent Person Rule for Trustee Investment and Modern Portfolio Theory*, 69 N.C. L. REV. 87, 108 (1990) ("[U]nder portfolio theory, the well-diversified portfolio may have a low level of risk despite the presence of individually volatile components."). *See generally* Harry M. Markowitz, *Portfolio Selection*, 7 J. FIN. 77 (1952) (providing a seminal approach to portfolio theory).

[401] Companies may be more risk averse than their shareholders because of agency problems. *See, e.g.*, SCHERER & ROSS, *supra* note 55, at 46 (discussing the phenomenon of "empire building").

[402] Lichtman, *supra* note 21, at 132. Lichtman adds that "[e]rror in and of itself raises distributional, but not efficiency, concerns." *Id.*

[403] On the significance and sources of stock market volatility, see Clifford W. Smith, Jr., *Market Volatility: Causes and Consequences*, 74 CORNELL L. REV. 953 (1989).

[404] I use this as an example because of criticisms that federal attempts to reduce pollution have focused excessively on command-and-control approaches despite their lack of success in efficiently reducing pollution. *See, e.g.*, Eric W. Orts, *Reflexive Environmental Law*, 89 NW. U. L. REV. 1227, 1235-41 (1995).

[405] *See supra* note 60.

social perspective are the investors' decisions whether to invest and whether to opt for a prize instead of full exploitation of a patent. Governmental errors in awarding prizes will affect these decisions only if the errors are predictable in advance. This is counterintuitive, because in most contexts, the prospect that the government might make bad decisions counts as a mark against these programs. Usually the government spends money to accomplish something in the future, but when the government ultimately distributes money in a prize system, it rewards activity in the past. Thus, while flawed governmental decisionmaking in awarding prizes might increase risk slightly, it is otherwise of concern only if the government's biases are predictable in advance.

The possibility that inventors would be able to predict some bias in a prize system is less worrisome than the certainty that a constrained system would have biases built-in. We have seen that each of the various patent proposals ignores data that ought to be relevant to decisions about prizes. The Guell and Fischbaum proposal ignores sales data after the initial market test,[406] while the Shavell-van Ypersele approach assumes that a patent will have no value as a foundation for subsequent innovations.[407] The Kremer mechanism will lead to overcompensation for complementary patents not identified by the government agency,[408] and the Lichtman approach risks providing coupons without limiting deadweight loss.[409] In addition, none of the proposals would lead the government agency to consider any social loss that release of a patent might cause through rent dissipation in development of follow-on innovations.[410]

Moreover, because each of the proposals necessarily would entail some subjective decisionmaking, there is no guarantee that even a constrained system will prevent an agency from being biased. An agency might, for example, estimate demand curves in such a way as to advance the projects that it prefers,[411] or award large coupons as a means of rewarding a company without consideration of whether the coupons are provided to the correct individuals to lower deadweight loss. Thus, constrained proposals inevitably prevent the government from making appropriate adjustments, while failing to ensure that bias will not contaminate administrative outcomes. Of course, an agency might use its discretion in a constrained system to take into account some legitimate factors not explicitly addressed in a constrained system, such as rent dissipation. To the extent that this makes a constrained system more like an unconstrained one, such discretion may make the proposals closer. Nonetheless, incorporation of legitimate factors in a prize system not designed to accommodate them would be messy at best, while general bias for or against an applicant would be easy to achieve simply by estimating individual variables in a biased way.

Perhaps the greatest advantage of a flexible system over a constrained one is that it would allow different approaches to reducing deadweight loss to be used in different circumstances. We have seen that a variety of factors affect which approach to reducing deadweight loss is best. Where government information is sufficiently good, a coupon scheme might be preferable to a patent buyout.[412] Where a product market is unlikely to be competitive regardless of whether a patent is released into the public domain, the best solution may be a reduction in price by the

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[406] *See supra* text accompanying notes 74-76.

[407] *See supra* text accompanying note 112.

[408] *See supra* text accompanying notes 165-166.

[409] *See supra* text accompanying notes 188-189.

[410] *See supra* Part II.B.

[411] *See supra* text accompanying notes 124-125.

[412] *See supra* text accompanying note 191.

patent holder.[413] Even if a patent buyout is optimal, different methods of valuing the patent may be appropriate. When there is a one-to-one relationship between a patent and a product, the Shavell-van Ypersele formula may prove useful.[414] On the other hand, when a substantial portion of the value of a patent is as a foundation for follow-up innovations, the Kremer market scheme may be more accurate, especially if the patent is not complementary with any others.[415] Similarly, we have seen that sometimes it may be optimal to obtain a patent and then release it to the public domain, while at other times it may be preferable to provide prizes for companies skipping the patent process altogether.[416] In theory, it might be possible to create a complex formula to determine the optimal approach for each patent, but the number of considerations is so staggering that it seems unlikely that an effective formula could be developed in advance.

A system in which agency officials are unconstrained helps accomplish this by allowing patent holders to choose whatever means of reducing the effects of monopoly that they wish and then permitting agency officials to tailor awards based on the benefit of the scheme chosen.[417] For example, if a company decided to reduce the monopoly effects of its patent by giving coupons, the agency nonetheless might conclude that no decrease in deadweight loss resulted if the coupons simply allowed the monopolist to charge more than it otherwise would have. As long as potential prize applicants anticipate that the agency will base prizes on reduction in deadweight loss accurately on average, applicants will have an incentive to select the method that will achieve the greatest benefit at lowest cost. The same logic goes for any other factor that the agency ought to take into account. The agency, for example, might reduce prizes when release of a patent into the public domain leads to inefficient rent dissipation. Although it might be difficult to calculate the extent of this inefficiency,[418] as long as the agency's adjustments are on average correct, patent holders will have optimal incentives in choosing an approach, if any, to eliminating or reducing deadweight loss.

Similarly, patent holders choosing to release their patents into the public domain would have incentives to accede to procedures for valuing the patents when doing so would be efficient. A holder of a patent that would be relatively difficult to value by examining sales could accede to Kremer's scheme. Even without government involvement, a private group might perform a similar function, auctioning off patents using the same randomization procedure that Kremer recommended. Presumably, there would be some cost in doing so, but a patent holder might do so as a way of certifying results to the government agency. Similarly, a patent holder might hire an independent accounting firm to estimate the value of a patent being placed in the public domain. These methods might increase the confidence that an agency will have in its ultimate

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[413] *See supra* notes 192-195 and accompanying text.

[414] *See supra* notes 115-119 and accompanying text.

[415] Bidders would have incentives to calculate the value of the patent, regardless of the extent to which this value stems from direct sales of a product or licensing or exploitation of the patent for follow-up inventions. *See supra* note 129 and accompanying text.

[416] *See supra* text accompanying note 360.

[417] Such a system also might discourage patent holders from taking any actions to reduce deadweight costs if those actions would increase other costs. For example, one commentator has developed a model suggesting broad patent protection for antibiotics may be beneficial, because excessive use of antibiotics may lead to resistance, thus making them less valuable in the future. *See* RAMANAN LAXMINARAYAN & GARDNER M. BROWN, ECONOMICS OF ANTIBIOTICS RESISTANCE: A THEORY OF OPTIMAL USE (Resources for the Future Discussion Paper No. 00-36, 2000).

[418] Such calculations would not be impossible. *Cf.* Grady & Alexander, *supra* note 213, at 313 (suggesting that criticisms that the patent system simply could not take into account variables like the difficulty of developing an invention are overstated). One might consider different companies' investments in follow-up inventions and the profits from those inventions. If the profits tend to amount only to a fair rate of return on capital, rent dissipation has probably occurred. Such a conclusion would be bolstered by evidence of redundant research by competing companies.

prize assessment and thus reduce the amount by which the agency would decrease prizes as a way of accounting for the adverse selection problem.[419] Of course, using these procedures entails costs, but these costs may be worth undertaking in some cases if not in others.[420]

That a system in which agency officials are given flexibility is superior to one adopting a single approach does not necessarily mean that the agency should be given no guidance whatsoever. The statute creating the agency usefully might catalogue some of the considerations that should be taken into account in calculating prizes. By explicitly indicating that an agency should take into account a particular factor, Congress could avoid the danger that companies might believe that the agency will ignore a factor even though that factor seems important to economic efficiency. That danger also could be lessened by requiring the agency to document its calculations and to explain why it rejected any arguments for considering a factor suggested by the applicant or an adversary. The virtue of requiring such explanations is similar to that of requiring appellate judges to produce written opinions,[421] providing the decisionmaker with a reputational incentive to demonstrate consideration of all relevant factors.

Of course, I may not have anticipated all potentially relevant factors, and Congress might do no better. Ultimately, though, this is an argument for flexibility, not an argument against it. Indeed, one virtue of allowing flexibility is that it might stimulate further research into when it is efficient to grant prizes and how large prizes should be. If an agency simply applies a formula, academic commentators might urge reforms and changes, but private parties would have little incentive to do anything other than plug projections into the government-mandated equation. With a flexible agency, prize applicants will be incentivized to advertise any way in which the efforts they make improve social welfare. Similarly, if an adversary system is used to resolve prize claims,[422] the adverse parties would have an incentive to point out any inefficiencies that should offset prize awards. These analyses might be useful beyond individual cases in promoting understanding of the value of prizes.

Some issues about valuing prizes might remain controversial even after considerable debate. Consider, for example, the issue of whether a payment for a patent buyout should approximate the private benefit that the monopolist would have received from the patent or the full social benefit of the invention. On one hand, paying a monopolist just the private benefit would provide cost savings, as prizes would be the minimum necessary to induce release of patents in the public domain. On the other hand, paying the social benefit may provide additional

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[419] *See* Shavell & van Ypersele, *supra* note 18, at 539-40 (optimizing the amount by which prizes should be lower than the anticipated social surplus); *supra* text accompanying notes 103-104, 121.

[420] Sometimes, it might seem, a patent holder would have excessive incentives to provide verification of patent value, because the benefit in terms of a greater prize accrues solely to the patent holder. In theory, though, the agency might punish excessive spending on administrative costs by reducing the prize. *See infra* notes 563-564 (discussing the possibility of penalizing excessive spending in pursuit of prizes). Once again, as long as the agency makes the appropriate reduction on average, companies will have appropriate ex ante incentives.

[421] "The publication of written opinions provides judges with an opportunity to criticize colleagues, and allows members of the bar and academia to criticize sitting judges when the authors of published opinions fail to abide by their own stated principles in fugure cases." Maxwell L. Stearns, *Standing Back from the Forest: Justiciability and Social Choice*, 83 CAL. L. REV. 1309, 1349 (1995). Commentators interested in improving the quality of decisionmaking have called for requiring written opinions in various contexts. *See* Martha J. Dragich, *Will the Federal Courts of Appeals Perish if They Publish? Or Does the Declining Use of Opinions to Explain and Justify Judicial Decisions Pose a Greater Threat?*, 44 AM. U. L. REV. 757 (1995) (arguing for written, published opinions in the federal appellate courts); Christopher B. Kaczmarek, *Public Law Deserves Public Justice: Why Public Law Arbitrators Should Be Required to Issue Written, Publishable Opinions*, 4 EMPLOYEE RTS. & EMP. POL'Y J. 285 (2000) (arguing that arbitrators should issue written opinions). For articles assessing the importance of written opinions more broadly, see Frederick Schauer, *Opinions as Rules*, 62 U. CHI. L. REV. 1455 (1995); and James Boyd White, *What's an Opinion for?*, 62 U. CHI. L. REV. 1363 (1995).

[422] *See infra* Part III.H.

incentive to innovate.[423] The economic question is whether the deadweight loss associated with additional taxation outweighs the marginal benefit of higher prizes in stimulating research.[424] A constrained approach based on a formula or algorithm would demand an ex ante resolution of this question, but a flexible approach need not. If different people would disagree about the proper answer, inventors would anticipate that rewards would reflect a weighted average. Hedging based on disagreement and uncertainty may be a more efficient approach than resolution through a majority vote or other means,[425] especially because the weighted average could change over time as the case for one answer or the other becomes clearer.[426]

To some, the notion of simply giving a government agency money to spend, while not unheard of,[427] is utopian and foolish. We know, the argument goes, that the government simply will not do a good job of spending it, and there is a good reason that we do not generally give agencies large amounts of money to dispose of based on the whims of individual decisionmakers. Retrospective prizes, though, are different from other government programs, because what matters from a social perspective is not individual prize decisions themselves, but predictions about those decisions. We cannot be satisfied if some social security recipients receive twice what they should and some deserving receive nothing.[428] But with prizes, if the average governmental decisionmaker will be expected to get it right, that is good enough.[429] If someone contemplating releasing a patent into the public domain anticipates that he might receive twice his estimate of the social benefit half the time and nothing at all half the time, he still might release the patent.

Prize systems may not be unique among legal institutions in being able to achieve an aim well even if decisions are noisy. Tort scholars have pointed out that the tort system could provide the appropriate amount of deterrence even if individual decisions are variable.[430] For example,

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[423] *See supra* Shavell & van Ypersele, *supra* note 18, at 532; notes 87-88 and accompanying text.

[424] Advocates of the various prize proposals offer different answers. Kremer, for example, explicitly advocates a "markup" so that inventors can receive the social value of their inventions. *See* Kremer, *supra* note 20, at 1141; *see also supra* notes 132-133 and accompanying text. Lichtman, by contrast, urges the approach that would result in the smallest payment possible to eliminate deadweight loss. *See* Lichtman, *supra* note 21, at 124, 136; *see also supra* note 169 and accompanying text.

[425] For an extended argument in favor of compromise verdicts, in which jurors resolve uncertainty by awarding partial damages, see Michael Abramowicz, *A Compromise Approach to Compromise Verdicts*, 89 CAL. L. REV. 231 (2001).

[426] I lean toward compensation based on the social benefit of an innovation, especially if a fund is used to encourage innovation. *See infra* text accompanying notes 480–483 (explaining that using social benefit as a basis for distributing a fund produces a socially beneficial selection effect).

[427] Agencies are often given considerable freedom whenever they are given lump sum appropriations. *See* Kate Stith, *Rewriting the Fiscal Constitution: The Case of Gramm-Rudman-Hollings*, 76 CAL. L. REV. 593, 612-13 (1988) (documenting the increasing prevalence of lump sum appropriations over the twentieth century).

[428] Some level of incoherence and inconsistency in the operation of such a program, however, may be inevitable. *See* JERRY L. MASHAW, BUREAUCRATIC JUSTICE: MANAGING SOCIAL SECURITY DISABILITY CLAIMS 49-78 (1983).

[429] If looking only at the universe of settled civil cases, achieving justice on average may be good enough too, since settlements reflect expected values of verdicts. This logic suggests that settled cases may achieve a higher level of justice than litigated cases, in which there is a possibility that the court might err significantly. *See, e.g.*, Joshua P. Davis, *Toward a Jurisprudence of Trial and Settlement: Allocating Attorney's Fees by Amending Federal Rule of Civil Procedure 68*, 48 ALA. L. REV. 65, 122 (1996) ("Settlement for the expected outcome may not yield perfect justice, but neither will it yield perfect injustice.").

[430] Louis Kaplow, for example, explains, "Accuracy in the assessment of damages is relevant primarily because of how it affects the precision with which legal rules control behavior." Louis Kaplow, *The Value of Accuracy in Adjudication: An Economic Analysis*, 23 J. LEGAL STUD. 307, 399 (1994). If there is simply a fifty percent chance of receiving zero damages and a one hundred percent chance of receiving double damages, the expected damage, at least for a risk-neutral party, is unaffected. Thus, inaccuracy matters only to the extent it affects ex ante expectations and imposes risk costs on risk-averse parties. As Kaplow and Steven Shavell explain:

> [A]ccuracy in the assessment of harm cannot influence the behavior of injurers—and is therefore of no social value—to the degree that they lack knowledge of the level of harm they might cause when they make their decisions. Thus, if, when choosing his precautions, an injurer knows only that the average level of harm that would be caused in an

economists have argued that if punitive damages when tortfeasors are caught compensate for the chance that tortfeasors sometimes will not be caught, deterrence will be optimized.[431] Of course, in tort law, many scholars argue that economic efficiency should not be the only goal,[432] and consideration of factors other than optimal deterrence therefore might lead to systematic overdeterrence or underdeterrence. Disagreement over fundamental premises should be less of a danger in patent law.[433] In addition, while jury-based decisionmaking may make tort law difficult to rationalize,[434] prize determinations presumably would be made by government officials rather than juries.

B. *Delay vs. Immediate Payouts*

The government might award prizes relatively quickly after the actions meriting the prizes. Once an inventor releases the patent into the public domain, the former patent holder

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accident is $500,000, there is no point in the court's measuring harm accurately. As long as the injurer's expected liability is $500,000, his behavior will be the same as if harm were measured precisely.

Louis Kaplow & Steven Shavell, *Accuracy in the Assessment of Damages*, 39 J.L. & ECON. 191, 192 (1996). *But see* Randall R. Bovbjerg et al., *Valuing Life and Limb in Tort: Scheduling "Pain and Suffering,"* 83 NW. U. L. REV. 908, 925 (1989) ("[H]ighly variable, unpredictable valuations undercut the deterrence function of tort law. Where liability costs are relatively predictable, they can be avoided (where it is efficient to do so) or 'built in' to the costs of goods and services."). The problem with Professor Bovbjerg et al.'s analysis is that potential tortfeasors will avoid uncertain liability at least as much as certain liability, if uncertainty can equally result in greater or lower damages than would be efficient.

[431] *See, e.g.*, A. Mitchell Polinsky & Steven Shavell, *Punitive Damages: An Economic Analysis*, 111 HARV. L. REV. 869, 887-88 (1998).

[432] Jules Coleman argues that economic analysis does not even produce the best positive analysis of tort practice. *See, e.g.*, COLEMAN, *supra* note 277 (providing a comprehensive guide to his theory of corrective justice); Jules L. Coleman, *The Practice of Corrective Justice*, 37 ARIZ. L. REV. 15 (1995) (considering some meta-issues in articulating a theory of corrective justice). Similarly, some scholars argue that even if economic efficiency is the only goal, optimal deterrence may trade off with other efficiency concerns. *See, e.g.*, Abramowicz, *supra* note 425, at 271 (noting a tension between optimizing deterrence of harm-causing acts and optimizing incentives for firms to enter into industries membership in which might lead to erroneous findings of liability).

[433] The vast majority of patent law scholarship is utilitarian and economic, at least in spirit if not in form. For explicitly noneconomic analyses of intellectual property law, see Wendy J. Gordon, *A Property Right in Self-Expression: Equality and Individualism in the Natural Law of Intellectual Property*, 102 YALE L.J. 1533 (1993), which defends a natural rights approach for patent, copyright, and trademark law; and Steven Cherensky, Comment, *A Penny for Their Thoughts: Employee-Inventors, Preinvention Assignment Agreements, Property, and Personhood*, 81 CAL. L. REV. 597 (1993), which argues that an employee's personhood should be a primary consideration in law concerning preinventions assignments of property rights. A. Samuel Oddi, meanwhile, has argued that natural rights ideas help explain the acceptance of a universal standard of patent law even by countries that might not benefit from such a standard. *See* Oddi, *supra* note 58, at 417-40. Part of the reason for the dominance of utilitarian arguments is that scholars have generally believed that the Framers defended intellectual property using such arguments, but a recent intellectual history suggests that natural rights arguments were important as well. *See* Adam Mossoff, Rethinking the Development of Patents: An Intellectual History, 1550-1800 (2000) (unpublished manuscript, on file with author).

Even someone accepting a natural rights rather than an economic approach to patent law would not necessarily object to a prize system on the ground that such a system would deprive inventors of their natural rights. Professor Gordon's natural rights analysis, for example, emphasizes that the claims of a creator of intellectual property do not necessarily trump those of the public to use intellectual property. *See* Gordon, *supra*, at 1544-69. Specifically, she argues "that creators should have property in their original works, only provided that such grant of property does no harm to other persons' equal abilities to create or to draw upon the preexisting cultural matrix and scientific heritage." *Id.* at 1563-64. Professor Gordon argues that this requirement might be satisfied by an intellectual property regime in which the right was protected only by a liability rule. *Id.* at 1572-76. If such a regime would not infringe on the natural rights of a creator of intellectual property, then a like regime in which "damages" are paid by society as a whole rather than by individual users of the property would not infringe the creator's rights, at least if we assume the legitimacy of the taxation needed to pay the prizes. Indeed, a prize system may be more appealing under a natural rights approach than the existing patent system, because such a system would reduce interference with the public's access to the common by increasing works placed in the public domain.

[434] One reason for this is that even where juries agree on moral desert, they exhibit high variability in translating such judgments into dollar figures. *See* Cass R. Sunstein et al., *Assessing Punitive Damages (With Notes on Cognition and Valuation in Law)*, 107 YALE L.J. 2071 (1998).

could file an application, and the wheels of the government would turn as fast as they could turn. Intentionally delaying the ultimate payout might seem absurd, akin to increasing the wait that political asylum applicants must endure from the INS.[435] On this view, while allowing some modest backlog of applications might be an efficient way of reducing personnel costs,[436] there is no value in delay for delay's sake.[437] This section will offer the counterintuition, arguing that in fact delay might have significant benefits. There are three reasons, explored in each of the following subsections, that this is so. First, allowing time to pass will allow for the accumulation of data that will improve the government's ability to value a patent. Second, delay will prevent inventors from devoting resources based on their perceptions of individual decisionmakers' preferences. Third, delay will reduce decisionmakers' incentive to use the prize making system as a vehicle for encouraging investments in particular technologies. After explaining these benefits, I will counter some arguments that delay might impose significant costs.

1. *Improving Government Information*

The most obvious function served by delay is that it helps to overcome the informational asymmetry between the government and the patent holder.[438] As Shavell and van Ypersele show, if the government has worse information about the demand curve than the patent holder, data from sales subsequent to the patent's being placed in the public domain may help.[439] Indeed, it is conceivable that the government ex post may have as good or even better information about the value of a patent than the patent holder has ex ante.[440] Thus, sales data can mitigate the adverse selection problem. A patent holder who knows that the patented product will turn out to be unpopular will not opt into the prize system hoping to fool the government, because low sales in a competitive market ultimately will reveal to the government that the product would have been unsuccessful.

The government, of course, might benefit from considering a variety of information, in addition to sales, that would have been difficult to discern initially. The government might even use sales data of a competing product as a way of better estimating what the demand would have been for a product released into the public domain. As another example, if the agency is to consider whether placing the patent into the public domain led to rent dissipation,[441] this task will be considerably easier later rather than earlier. When a patent is first issued, one can speculate about whether it will produce follow-up inventions and whether companies will invest in such inventions, but time will allow the government to make such assessments much more easily. If the goal is to determine how much research into follow-up inventions results and whether this research is socially excessive, which depends in part on the social benefit of the follow-up inventions, decisions made later should be much more accurate than decisions made earlier.

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[435] *Cf.* Joe Davidson, *Clinton's Move to Speed Handling of Requests for Political Asylum Raises Critics' Skepticism*, WALL ST. J., Mar. 30, 1994, at A18 (discussing delays in processing political asylum applications).

[436] Optimizing such problems is the task of those who study queuing theory. *See, e.g.*, http://www2.uwindsor.ca/~hlynka/queue.html (last visited Sept. 14, 2001) (providing links to various queuing theory Web sites).

[437] Lawyers sometimes delay for delay's sake, but the legal system is typically at least rhetorically hostile to such tactics. *See, e.g.*, FED. R. CIV. P. 11(b)(1) (requiring attorneys to certify that motions are not "being presented . . . to cause unnecessary delay").

[438] *See supra* notes 320-321 and accompanying text.

[439] *See* Shavell & van Ypersele, *supra* note 18, at 540-41; *supra* notes 106-109 and accompanying text.

[440] *See* Shavell & van Ypersele, *supra* note 18, at 542; *supra* text accompanying note 110.

[441] *See supra* Part II.B.

Delay might be useful not only when an inventor releases a patent to the public domain, but also when an inventor takes some other action to reduce the monopoly effect of a patent. For example, if an inventor promises to charge less than the monopoly price for an invention, time is needed to ensure that the inventor keeps the promise. Even if there would be some legal means of binding an inventor to keeping the low price, there might be reasons to encourage the inventor to have some flexibility in pricing, for example to reflect changes in manufacturing costs. In addition, delay might allow for development of information that would make it clearer whether a price reduction in fact was meaningful. It might be less meaningful if an inventor subsequently released an improved version of the product at a higher price or if the arrival of competing substitute products makes it apparent that high prices could not have been maintained long in any event.

Finally, delay might increase private incentives to engage theoretical considerations about the best means of reducing deadweight loss. We have seen that giving the administrative agency flexibility will encourage private parties to furnish arguments for and against various approaches.[442] When the government agency will not make decisions on prizes for a long time, the level of understanding about the costs and benefits of different approaches will be expected to grow by the time that decisions are made. An inventor anticipating this might be hesitant simply to rely on current conventional wisdom about the relative merits of various approaches. Thus, patent holders may devote some resources to considering carefully any existing literature on patent rewards as well as seeking out flaws in the literature that time ultimately would reveal. Because a patent holder will spend a marginal dollar on such research only if that marginal dollar is likely to increase the expected value of a prize by a dollar, and prizes depend in turn on social welfare,[443] such expenditures are worthwhile from a social as well as from a private point of view.

How much delay is needed to improve the government's information is difficult to determine conclusively. Presumably, more delay will always allow for an increase in the amount of information potentially available for analysis by the prize agency. Indeed, it is possible that information about the social benefit provided by a patent holder taking some action to release deadweight loss could be developed even after the patent term would have expired. Such a lengthy term, however, is probably not necessary. My own sense is that a delay of a decade generally would be sufficient for the patent holder or other companies to introduce products based on the patent, for long-term consumer demand for the product to become relatively clear, and to assess the degree of rent dissipation through competition for improvements. A decade, of course, will not allow for perfect estimates, as for example a substitute product might hit the market unexpectedly twelve years after the initial issuance of the patent and substantially reduce the import of the original invention. Information that emerges after a decade, however, ordinarily will not have been in the possession of the patent holder at the beginning of the decade. Consideration of such information by the government thus would not help combat the adverse selection problem. Delays of ten years, by contrast, might not hurt even if they do not help, depending on the costs of delay.[444]

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[442] *See supra* text accompanying note 422.

[443] It might be argued that prizes could depend on potential monopoly profit rather than on social welfare. *See supra* text accompanying notes 423-424. Even if prizes are based entirely on monopoly profits, however, producer's surplus is a social benefit, and so unless this benefit comes at the expense of consumers, the conclusion in the text holds.

[444] *See infra* Part III.B.4.

2. *Cloaking Decisionmakers' Identities*

In arguing that prize systems should provide wide discretion to individual decisionmakers,[445] I ignored one significant objection to a flexible approach. While it might be possible in principle to imagine that hypothetical decisionmakers will make good decisions on average (or, more precisely, decisions that average out to good decisions), this might become more difficult once actual decisionmakers exist. Suppose the head of the agency announces that she is particularly interested in rewarding pharmaceutical companies that help victims of a particular disease that allegedly has received insufficient attention. Or, suppose that she announces that she believes that rent dissipation should be irrelevant to prize determinations. Or, worse yet, that prizes should not be calculated on the basis of heartless economic models. Such announcements might affect which inventors decide to submit prize applications and, if her term is sufficiently long, this may in turn affect inventors' decisions about what investments to make. Even without formal announcements, potential applicants could analyze prize decisions to identify preferences. If the prize agency had apparent biases, these biases would distort investment decisionmaking.

"Why care if different decisionmakers have different priorities?" some might ask. The answer is that if we believe that in majoritarian decisionmaking, either as a result of democratic theory or because we believe that the majority is more likely to be correct than a minority, then we should prefer an average decisionmaker to an extreme one. The logic of the Condorcet Jury Theorem, which holds that larger decisionmaking bodies are more likely to produce correct answers than smaller ones, helps explain this conclusion.[446] If the median well-informed decisionmaker would recommend promising prizes of a certain amount for a particular type of invention, then promising prizes of a much larger or smaller amount is to adopt an extreme viewpoint over a moderate one. Sometimes, someone with an extreme opinion may be correct, but, especially when a decision is made over a continuum,[447] legal institutions generally select moderate opinions rather than randomly select extreme ones.[448] It may be the norm in politics for a shift in presidential administrations to lead to a shift in some policies (though certainly not all, because the legislative power lies in Congress), but this practical inevitability does not establish an ideal to be emulated.

The concern, one might argue, can easily be overstated. The head of the prize agency might not control every decision. The more decisionmakers that there are, the less likely it will be that the agency will have systematic biases. This is not a complete answer, however, especially if decisionmakers are all appointed by the same person, either the President or the agency head.[449] There is, in any event, an effective way to neutralize the biases of individual

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[445] *See supra* Part III.A.

[446] "The Condorcet Jury Theorem provides a justification for majoritarian decisionmaking and a potential justification for mass democracy if its citizenry are of at least minimal competence." Bernard Grofman, *Public Choice, Civil Republicanism, and American Politics: Perspectives of a "Reasonable Choice" Modeler*, 71 TEX. L. REV. 1541, 1550 (1993). For a large number of sources on the Jury Theorem, see *id.* at 1550 n.27. A notable recent work on the Jury Theorem is Saul Levmore, *Conjunction and Aggregation*, 99 MICH. L. REV. 723, 735-39 (2001).

[447] In technical jargon, anomalies are less likely to occur when decisionmakers have "single-peaked preferences." *See generally* MAXWELL L. STEARNS, CONSTITUTIONAL PROCESS: A SOCIAL CHOICE ANALYSIS OF SUPREME COURT DECISION MAKING 72 (2000) (explaining the significance of unipeaked preferences).

[448] For example, the Supreme Court does not randomly select a Justice's opinion as the majority opinion. *See* Michael Abramowicz, *En Banc Revisited*, 100 COLUM L. REV. 1600, 1631 (2000) (noting that "[t]his would be a functional legal system, but it would place less value than the existing system on ensuring that a particular legal [decision] is majoritarian").

[449] Both methods of appointment would be constitutionally permissible. *See* U.S. CONST. art. II, § 2, cl. 2 ("[The President] shall nominate, and by and with the Advice and Consent of the Senate, shall appoint Ambassadors, other public Ministers and Consuls,

decisionmakers: delay. If decisions on prizes are made so far after the applications are submitted that inventors will not be able to guess the decisionmakers' identities or political affiliations, then inventors will not factor existing biases into their investment plans, and potential applicants similarly will not weigh individual administrators' pet preferences in considering whether to file an application. Delaying payment ten years, and thus at least two presidential elections, seems sufficient to induce potential applicants to assess how average decisionmakers will reward individual inventions, rather than how particular decisionmakers will do so.

3. *Reducing Individual Biases for Particular Technologies*

Delay is an answer to the concern about individual biases affecting prize allocation not only because it will be difficult to guess who the individuals are likely to be, but also because the individuals themselves are less likely to be biased. Someone who is awarding a prize for an effort made the previous year might hope to influence work done the next. The award of a large prize, even for activities past, may influence predictions about future rewards and thus the direction of research. A decade, though, is practically a generation in the scientific world, and someone awarding prizes will thus be less likely to believe that the evaluation of such old decisions will have much effect on new ones. This would be true even if prizes for innovations current at the time the first set of prizes are given are anticipated to be awarded shortly thereafter. It will especially be true, however, when the decisionmaker recognizes that her decisions will have little effect on predictions about prizes to be made yet another decade hence.

It might seem that in the absence of an ability to affect the future, decisionmakers would have little incentive to make accurate decisions. After all, political scientists claim that judges and other government officials act in large part to advance their conceptions of the common good,[450] so if that possibility is gone, decisionmakers might not care about the quality of their decisions at all. In the absence of any real effect on the world, decisions might be made entirely capriciously. If there were any rhyme or reason at all, the argument goes, decisions might depend on personal affection or spite for those seeking prizes. Or, agency officials might seek to use the prize system as a way of achieving a distributional benefit, not by rewarding those who have invented products that helped the poor, for that already is done, but by giving prizes to relatively impoverished claimants, irrespective of achievement.

Quite the reverse, however, is likely to be true, for three reasons. First, the quality of decisions still may matter in fostering confidence among investors anticipating future prizes, and so decisionmakers concerned about the public good will have an incentive to produce decisions that will lead investors to believe that prizes will be appropriate on average. That the decisionmakers may now be able to improve the public good only in this narrow way is a benefit rather than a cost. By analogy, consider judges in common law courts. Judges may care both about establishing a stable and predictable system of law and about moving precedents in their ideologically preferred direction.[451] If suddenly a judicial decision had no ideological effect, then to the extent that judges care about the world, they would care only about establishing a stable

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Judges of the supreme Court, and all other Officers of the United States, whose Appointments are not herein otherwise provided for, and which shall be established by Law . . . .").

[450] The attitudinal model suggests that judges vote on the basis of their "attitudes" about particular issues. *See generally* JEFFREY A. SEGAL & HAROLD J. SPAETH, THE SUPREME COURT AND THE ATTITUDINAL MODEL (1993) (providing the seminal account of the attitudinal model).

[451] They may care about a variety of other things too. *See, e.g.*, RICHARD A. POSNER, OVERCOMING LAW 119-23 (1995) (considering a variety of variables that judges may seek to maximize).

and predictable system. Similarly, in a patent prize system, if a decisionmaker believes that her decisions cannot steer future research in her preferred direction, because those making current investment decisions will realize that there will be a different decisionmaker in due time, then she will be concerned only with establishing the high quality of the prize system.

Second, if affecting the world and improving one's reputation are two sometimes competing goals in the decisionmaker's welfare function, personal reputational interests will become relatively more important. If decisionmakers cannot turn their idiosyncratic preferences into research anyway, then they will place greater weight on reputation. Just as being results-oriented is generally viewed as an epithet among judges,[452] so too might shoddy analysis based on personal preferences harm the reputation of prize givers. While the results-oriented judge may be willing to take a reputational hit to achieve an ideological goal, the giver of prizes to inventors for inventions of years ago has little reason to do so. This argument is, of course, related to the first. Decisionmakers presumably advance a number of considerations in making decisions. Removing or lessening decisionmakers' raw power to change the world will make them less likely to act in idiosyncratic ways. Because decisions still may have some importance in establishing the reputation of both the prize institution and the individual decisionmakers, decisions should get better rather than worse.

Third, pure caprice or preferences for individual prize recipients are not significant concerns. It is true that if such preferences enter the decisionmaker's welfare function, then the elimination of the opportunity to exercise raw power will make them relatively more important, for the same reason that it will make reputational incentives more important. It is hard, however, to imagine decisionmakers caring much about the size of the prize that any particular claimant receives. In tort and contract cases, judges may have strong individual senses of fairness or retribution that may influence them to act differently from how others might act.[453] Patent prize applicants are less likely to seem inherently meritorious or unworthy. And, once again, even if some decisionmakers might care about the identity of the prize applicants, such preferences matter only if they are systematic and predictable. It seems unlikely that decisionmakers systematically would favor, for example, individual inventors over corporate ones, since some might have the opposite bias. Some degree of irrelevant preference might be anticipated, but it is likely to be small.

To the extent that prize givers do have systematic and predictable preferences, delay will not help. These preferences are problematic, however, only if they are based on irrelevant data. Investors might anticipate a preference for a technology that has a distributional benefit relative to one that will disproportionately help the rich,[454] but the distributional benefit is at least arguably relevant. On the other hand, investors might anticipate that decisions will be affected by cognitive biases,[455] such as insufficient concern about large magnitude, small probability risks

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[452] Judge Posner identifies "result-oriented" as one of several "all-purpose terms of judicial abuse" among legal commentators. Richard A. Posner, *The Meaning of Judicial Self-Restraint*, 59 IND. L.J. 1 (1983/1984).

[453] As one judge explained, "Within the constraints of stare decisis and the limited role of judicial decisionmaking, judges turn to their 'guts,' their inner 'instincts,' to verify their decisions." Paul V. Niemeyer, *Law and Conscience*, 59 NOTRE DAME L. REV. 1011, 1016-17 (1994).

[454] Kremer, for example, suggests that a useful trial for patent buyouts might involve pharmaceuticals in part because "buying out pharmaceutical patents is likely to have benign distributional consequences, whereas buying out, say, patents for improved yachts will not." Kremer, *supra* note 20, at 1163.

[455] Any cognitive biases, however, are likely to be less significant if the decisionmakers are expected to have a high degree of training in relevant fields like economics. In an interesting study, Bryan Caplan suggests that cognitive biases like the availability heuristic may provide one explanation for differences in the general public's and economists' views on the economy, with economic training serving as a debiasing tool. *See* Bryan Caplan, *Systematically Biased Beliefs About Economics: Robust*

(and thus about technology that offsets such risks).[456] Such cognitive biases, however, will be present even if prizes are awarded without delay. Moreover, delay might reduce some cognitive biases, for example by making the system less susceptible to "availability cascades," in which large amounts of publicity lead to government overreaction.[457] While decisionmakers might be affected by such cascades at the time they are awarding the prizes, such cascades cannot be anticipated and thus cannot be predicted. At the same time, investors likely would expect publicity at the time of their initial investment decisions to subside by the time prizes are awarded.

4. *Costs of Delay*

A long delay might seem likely to decrease incentives to innovate, or at least incentives to submit to the prize system rather than seek a reward through a patent. Such a worry, however, is unnecessary as long as a sufficient interest rate is awarded.[458] Just as capital markets allow companies to take risks that an individual would not, so too do capital markets permit companies to make investments that are not anticipated to produce profits for years to come. The ample funding that Internet companies received reflects that investors are willing to bet on the future.[459] Closer to the subject matter here, companies often invest in research and development without expectations of being able to develop a commercial product as a result of such research for ten years or more.[460] In addition, the process of determining how much to invest presumably takes into account revenues from a patent beyond ten years; otherwise, there would be little reason to

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Evidence of Judgmental Anomalies from the Survey of Americans and Economists on the Economy, ECON. J. (forthcoming 2002) (manuscript at 22-23, on file with author).

[456] For example, suppose an inventor develops a vaccine against a potential epidemic that would be devastating to large numbers of people, but, in the absence of the vaccine, would have only a small chance of occurring. Sales data might be an unreliable guide to social benefit in such a context, especially if the vaccination of just some people provide benefits to others. *See, e.g.*, Clayton P. Gillette & Paul B. Stephan, Richardson v. McKnight *and the Scope of Immunity After Privatization*, 8 SUP. CT. ECON. REV. 103, 106 (2000) (noting that vaccination entails positive externalities). Thus, one might expect the agency to consider directly illness and death prevented. It is possible, though, that agency decisionmakers improperly would focus too much on the small pre-vaccine probability of an epidemic and too little on the potential magnitude of an epidemic, because of people's tendency to underestimate the significance of large magnitude, small probability risks. It is also possible, though, that decisionmakers will overestimate risk. *Cf.* Jennifer Arlen, *The Future of Behavioral Economic Analysis of Law*, 51 VAND. L. REV. 1765, 1781 (1998) (noting that because cognitive biases may work in opposite directions, it may be "difficult to predict whether on average people will overestimate or underestimate risk in a given situation"); Jon D. Hanson & Douglas A. Kysar, *Taking Behavioralism Seriously: The Problem of Market Manipulation*, 74 N.Y.U. L. REV. 630, (1999) (recognizing the difficulty of distinguishing low from very low probability risks).

[457] *See generally* Timur Kuran & Cass R. Sunstein, *Availability Cascades and Risk Regulation*, 51 STAN. L. REV. 683 (1999) (discussing how perceptions of salient data may create chain reactions resulting in regulatory over-reaction). One example that Kuran and Sunstein provide of an availability cascade is the reaction to Love Canal. *See id.* at 691-98. If the response to Love Canal occurred only years afterward, decisionmaking might have been less affected by the immediacy of the situation, and moreover even at the time of the event, people might have been able to predict that a delay would lead to a less vigorous public reaction.

[458] A sufficient interest rate would be one that provides a competitive rate of return on investment. *Cf.* William J. Baumol & J. Gregory Sidak, *Stranded Costs*, 18 HARV. J.L. & PUB. POL'Y 835, 840 (1995) ("[I]nvestors in a free competitive market will provide resources to the firm only if the actuarially expectable return is at the competitive level—offering, on the probabilistic average, repayment of the funds provided, plus a competitive rate of return on those funds, plus a suitable payment for the risk entailed in the investment.").

[459] It also suggests that investors sometimes may be overoptimistic. *See, e.g.*, ROBERT J. SHILLER, IRRATIONAL EXUBERANCE 19-21 (2000) (arguing presciently that Internet companies were overvalued because of public impressions not based on economic fundamentals). Yet there is little reason to think that overoptimism is more likely about decisions to be made in the far future than about decisions in the near future.

[460] *See, e.g.*, Stephen D. Moore & Philip Revzin, *Success of Ciba-Sandoz Merger Will Be Tested in the Lab*, WALL ST. J., July 30, 1996, at B4 (noting hopes that a merger would reduce drug development time from eleven years to seven).

have a patent term of any longer duration. Even an individual inventor unwilling to wait could get around the problem, for example by taking a loan against future earnings or by securitizing himself.[461]

A second concern about delay is that information might become stale. This is, however, less of a concern in the development of a prize system than in other litigation, for two reasons. First, while individual recollections conceivably could be relevant, they presumably will have much less importance than in other litigation.[462] What matters to decisionmakers in a prize system ordinarily would not be what happened in the development of an invention, but the invention itself that resulted. Second, prize applicants would have ample incentive to preserve evidence, because they would know from the outset that a decision on a prize ultimately would be forthcoming. A prize applicant likely would gather available evidence at the time of the initial application, including for example studies showing the benefits of the invention. The applicant then would have incentives to preserve such evidence and update the information over time with more recent sales data and the like.

A third concern is that delay might have adverse psychological consequences for litigation participants. Several studies of the tort process have found that plaintiffs who do not settle their cases suffer psychological consequences as a result of the delay.[463] Such findings may help to explain why commentators seek to reduce delay in civil litigation,[464] but they do not provide a strong argument against delay in this context. The studies focus on the effects of litigation, but a rule definitively delaying litigation for some period of time might have less of a damaging psychological effect than a litigation that drags on for the same period of time. Moreover, the studies on the psychological effects of the tort process may not be generalizable to other areas of litigation. While extended litigation may force litigants in tort cases to relive traumatic events, this will not be a concern with long anticipation of patent prize decisions. Psychiatric symptoms are particularly unlikely in the vast majority of patent cases involving corporate parties.[465] Even though litigation may affect individuals within a corporation,

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[461] For introductions to securitization, see Lisa M. Fairfax, *When You Wish upon a Star: Explaining the Cautious Growth of Royalty-Backed Securitization*, 1999 COLUM. BUS. L. REV. 441, 445-51 (1999); and Claire A. Hill, *Securitization: A Low-Cost Sweetener for Lemons*, 74 WASH. U. L.Q. 1061, 1066-77 (1996).

[462] In patent trials, inventors almost always testify, but their testimony is quite different from, say, that of an eyewitness in a criminal trial. As John Sganga notes, although the inventor may be "the most important witness in a patent case . . . the inventor's testimony can border on expert testimony." John B. Sganga, Jr., *Presenting the Witnesses Special to a Patent Trial*, 572 PLI/Pat 95, 98-99 (1999). Sganga explains that "the inventor should be prepared to be asked questions such as what the inventor believes the invention is, how the invention differs from the prior art, how to read the claims of the patent on the accused device, and the meanings of specific terms used in the patent." *Id.* at 99.

[463] *See, e.g.*, Roger Culpan & Christine Taylor, *Psychiatric Disorders Following Road Traffic and Industrial Injury*, 7 AUSTRALIAN & NEW ZEALAND J. PSYCHIATRY 32 (1973) (finding that about half of accident victims referred for psychiatric care did not improve until their cases settled); Peter G. Denker, *The Progress of Insured Neurotics: A Study of 1,000 Disability Insurance Claims*, 39 N.Y. STATE J. MED. 238, 246 (1939) (finding diminishment of psychological symptoms following settlement); Henry Miller, *Accident Neurosis*, 1 BRIT. MED. J. 919 (1961) (finding psychiatric symptoms in only two of fifty tort claimants two years after settlement). One limitation of these studies is that the psychological benefits may flow as much from the fruits of settlement, cash awards, as from the end of litigation itself. For a useful discussion of these studies, as well as studies finding no beneficial psychiatric effect from settlement, see Daniel W. Shuman, *When Time Does Not Heal*, 6 PSYCHOL. PUB. POL'Y & L. 880, 886-90 (2000).

[464] The American Bar Association, for example, has issued recommendations for the speed at which civil claims should be processed. *See* AMERICAN BAR ASSOCIATION, JUDICIAL ADMINISTRATION DIVISION, STANDARDS OF JUDICIAL ADMINISTRATION: STANDARDS RELATING TO TRIAL COURTS § 2.52(a) (1992) (recommending, for example, that 98% of cases be resolved within 18 months of filing).

[465] Professor Shuman implicitly acknowledges that psychological concerns are less with institutional parties in noting, "Although large numbers of tort defendants are institutions, in approximately half of tort cases there is an individual defendant." Shuman, *supra* note 463, at 894.

individuals would probably not suffer severe symptoms as a result of delay in prize litigation, just as scientists presumably do not suffer such symptoms as a result of uncertainty about whether a product currently being developed will prove successful in a decade's time.

A final concern about delay, probably the weightiest one, is that it might reduce the expectation that *any* prizes will be awarded. The government might have an incentive to renege on an initial promise to pay inventors, for example by repealing the statute promising prizes. Perceptions that prizes will not be granted are significant even if the government does not in fact renege, because it is the anticipation of prizes that induces investment. If the government cannot somehow "tie its hands,"[466] then the possibility that the government will renege indeed provides an argument against delay, or for shorter delays rather than longer ones. While it may be impossible for the government to provide perfect assurance,[467] it may be able to come close by establishing with statutory language that applicants have a property right to a prize (unless their actions did not merit a prize), so that deprivation of the right might be seen as a Takings Clause[468] violation.[469]

C. Fund vs. Open-Ended Program

One way to enhance an argument that applicants have a property right would be for the government to provide in advance a set fund for a patent prize program rather than to make the program open-ended. Suppose, for example, that the government, frustrated by high monopoly prices on the latest mousetrap designs, decided that it wished to allocate funds to a patent prize system for mousetraps. Instead of promising to provide however much money turns out to be appropriate to however many people who apply for prizes for their mousetraps, the government might decide to devote a set amount of money to a mousetrap fund. For example, the government might decide to set aside ten million dollars for mousetrap patent prizes and place these funds in an interest-bearing account. The government would then promise that the entirety of the fund would be distributed to applicants, providing in legislation that the fund was in trust for those who filed applications in a certain time period.[470]

This approach not only increases the confidence that inventors have that the government will not renege altogether on a promise to provide prizes, but also answers the concern that the government might underestimate the value of innovations in granting prizes. Before the recent literature seeking to develop formulas or algorithms that purportedly would eliminate

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[466] The challenge of obtaining government precommitment is one that appears in a variety of policy and legal contexts. *See generally* JON ELSTER, ULYSSES UNBOUND: STUDIES IN RATIONALITY, PRECOMMITMENT, AND CONSTRAINTS (2000).

[467] Some governmental promises, however, do seem to entail no risk of repudiation. U.S. bonds are often characterized as the quintessential risk-free investment. *See, e.g.*, Gregory Zuckerman, *Ring in a New Bond Bellwether: 10-Year*, WALL ST. J., May 3, 2000, at C1 ("Treasury securities, backed by the full faith and credit of the U.S. government, have been viewed a risk-free investment with no peer. . . . [A]s long as an investor holds the bond to maturity, he or she is all but guaranteed to get the money back."). One reason for this might be the belief that powerful interests would oppose repudiation and because there is a constitutional provision arguably preventing debt repudiation. *See* U.S. CONST. amend. XIV, § 4 ("The validity of the public debt of the United States . . . . shall not be questioned . . . .").

[468] *See* U.S. CONST. amend. V.

[469] An argument for permitting the government to renege on a promise to provide prizes might focus on *Flemming v. Nestor*, 363 U.S. 603 (1960), which upheld Congress's right to terminate Social Security benefits for specified classes of individuals. In that case, however, the statute itself reserved Congress's right to make such a change. *Id.* at 610-11.

[470] Government may have less flexibility in acting as a trustee than it would otherwise. *See, e.g.*, Cobell v. Babbitt, 30 F. Supp. 2d 24 (D.D.C. 1998) (considering a class action by Indians against the Secretary of the Interior for mismanaging trust fund accounts); James L. Huffman, *A Fish out of Water: The Public Trust Doctrine in a Constitutional Democracy*, 19 ENVTL. L. 527 (1989) (discussing the public trust doctrine of environmental law).

governmental discretion,[471] the possibility of such underestimation was the foremost complaint among industrial organization economists about prize systems. Jean Tirole, for example, explained that "[b]ecause the investor's investment is sunk at [the research and development] stage, the inventor is subject to the hold-up problem . . . . The administrative and judicial bodies in charge of prizes generally estimate the values of inventions very conservatively."[472] Once a government has induced an innovation, especially if the innovation is not eligible for patent protection, its incentive is to provide meager prizes. If the entire fund is to be distributed to prize applicants, however, conservative estimations of the social value of inventions are not a matter of concern. As long as underestimation or overestimation is not invention-specific in a predictable way, underestimation of values will not affect the total size of the government subsidy.

Aside from increasing confidence that the government will not renege on its commitments, the primary advantage of the set fund approach over an open-ended program is political. Legislators might be hesitant to create programs whose expense is highly uncertain, in part because if such programs use more resources than anticipated, other programs might need to be cut or taxes to be raised if balanced budget goals are to be reached.[473] Of course, the government does create some programs whose budget allocation is uncertain, as, for example, Social Security expenditures may vary from one year to another and not be fully predictable.[474] The Congressional Budget Office routinely calculates both anticipated revenues and anticipated expenses to allow Congress to make budgetary choices.[475] Nonetheless, Congress might be hesitant to create a mousetrap program if there was any chance that the program might use eighty million instead of ten million dollars, even if the increased expenses corresponded to higher than anticipated benefits of the program. Such concerns might be even greater for larger scale programs.

Creating a fund rather than an open-ended program is also a useful means of providing an experimental program. Legislators might be interested in exploring the possibility of patent prizes, but sensibly hesitant to create a massive program without preliminary testing. An experimental program might be especially important if legislators decided, contrary to the advice above,[476] to implement a patent prize system according to a prespecified formula or algorithm. An initial experimental run would allow the government and investigators to observe problems with and exploitations of the system and make suitable changes before expanding the program. Even if such an experiment ran into so many problems that the program turned out to have greater costs than benefits, the government might be able to fine tune it. Even the proposal described here could benefit from modest experimentation, both to build confidence in the patent prize system and to expose any unanticipated problems.[477] Whatever approach is adopted, the government can increase the size of the fund as confidence in the program increases.

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[471] *See supra* Part I.

[472] *See* TIROLE, *supra* note 86, at 401. Tirole thus concludes that "[a] more serious rival to the patent system is a centralized solution known as the *procurement* or *contractual mechanism*." *Id.*

[473] In the absence of a balanced budget amendment, however, Congress may well find ways to circumvent budget targets that it has established. *See, e.g.*, Donald B. Tobin, *Less Is More: A Move Toward Sanity in the Budget Process*, 16 ST. LOUIS U. PUB. L. REV. 115, 123-27 (providing a history of congressional budgets targets and evasions in the 1980s).

[474] The uncertainty of such expenses may provide an affirmative benefit, complementing federal income taxation and unemployment insurance as automatic stabilizers that help create countercyclical fiscal policy. *See generally* Alan J. Auerbach & Daniel Feenberg, *The Significance of Federal Taxes as Automatic Stabilizers*, J. ECON. PERSPECTIVES, Summer 2000, at 37 (estimating the importance of the federal tax system in reducing output shocks).

[475] *See* http://www.cbo.gov (last visited Sept. 15, 2001) (listing various recent economic reports).

[476] *See supra* Part III.A.

[477] The government would not have to wait until prizes were actually distributed to assess the value of the experiment. Indeed,

The fund approach requires some method for distributing a limited sum of money to claimants. A FIFO, or first-in, first-out strategy, would distribute prizes to applicants sequentially until the fund were exhausted. The problem with this approach is that as applications accumulate, the probability that the fund will be depleted before any new application is processed increases, and this uncertainty will decrease the expected prize to applicants once the fund is almost topped off. A LIFO, or last-in, first-out strategy, would solve this problem, but produce even more perverse incentives. All patent holders would be hesitant to be the first to apply and so presumably would wait to file applications until the last minute. Neither of these strategies seems likely to produce an equilibrium in which the total number of applications roughly exhausts the fund.

Probably the simplest strategy would be to calculate prizes for all applicants and then increase or decrease all by the same percentage as necessary to use up the fund, including any interest that has accumulated on it.[478] This could, but need not necessarily, be operationalized by awarding applicants shares in the fund. Instead of giving a million dollar prize, the agency would award a million shares in the fund. Regardless of how this strategy is effectuated, it should in equilibrium result in the applications' roughly exhausting the fund. More precisely, the sum of the private benefits that the applicants could have obtained by exploiting their patents monopolistically will tend to equal the total amount in the fund.[479] Interestingly, this proves to be true whether the agency calculates prizes based on the private benefit that the applicants have yielded or whether it does so based on the social benefit that the applicants have produced.

To understand why, suppose first that the agency calculates prizes based on the private benefits forgone. A patent holder who would lose one million dollars by placing the patent into the public domain would be willing to do so if the expected prize were at least that much, plus interest. The patent holder will thus make an estimate of the prizes that other applicants will receive. If these prizes sum up to more than the value of the fund, then the patent holder will anticipate that her own prize for yielding the patent would be reduced accordingly. If these prizes sum up to less than the value of the fund, by at least one million dollars, then the patent holder will be willing to yield the patent. A slight complication is that the patent holder will consider not just the expected value of the prize, but also the riskiness of the prize scheme relative to the riskiness of market exploitation of the patent. A result, though, is that the prize scheme will tend to induce applications from those for whom the prize scheme is relatively safe, for example because market exploitation is particularly uncertain.

Now suppose that the agency calculates prizes based on the social benefits produced, which we have seen may be greater than the private benefit.[480] Patent holders will still compare

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using the quality of actual prize decisions to assess a program might be misleading. The purpose of the program, after all, is to induce innovation based on anticipation of prizes, not to distribute prizes as fairly as possible.

[478] Prizes would all be calculated discounting dollars to the first date at which any applicant's actions might have produced some public benefit. If a fund is distributed proportionately, however, all that matters is that all applications are discounted using the same method.

[479] Other distribution schemes may also produce this equilibrium. Consider, for example, a strategy in which applications are considered in random order and the funds are disbursed until exhausted, and any excess funds are distributed proportionately as in the scheme described in the text. The only difference between the two schemes is that if prizes end up adding up to more than the fund, in the scheme described in the text, all share the burden of the fund shortfall, while in the random scheme, the burden is essentially randomly placed on select applicants. The randomness of the scheme would add to the risk of submitting an application. As indicated above, though, inventors will invest resources in research and development even if there is some possibility of zero return. *See supra* text accompanying notes 400-401. The additional risk cost, however, seems unnecessary to bear, unless it is offset by the administrative savings from the agency's not having to consider applications after depletion of the fund.

[480] *See supra* note 272 and accompanying text.

their expected private benefit from monopoly exploitation against the prize. For example, a patent holder with a private benefit of one million dollars but a social benefit from yielding the patent of two million dollars will be willing to yield the patent as long as the total prizes are no more than twice the value of the fund. Thus, the equilibrium once again will be one in which private benefits approximately add up to the fund value.[481] This approach produces a useful sorting. A patent holder will yield a patent (or do something else to offset the monopolistic effect of a patent) if and only if the ratio of social to private benefit is higher for the patent holder than the ratio of total initial prize awards to funds available. If prizes are calculated according to social benefit, the program will attract those for whom the social benefits of releasing the patents are highest. Using a fund and granting prizes on the basis of social value thus effects proverse selection,[482] the opposite of adverse selection.[483]

When the government uses a modest limited fund instead of sponsoring an open-ended prize program, the program will not encourage innovation any more than the patent system. This might seem to furnish an argument for an open-ended system, so that the system can both decrease deadweight loss and increase innovation. The argument, however, is not a strong one, because the government could always increase the size of the fund from one year to the next. The larger the fund, the more patent holders will decide to participate. If the fund becomes larger than needed to induce all patent holders who might participate to do so, then the excess is a subsidy that will encourage greater research and development. Conceivably, the government could continue to increase the fund for a program in successive years until the marginal participant is one who would lose money in the patent system but could earn zero economic profit in the prize system,[484] assuming all inefficiencies of prizes, including deadweight costs of taxation,[485] are accounted for in the prize awards. In any particular case, though, the fund approach relieves decisionmakers of the need to calculate the deadweight cost of funding prizes through taxation, since the deadweight loss per dollar of prize would affect all prize recipients equally.[486]

Perhaps the most significant argument against the limited fund approach is that potential applicants will have to estimate how many other applications are submitted. The uncertainty does not mean that no one will apply, but it does increase the variance of an expected prize, and this will make the prize system slightly less attractive than it otherwise would be. In addition, applicants might devote some resources to calculating the value of applications submitted so far and projecting how many applications may be submitted in the future,[487] and this expenditure is a

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[481] The equilibrium will not be exactly this, because the ratio of social to private benefits may vary among applicants. Suppose, for example, that an applicant's invention would have produced zero monopoly profits (i.e., zero private benefit from exploiting the patent), but there nonetheless would be one million dollars in social benefits from releasing the patent into the public domain. If the total fund is one million dollars, and the ratio for everyone else between private and social benefit is 1:1, then no one else will have an incentive to submit a patent to the fund. Thus, in this extreme case, the total private benefit foregone would be zero.

[482] On proverse selection, see, for example, Robert H. Jerry, II, *Health Insurers' Use of Genetic Information: A Missouri Perspective on a Changing Regulatory Landscape*, 64 Mo. L. Rev. 759, 770-71 (1999).

[483] The proverse selection effect might offset or outweigh any adverse selection problem. *See supra* Part II.C.

[484] It would not necessarily be desirable to do so given the rent dissipation problem, unless this problem is taken into account in calculating awards. *See supra* note 418 and accompanying text.

[485] *See supra* Part II.D.1.

[486] For example, suppose that the total social benefit found for all applications to a $100 million fund is $200 million, not including the deadweight loss of taxation. Whether the deadweight cost of providing a $1 prize is negative, zero, ten cents, or sixty cents would have no effect on how much each prize applicant would receive, fifty cents for every dollar of social benefit. If the deadweight cost is *greater* than the deadweight cost of the patent system, that would provide an argument against having a patent prize system at all, but not an argument that would result in different discounts for different proposals.

[487] Projecting future applications may be the more difficult task. A potential partial solution is to allow different deadlines for different applications. For example, anyone submitting on January 1 might receive a prize of any amount, but someone submitting on February 1 would be allowed a prize of only up to $1 million, even if the application turned out to merit a larger

social cost. Both the risk and the resource reallocation in effect make opting into prizes more expensive than it otherwise would be. The effect is equivalent to increasing the private benefit foregone, since the patent holder could have avoided the costs by exploiting the patent monopolistically. Thus, these costs will slightly reduce the number of applications and the total social benefits of the program.

These are significant concerns, but my estimation is that the advantages of a limited fund approach are more than sufficient to offset them. Except in very narrow contexts, I suspect that legislators would be unwilling to adopt the more open-ended approach anyway, at least initially, even if it would produce higher benefits. That may be more a concession than an argument, but it is coupled with the advantage of a fund in instilling confidence in prize applicants that they will in fact be paid if they have done something of social value. Once the fund is allocated and placed in an interest-bearing account, perhaps even in a private trust with the trustee instructed to distribute it to applicants based on the agency's ultimate prize determinations, investors will recognize that the money will not disappear. With the open-ended approach, even if investors are confident that the prize program will not disappear, they might reasonably worry that individual decisionmakers might care more about the size of the government debt than about retrospective prizes. Using a fund eliminates that concern.

D. Tradable vs. Untradable

Regardless of whether prize applicants receive a portion of a fund or an amount that depends on the merits of their application alone, applicants should be allowed to sell their right to any future prize to third parties. Allowing such rights to be traded would permit independent inventors or small companies that have developed inventions to cash out their prizes immediately by finding someone to purchase the right to a prize. We have already seen that inventors in need of immediate cash might be able to borrow against a prize or to securitize themselves,[488] but sale of a prize claim may provide the same benefit more easily. Allowing tradability of claims permits claims to flow from relatively risk-averse parties to relatively risk-neutral parties and thus improves allocative efficiency. Even large public corporations sometimes might be better off liquidating their prize claims, for example as a way of demonstrating the success of a past product to investors and thus inspiring confidence in future products.[489]

This is a straightforward conclusion, and it provides an answer to concerns that delay is infeasible. Nonetheless, it may seem a surprising approach, because our legal system often prohibits the alienation of legal claims. While legal claims that survive the death of the claimant generally may be assigned,[490] rules against champerty and maintenance may prevent lawyers and others from purchasing legal claims or marketing themselves as purchasers of legal claims.[491]

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prize, and so on. This method effectively allows the fund to be topped off with relatively small prizes. *See infra* text accompanying notes 561-562 (suggesting a refinement of this mechanism).

[488] *See supra* text accompanying note 461.

[489] Presumably, the stock price of a company would reflect an asset of a prize claim, but the market valuation of a prize claim may be quite noisy. No one stock analyst will have sufficient incentive to research fully the value of the prize, because the analyst may be unable to prevent other analysts from appropriating the benefits of such research. *See* D. Bruce Johnsen, *Property Rights to Investment Research: The Agency Costs of Soft Dollar Brokerage*, 11 YALE J. ON REG. 75, 92-95 (1994) (discussing the difficulty that stock analysts have in preventing others from appropriating the benefits of their research). Sale to a single third party, which would have ample incentive to investigate the claim's value, would eliminate for a firm's shareholders any uncertainty about a prize.

[490] *See, e.g.*, Annotation, *Assignability of Claim for Personal Injury or Death*, 40 A.L.R.2d 500 § 4 ("[T]he test of assignability of a claim is its survival after the death of the original holder thereof.").

[491] On champerty and maintenance, see, for example, Susan Lorde Martin, *Syndicated Lawsuits: Illegal Champerty or New*

Prohibitions on alienation of legal claims, however, have recently received substantial criticism from commentators who argue that permitting sale of claims would have substantial benefits, such as allowing tort plaintiffs to receive recoveries faster, without significant drawbacks.[492] In any event, if the basis of such prohibitions is unseemliness, early cashing in of patent prizes seems much less troublesome than sale of tort claims.

Sale of a right to an eventual prize is not free, in the sense that the seller is not likely to receive the expected value of the prize in exchange for sale.[493] The price ordinarily will be less than this to compensate buyers in three different ways. First, buyers will demand compensation for the risk that they must bear, given the uncertainty of prize returns. This risk is a significant cost of a regime in which decisionmakers have considerable discretion in setting prizes, but, as we have seen, publicly traded companies are relatively risk-neutral, because they are generally held in diverse portfolios.[494] The risk premia might be even lower with a fixed prize fund, since an individual company might buy up rights to a significant percentage of the fund. Second, buyers will demand compensation for the resources used to evaluate a patent prize application.[495] Third, sellers in effect will have to pay the anticipated legal costs that buyers of rights to prizes will expect to bear, along with a premium because of the uncertainty of the magnitude of such costs.

E. Special Purpose vs. General Purpose

A patent prize system could be established for patents generally (or even for patents and copyrights generally)[496] or for a much narrower range, such as prescription drugs.[497] Creation of a program with a narrow range might seem to reflect an arbitrary preference, and indeed concentrated interest groups presumably would press for prize systems that would provide greater benefit for them than for others.[498] Government spending, however, will presumably be influenced by interest groups anyway, and if a prize system spends government money more efficiently than some other allocation scheme, then society as a whole benefits. Interest group pressures to shift one source of money intended to benefit them into a prize program for their benefit is benign. Moreover, prize systems may be politically feasible only when there is interest

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Business Opportunity?, 30 AM. BUS. L.J. 485, 486-87 (1992).

[492] *See* Peter Charles Choharis, *A Comprehensive Market Strategy for Tort Reform*, 12 YALE J. ON REG. 435 (1995) (maintaining that allowing trading of claims would cure many ills of the tort sy stem); Marc A. Shukastis, *A Market in Personal Injury Tort Claims*, 16 J. LEGAL STUD. 329, 337 (1987) (advocating the creation of a market in which injured parties could sell their claims to third parties); Ari Dobner, Comment, *Litigation for Sale*, 144 U. PA. L. REV. 1529, 1538 (1996) (arguing that trading of legal claims is fair and efficient); Teal E. Luthy, Comment, *Assigning Common Law Claims for Fraud*, 65 U. CHI. L. REV. 1001 (1998) (defending assignability of fraud claims).

[493] On occasion, the seller might, as a result of the winner's curse. *See supra* note 134.

[494] *See supra* notes 401-403 and accompanying text.

[495] If a seller auctions off rights to a patent prize, auction theory suggests that the seller in effect will pay the research costs of all bidders. *See, e.g.*, Kenneth R. French & Robert E. McCormick, *Sealed Bid, Sunk Costs, and the Process of Competition*, 57 J. BUS. 417, 439 (1984) (discussing common value auctions).

[496] *See infra* Part IV.B.1 (discussing applicability of prize system to copyright).

[497] Indeed, a prize system might be narrower still. *See infra* Part IV.A.1 (describing prizes for providing prescription drugs to seniors).

[498] In the patent area, however, interest group competition for limited funds might more or less cancel out, as presumably a range of inventor groups and consumer groups would be able to overcome the free rider problem that may inhibit interest group formation. *Cf.* Charles L. Gholz, *First-to-File or First-to-Invent?*, 82 J. PAT. & TRADEMARK OFF. SOC'Y 891, 892 n.1 (2000) (providing another example of a patent issue on which competing interest groups are likely to differ).

group pressure, as some interest groups, such as the patent bar,[499] likely would oppose prize systems.

There are also practical reasons that a special purpose prize system might be superior to a general prize system. First, a special purpose prize system may make prize calculation easier. Decisionmakers would need to acquaint themselves with the complexities of one market, rather than the complexities of a number of markets. It would also be easier for potential applicants to estimate the number and strength of submitted patent applications if the number of potential applicants is relatively small. A pharmaceutical firm, for example, might be better situated to assess whether other pharmaceutical companies will submit applications than whether automobile companies will submit applications. Second, a special purpose prize system may help offset adverse selection problems.[500] Adverse selection will be less of a problem the larger the proportion of eligible firms that decide to seek prizes. If millions of firms are eligible and only a small number are expected to submit applications, these may well be firms that have asymmetric negative information about the value of their products that they do not expect the patent agency to discover even with considerable delay.

The primary disadvantage of a special purpose prize system as opposed to a general one is that it would bar some actions that would have great potential to mitigate deadweight loss. Perhaps the yachting industry does not have a sufficiently strong lobby to create a patent prize system for innovations in yacht design,[501] even though it is possible that the deadweight loss in that area is large. There might be some yachting patents for which the ratio of social to private benefit of a patent is higher than for, say, some pharmaceutical patents, even if the ratio for pharmaceutical patents is generally higher. A general purpose prize system with a limited fund would induce applications where the ratio of social to private benefit is highest,[502] and so the marginal ratio will be lower in a special purpose system. The ultimate cost-benefit analysis is thus indeterminate, though as a practical matter, it probably makes sense to start with modest special purpose prize systems, leaving large general purpose prize systems as a potential long-term goal.

F. Winner-Take-All vs. Shared

So far, I have assumed that a prize would be awarded to each inventor who took some socially beneficial action to offset the deadweight loss of a patent, but that need not be so. Indeed, the word "prize," perhaps more so than the alternative "reward,"[503] might seem to suggest a set sum of money for a top contributor. In a winner-take-all system for mousetraps, the government might promise a set sum of money to whoever takes an action that has the greatest social benefit, with perhaps smaller prizes for second- and third-place finishers. Or, the government might establish a prize for the first inventor to achieve some specified goal—say,

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[499] A prize system need not displace the Patent and Trademark Office and thus patent prosecution. *See supra* text accompanying note 360. Nonetheless, the patent bar would presumably lose considerable money from decreased patent litigation. *See supra* Part II.D.3.

[500] *See supra* Part II.C.

[501] It would need a strong lobby to overcome sentiments that the public ought not pay to improve yachting technology. *See* Kremer, *supra* note 20, at 1163 (indicating a preference for patent buyouts in the pharmaceuticals area over such buyouts in the yachting area); *supra* note 454.

[502] *See supra* notes 481-483.

[503] *The American Heritage Dictionary* defines "prize" as "[s]omething offered or won as an award for superiority or victory, as in a contest or competition," and "reward" as "[s]omething given or received in recompense for worthy behavior." THE AMERICAN HERITAGE DICTIONARY OF THE ENGLISH LANGUAGE 1442, 1546 (3d ed. 1992).

developing a mousetrap that works with deadly laser beams—and simply place the prize aside until someone finally claims it. Though none of the advocates of patent prize systems described in Part I advocates such an approach, it has a stronger historical pedigree than a system in which everyone receives a prize.[504] Winner-take-all systems are also familiar in the economic landscape,[505] including patent law, in which the first to win a patent race receives the patent.[506]

Winner-take-all systems do have some significant virtues. All a decisionmaker would need to do is to select a single winner. Not only would this likely reduce the costs of the decisionmaking process, but it also might be an easier task. In addition, winner-take-all systems may induce relatively few frivolous applications. In a system in which everyone is eligible to receive something, the chance to receive even just a few dollars might induce a large number of applications claiming very small prizes, and the cost of processing these applications might exceed the social value of any services performed by the applicants. With winner-take-all, by contrast, relatively few would apply. Someone without the laser beam mousetrap, or at least something that might pass for a solution, would not submit it. Similarly, if the prize is to whoever provides the greatest social benefit in an area, someone who knows that another applicant is clearly superior probably will not bother applying.

The vices of winner-take-all systems, however, are greater than their virtues. Consider first a winner-take-all system in which the prize is awarded to whoever provides the largest social benefit. Although it is possible that several applicants might compete for the prize, it is also possible that the participation of one party would scare others off.[507] Yet, it may be that the greatest social benefit could be achieved by having each of a number of patent holders taking some action to lower deadweight costs, rather than having one patent holder take a single dramatic action. Shared prizes could lead to a single entity taking the vast majority of the prize fund, if that entity is capable of producing social benefit at lowest marginal private cost, but it would allow for many contributions where that is more efficient. Similarly, if a winner-takes-all prize is to be awarded to whoever achieves some specified innovation first, someone who

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[504] *See supra* note 15 (providing examples of early prizes for inventions).

[505] For analyses of winner-take-all regimes, see ROBERT H. FRANK & PHILLIP J. COOK, THE WINNER-TAKE-ALL SOCIETY (1995), which argues that markets in many contexts are winner take all; REBECCA L. SANDEFUR & JOHN P. HEINZ, WINNER-TAKE-ALL MARKETS FOR LEGAL SERVICES AND LAWYERS' JOB SATISFACTION (American Bar Found. Working Paper Series, 1999), which demonstrates that markets for legal services are increasingly winner-take-all; Lani Guinier, *Groups, Representation, and Race-Conscious Districting: A Case of the Emperor's Clothes*, 71 TEX. L. REV. 1589 (1993), which criticizes winner-take-all congressional races; and Victor Williams & Alison M. MacDonald, *Rethinking Article II, Section 1 and Its Twelfth Amendment Restatement: Challenging Our Nation's Malapportioned, Undemocratic Presidential Election Systems*, 77 MARQ. L. REV. 201 (1994), which challenges the winner-take-all approach that most states take to apportioning electoral votes.

[506] For an analysis of the winner-take-all nature of intellectual property regimes, see Jonathan B. Baker, *Promoting Innovation Competition Through the* Aspen/Kodak *Rule*, 7 GEO. MASON L. REV. 495 (1999).

[507] This is similar to the dynamics of a patent race. *See supra* Part II.B.1. One reason that someone might be hesitant to join a race is that with a single prize, there is a risk that the race will devolve into an escalation auction. *See generally* Martin Shubik, *The Dollar Auction Game: A Paradox in Noncooperative Behavior and Escalation*, 15 J. Conflict Resolution 109 (1971) (describing an "escalation auction," in which each of the top two bidders must pay the amount of his bid, and in which participants often end up bidding individually more than a dollar when a dollar is the item auctioned); Ian Ayres & Peter Cramton, *Deficit Reduction Through Diversity: How Affirmative Action at the FCC Increased Auction Competition*, 48 STAN. L. REV. 761, 796-97 (1996) (summarizing the dynamics of such an auction). For example, if two parties have each spent one million dollars to win a one million dollar prize, each still might continue to spend because the marginal spending might make the difference in winning the prize. The result is not unlike a litigation in which both parties spend more on legal fees than the money at stake or a war in which countries continue to devote troops even though the total losses have already exceeded whatever initially might have seemed at stake. *See* Barry O'Neill, *International Escalation and the Dollar Auction*, 30 J. CONFLICT RESOLUTION 33 (1986) (comparing war to behavior in an escalation auction). Recognizing the possibility of an equilibrium in which both parties spend far more than the prize, potential competitors may be hesitant to compete. Even if escalation (and thus high spending to produce social benefit) results, the marginal spending might produce smaller social benefits than private costs.

anticipates being able to come close to the goal, but not quite achieve it, will have no incentive to do so.[508] Winner-take-all prizes, in sum, are crude tools that are unlikely to produce just the right mix of private contributions.

A more difficult question is whether prizes for individual innovations should be winner-take-all or shared. In the patent system, a single inventor applies for a patent, with the loser in a patent race receiving nothing.[509] A variety of reasons make this logical for the patent system, including that it is difficult to divide a patent among multiple claimants,[510] and that it might be difficult to craft doctrine establishing what one must accomplish to be a contributor. It would not necessarily be impossible in the prize context. Money is easily divisible, and, in the absence of a need for predictable doctrine, an agency could make an assessment of relative contributions to an innovation and distribute the prize accordingly. That the agency sometimes might misestimate, giving a contributor more or less credit than deserved, is of little concern, as long as the agency approximates contributions on average.

The possibility of dividing prizes for single innovations may not be sufficient to justify the practice. We have seen, though, that it might be efficient to award a prize to someone who releases valuable information without developing a product, because doing so would encourage release of information and thus limit research redundancy.[511] On the other hand, there may be instances in which release of information may be socially inefficient, because a variety of firms will compete inefficiently to accomplish the next innovation step.[512] In addition, there might be instances in which releasing information does not contribute to reducing the deadweight cost of patents, because the party that uses the information released still receives a patent and decides to exploit it monopolistically rather than seeking a prize. There may be other situations, however, in which release of information provides a social benefit by limiting the scope of any patent eventually obtained or by preventing another party from receiving a patent altogether.[513]

A virtue of a system investing those awarding prizes with wide discretion is that, in contrast to any mechanical prize proposal, decisionmakers would have the option of splitting a

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[508] This problem animates Michael Kremer in his analysis of the problem of encouraging the development of new vaccines. *See* Michael Kremer, A Purchase Fund for New Vaccines: Rationale and a Proposed Design (Nov. 16, 1999) (unpublished manuscript, on file with author) [hereinafter Kremer, Purchase Fund]; *see also* Rachel Glennerster & Michael Kremer, *A Better Way to Spur Medical Research and Development*, REGULATION, Summer 2000, at 34 (summarizing the proposal); Walter Williams, *We Can Cure World Disease by Offering Prizes*, DESERET NEWS, July 19, 2000, at A15, *available at* 2000 WL 24356585 (discussing the proposal); Michael Kremer & Rachel Glennerster, *Creating a Market for Vaccines*, N.Y. TIMES, June 1, 2001, at A19 (advocating the proposal). Kremer notes that by providing rigid specifications that a solution must meet to receive a prize, the prize-giver offers no incentive to develop imperfect solutions:

> For example, if the specifications required a 90% reduction in mortality in all localities, potential vaccine developers might not pursue a candidate vaccine that would be likely to yield 99% protection in most regions, but only 85% protection in others. If it were difficult to create a vaccine delivering 90% protection in all regions, no vaccine at all might be developed. In order to provide appropriate incentives for researchers, the fund should pay more for superior vaccines; a vaccine with 90% efficiency is worth more than one with 80% efficiency, and a vaccine that requires no booster is worth more than one requiring boosters every five years. However, specifying a full schedule of prices based on characteristics of hypothetical vaccines is likely to prove impossible.

Kremer, Purchase Fund, *supra* (manuscript at 24).

[509] *See supra* Part II.B.1.

[510] It would not necessarily be impossible. The winner might be placed in possession of the patent for the first ten years of its life, with the second-place finisher in possession for the last ten. It is not uncommon for real property to be split in similar ways, and copyright law long provided for reversion of the property right to the author after a set period of time. *See* R. Anthony Reese, Note, *Reflections on the Intellectual Commons: Two Perspectives on Copyright Duration and Reversion*, 47 STAN. L. REV. 707, 727-28 (1995) (describing the origin of this regime); *id.* at 731 (explaining that aspects of this reversionary practice remain).

[511] *See supra* text accompanying notes 292-293.

[512] This is, of course, yet another example of the common pool problem. *See supra* Part II.B.

[513] *See supra* notes 283-289 and accompanying text (discussing strategic disclosure to prevent patents from issuing).

prize where that is efficient. At the same time, though, agency decisionmakers might decide in a particular circumstance that an applicant made no contribution to an innovation or that there is some other reason that the decision to release information does not merit a prize. For example, a decisionmaker should take into account that the cost of processing a prize application is a social cost reducing any benefits claimed and thus, if calculating prizes on the basis of social benefit, lower the prizes awarded accordingly. If a decision to release information is inefficient because it will lead to wasteful applications or disputes about relative contributions, which is particularly likely in areas in which it will be difficult for an agency to separate one firm's contribution from another's, the agency might award nothing. Similarly, it might decide that awarding a single prize for the best innovation is more efficient than awarding a multitude of prizes for various innovations. Once again, as long as the agency is expected to weigh such criteria the appropriate amount on average, inventors will make efficient ex ante decisions.

G. Independent vs. Executive

An important decision in the creation of any administrative agency is whether the agency should be independent or executive. The primary functional difference is that in an executive agency, the President has unlimited removal power, while in an independent agency, decisionmakers at the top of the agency hierarchy are removable only for good cause.[514] Appointees to independent agencies usually receive terms longer than the four years of a single presidential term.[515] Typically, though not by definition, executive agencies, including the various cabinet departments, have a single head, while independent agencies have multiple individuals compromising the leadership and are often referred to as "commissions" or "boards" rather than as "agencies."[516] The reason for this correlation is that when presidential control is desired, having a single individual reporting to the President at the helm is advisable, while when an agency is intended to make decisions according to scientific rather than political considerations, a multi-member board often seems preferable.[517]

The goals of a patent prize agency strongly argue for independence. Such an agency, after all, is intended not as a vehicle for steering federal policy, but rather as a vehicle for rewarding past inventive effort in as efficient a way as possible. If the President controlled the agency's decisions, directly or indirectly, investors might worry, even with delay, that superficially attractive companies, for example companies working on solutions to the problems viewed as most pressing, would receive high rewards, independent of the amount of deadweight loss

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[514] *See, e.g.*, GARY LAWSON, FEDERAL ADMINISTRATIVE LAW 7 (2d ed. 2001). Traditionally, as a result of the Supreme Court's decisions in *Myers v. United States*, 272 U.S. 52 (1926), and *Humphrey's Executor v. United States*, 295 U.S. 602 (1935), limitations on presidential removal power were considered constitutional unless the officials insulated from removal were executive officials. In *Morrison v. Olson* 487 U.S. 654, 691 (1988), however, the Court held that Congress could limit the removal of even executive officials, as long as the "removal restrictions are [not] of such a nature that they impede the President's ability to perform his constitutional duty."

[515] Members of the Board of Governors of the Federal Reserve System, for example, receive fourteen year terms. *See* 12 U.S.C. § 241 (1994).

[516] *See* LAWSON, *supra* note 514, at 7 n.8. An example is the Federal Communications Commission. *See* 47 U.S.C. § 154 (1994) (establishing a commission of five members, without providing for presidential removal).

[517] *See* LAWSON, *supra* note 514, at 8. Professor Lawson explains:
> There is a substantial correspondence between the single-headed/multi-member and executive/independent axes. . . . The theory behind these particular combinations has long been that single-headedness and executiveness both promote accountability (because you can blame a single administrator for the agency's mistakes and then blame the President for retaining the administrator), while multi-memberness and independence both promote disinterested professionalism (because a group of tenured officials will presumably be less vulnerable to special-interest and presidential influence).

Id.

reduced. This consideration, however, does not necessarily mean that the agency should have the same structure as most independent agencies. Indeed, as argued above, members' terms should not be so long that the identity of decisionmakers could be predicted in advance. Terms of four or five years might be the optimal length, assuming a delay of ten years before prizes are awarded,[518] balancing concerns about presidential control with concerns about making the identity of decisionmakers unpredictable.

Even this approach, however, may be insufficient to combat concerns about rent-seeking. Someone who has filed an application for a prize might seek to influence the selection of a decisionmaker by giving campaign donations to the President or other officials in a position to affect the appointment. To solve this problem, the President and legislators could be taken out of the loop. One approach would be for prize determinations to be made by borrowing administrative law judges from other agencies, though this might reduce the benefits of specialization.[519] Moreover, it would foreclose the possibility of having decisionmakers with training appropriate to the task of awarding prizes. Training in economics is likely to be more important than training in law. The job of decisionmakers is to make the best economic calculation possible,[520] especially in an agency giving such decisionmakers wide discretion, not to discern the current state of legal doctrine.

Perhaps a more effective approach would be to vest appointment in the courts, for example by creating a three-judge panel of the D.C. Circuit or Federal Circuit charged with the task. Under the U.S. Constitution's Appointments Clause,[521] this is permissible as long as the appointees are inferior rather than principal officers,[522] or presumably if they are not officers at all.[523] The case law in this area is controversial, as illustrated most famously by Justice Scalia's dissent in *Morrison v. Olson*,[524] in which the majority found that the independent counsel was an inferior officer. The case law turned towards Justice Scalia's point of view in *Edmond v. United States*,[525] which emphasized that "the term 'inferior officer' connotes a relationship with some higher ranking officer or officers below the President."[526] Because the work of the judges on the Coast Guard Court of Criminal Appeals at issue in the case was supervised by higher-ranking

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[518] *See supra* text accompanying note 444.

[519] The tradeoff is familiar to debates on administrative law. William Fox, for example, notes:

Assignment of ALJ's to specific agencies is something that has been debated at length on the federal level. To a certain extent, an agency assignment still leaves the ALJs at the mercy of the agencies for things such as office assignments, secretarial services and staff support. By contrast, removing ALJs from individual agencies and assigning them to a central board which would then farm out individual judges to agencies on a case-by-case basis would diminish their expertise in specific areas of regulation.

WILLIAM F. FOX, JR., UNDERSTANDING ADMINISTRATIVE LAW § 8.06, at 245 (4th ed. 2000).

[520] I mean to invoke welfare economics in the broadest possible sense. *See* Kaplow & Shavell, *supra* note 350, at 977-99 (arguing that welfare economics encompasses a wide range of issues sometimes not considered to be part of efficiency analysis).

[521] U.S. CONST. art. II, § 2, cl. 2

[522] *Id.* ("[T]he Congress may by Law vest the Appointment of such inferior Officers, as they think proper, in the President alone, in the Courts of Law, or in the Heads of Departments.").

[523] If they are not officers at all, but mere employees, the courts need not even be used to achieve independence. An agency, such as the Office of Personnel Management, might be charged with appointing those who would determine the size of patent prizes. Administrative law judges are considered employees and are appointed by the agencies that employ them. *See* 5 U.S.C. § 3105 (West. Supp. 2001); Landry v. FDIC, 204 F.3d 1125 (D.C. Cir. 2000) (holding that because administrative law judges do not enter final decisions on behalf of the United States, they are not officers).

[524] 487 U.S. 654, 697 (1988) (Scalia, J., dissenting). Justice Scalia attacks the majority's conclusion that the independent counsel is an inferior officer in *id.* at 715-21.

[525] 520 U.S. 651 (1997). Justice Scalia wrote the opinion for the Court, joined by seven other Justices.

[526] *Id.* at 663.

officers, the Court found the judges to be inferior officers.[527] It made this finding even though the higher-ranking officials were required to uphold the judges' rulings as long as there was some "competent evidence" to support the decisions.[528]

Perhaps the best constitutionally permissible structure, then, would be one in which the agency is an independent one, with the agency members appointed by the President and not removable without cause. These members would be responsible for any needed rulemaking, for example in specifying regulations concerning how applications should be filed,[529] as well as any other details that need not be included in the organic statute. The members of the agency, however, would not decide in the first instance what size prizes to award in individual cases. Those decisions would be made by individuals appointed by a judicial panel pursuant to procedures set forth in the statute.[530] Prize applicants or their adversaries would be able to appeal decisions to the agency members, but under a very limited standard of review, such as one that allows reversal if the prize decision could not be justified on any reasonable theory of public policy. Of course, this is not the only way that the prize agency intelligently could be structured. The possibility of this arrangement, however, suggests that the goal of creating an independent agency that prize applicants would not be able to capture is an achievable one.

H. Adversarial vs. Ex Parte Presentation

Agencies disbursing funds, such as the Social Security Administration, typically operate via nonadversarial procedures, with appellants pleading their cases before administrative law judges.[531] Even given such procedures, a case against an applicant typically already has been made by a caseworker who has determined that the applicant is not entitled to benefits,[532] so the decisionmakers have information supporting both sides of the case before them. In other administrative contexts, the United States is officially a named party opposing particular applicants, either before an administrative agency or before a court.[533] Finally, there are situations in which private parties oppose each other before an administrative agency.[534] Private adversarialness has the virtue of ensuring rigorous litigation of issues.[535]

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[527] *Id.* at 666.

[528] *Id.* at 665.

[529] Such regulations would likely be classified as "procedural rules" and thus could be made without notice-and-comment rulemaking. *See* 5 U.S.C. § 553(b)(A) (excluding from notice-and-comment requirements "interpretive rules, general statements of policy, or rules of agency organization, procedure, or practice"). Congress thus need not necessarily grant the authority to conduct any notice-and-comment rulemaking.

[530] For an example of a statute authorizing a judicial panel to make appointments, see 28 U.S.C. § 49(a) (1994), the independent counsel statute itself. The law expired on June 30, 1999. *Id.* § 599 (1994).

[531] *See* 20 C.F.R. §§ 404.900-404.906 (2001). The Supreme Court emphasized the nonadversarial nature of Social Security decisions in *Sims v. Apfel*, 503 U.S. 103, 107-08 (2000), holding that exhaustion of issues was not required as a result for decisions to be challenged in court.

[532] For a discussion of the role of caseworkers, see *Goldberg v. Kelly*, 397 U.S. 254, 258-59 (1970).

[533] For an overview of the United States's role as a party in civil disputes, see GREGORY C. SISK, LITIGATION WITH THE FEDERAL GOVERNMENT 1-17 (2000).

[534] Under *Crowell v. Benson*, 285 U.S. 22 (1932), a "legislative court" can adjudicate a private rights case as long as an Article III court has de novo review power over all issues of law as well as over constitutional facts. Later cases indicate more broadly that agencies may adjudicate private rights cases that are incident to public regulatory schemes, as long as this does not adversely affect "the institutional integrity of the [Article III] Judiciary." Commodity Futures Trading Comm'n v. Schor, 478 U.S. 833, 851 (1986).

[535] The Supreme Court has emphasized the importance of ensuring adversarialness in its standing jurisprudence. *See, e.g.*, Sierra Club v. Morton, 405 U.S. 727, 732 (1972).

A danger in the patent prize system, similar to the danger in any other administrative program disbursing funds, is that prize applicants will tend to overstate the amount of monopoly profit that they have foregone and the amount of social benefit that they have provided. They might do this by shading or mischaracterizing facts, as well as by expressing any relevant economic theory in the way most favorable to them. Decisionmakers, of course, might ferret out weaknesses in prize applications, just as judges seek to expose weak legal arguments, but it might be useful for an agency to provide additional personnel to seek to identify problems with applications. For example, the agency might employ caseworkers charged with examining an application, investigating the assertions it makes, and making a recommendation to the decisionmaker. A limitation of this approach is that caseworkers have no inherent incentive to oppose the applicant, and so some applications might receive stronger opposition than others for reasons unrelated to the merits.[536]

Relying on private parties to oppose patent prize applications provides the possibility of an energized alternative. A limited way to obtain private opposition would be by allowing whistleblower private prosecutors, and indeed prize applications presumably by default would be covered by the False Claims Act.[537] The danger, however, extends beyond fraud, and allowing whistleblowers to sue in federal court would add cumbersome litigation to the administrative process. An alternative way of obtaining private opposition would be to allow prize applicants to oppose other prize applicants. If there are a small number of prize applicants competing for a limited fund, this could be effective. If there are a large number of applicants, however, then the success of any one will have little effect on the others, and even with a relatively small number, free-rider problems may lead to too few applicants opposing others, and coordination problems may lead to redundant opposition where several applicants together oppose another.

An alternative approach is to ensure that there is a single party with an incentive to oppose each application. One strategy, unconventional but with some antecedents in legal practice,[538] would be to auction off the right to oppose the applicant, with auction revenues being added to the fund. The winner of the auction eventually would receive some payment dependent on performance, for example receiving a prespecified percentage of all money in the fund not awarded to the prize applicant. This approach is not free, as bidders would offer less than they expect to receive, because of the cost of litigation as well as the risk of undertaking such a project. Nonetheless, it is a simple and efficient way for the government to identify the party best situated to serve as an adversary, considering any private information that the bidders might have, as well as the bidders' ability to oppose applicants cheaply and effectively.[539]

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[536] A similar administrative context is federal sentencing, in which probation offers make recommendations to judges. Commentators have suggested that probation officers have considerable discretion even within the confines of the federal Sentencing Guidelines, leading to disparity in treatment of applicants. *See, e.g.*, Gerald W. Heaney, *The Reality of Guidelines Sentencing: No End to Disparity*, 28 AM. CRIM. L. REV. 161, 200-02 (1991).

[537] The Act covers anyone who "knowingly presents, or causes to be presented, to an officer or employee of the United States Government or a member of the Armed Forces of the United States a false or fraudulent claim for payment or approval." 31 U.S.C. § 3729(a)(1) (1994).

[538] Some courts have conducted auctions for the right to become class counsel. *See In re* Amino Acid Lysine Antitrust Litig., 918 F. Supp. 1190 (N.D. Ill. 1996) (directing the appointment of the firm with the fee structure most favorable to clients); Kathryn Kranhold & Richard B. Schmitt, *To Rein in Fees, Some Judges Ask Attorneys to Bid*, WALL ST. J., Dec. 6., 2000, at B1 (discussing the auction approach to selecting class counsel. For a criticism that the mechanics of some of the auctions has resulted in lead counsel with incentives systematically different from plaintiffs', see John C. Coffee, Jr., *Securities: Class Actions*, NAT'L L.J., Sept. 14, 1998, at B6.

[539] Perhaps the proposal most on point is A.C. Pritchard's to select appellate counsel in criminal cases on the basis of an auction, though selecting an opponent to a patent grant might be politically more palatable. *See* Pritchard, *supra* note 127.

I. Alternative vs. Conventional Dispute Resolution

Making decisions on prizes will consume social resources, just as all litigation and decisionmaking systems do. The agency itself will have to pay salaries and overhead. Whether these expenses are directly paid out of the fund that otherwise will be used for prizes or are budgeted separately, they will have opportunity costs. In addition, applicants for prizes themselves will expend resources on the applications and on pursuing any means of administrative or judicial recourse. Up to a point, such expenditures may be socially worthwhile, if they can be expected to improve the quality of agency decisions.[540] Past a certain point, however, privately optimal expenditures may be socially excessive.[541] This is especially true in a decisionmaking environment in which all that matters from a social perspective is that prizes are correct on average. Presumably, increased spending on persuading decisionmakers might make any bias that might be anticipated less likely to occur. There would be no social benefits, however, to reducing noisy random errors from the social optimum.

These considerations make it particularly important for the decisionmaking system to keep litigation costs low. Perhaps the most obvious response to the prospect of high litigation costs would be to mandate arbitration, given evidence that arbitration tends to be cheaper than other forms of dispute resolution.[542] Simply calling for arbitration, however, is inadequate, because there are many forms of arbitration.[543] In part, the term "arbitration" suggests that decisionmaking is privatized.[544] Though potentially important, especially because privatization may provide entrepreneurial incentives to innovate, the issue of whether private or government-supplied decisionmaking is superior is beyond my scope here.[545] Perhaps more importantly, the term "arbitration" suggests that the form of decisionmaking is different from that in courts. The relevant question is whether there are any specific alterations to the conventional adjudicative model that would be particularly useful here.

Arbitration is often thought to be more informal than judicial decisionmaking.[546] Such informality may be particularly useful in the prize context because of the relatively low need to correct errors that arbitrators make.[547] Level of formality, however, may not be the only axis

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[540] Spending on litigation in conventional contexts similarly may be beneficial by improving accuracy. *See* Kaplow, *supra* note 430 (explaining the importance of accuracy in adjudication).

[541] *See* Steven Shavell, *The Level of Litigation: Private Versus Social Optimality of Suit and of Settlement*, 19 INT'L REV. L. & ECON. 99, 99 (1999) (noting that in the absence of intervention "the privately determined level of litigation" may be excessive because "[w]hen a party spends on litigation, he does not take into account the litigation costs that he induces others to incur").

[542] *See, e.g.*, Wayne N. Outten, *Negotiating and Drafting Severance Agreements on Behalf of Employees*, 548 PLI/LIT. 957, 985-86 (1996) ("As compared to judicial litigation, arbitration is presumably faster and cheaper, though not necessarily as fair and just."). Some commentators, however, have questioned whether arbitration is in fact cheaper than court-based adjudication. *See, e.g.*, STEPHEN B. GOLDBERG AT AL., DISPUTE RESOLUTION: NEGOTIATION, MEDIATION AND OTHER PROCESSES 234-35 (3d ed. 1999); Deborah R. Hensler, *Does ADR Really Save Money? The Jury's Still Out*, NAT'L L.J., Apr. 11, 1994, at C2; James Lyons, *Arbitration: The Slower, More Expensive Alternative?*, AM. LAW., Jan.-Feb. 1985, at 107.

[543] For an analysis of the variety of forms that alternative dispute resolution generally and arbitration in particular may take, see Jack M. Sabatino, *ADR as "Litigation Lite": Procedural and Evidentiary Norms Embedded Within Alternative Dispute Resolution*, 47 EMORY L.J. 1289, 1296-1303 (1998).

[544] *See id.* at 1293-94 (placing ADR in the "broader context of the increasing privatization of traditional governmental functions").

[545] *See generally* William M. Landes & Richard A. Posner, *Adjudication as a Private Good*, 8 J. LEGAL STUD. 235 (1979) (comparing public and private provision of adjudication services).

[546] The informality of arbitration is exhibited in part by loosened attention to procedural and evidentiary rules. *See, e.g.*, Edward Brunet, *Arbitration and Constitutional Rights*, 71 N.C. L. REV. 71, 86 (1992) ("Informality is the hallmark of arbitral proceedings. Formal rules of evidence are avoided by the sponsors of arbitration.").

[547] If we assume that procedural and evidentiary rules ordinarily serve to improve the quality of decisionmaking, arbitration can be expected to produce a lower quality of decision. *But see* Judith Resnik, *Many Doors? Closing Doors? Alternative Dispute*

around which adjudicative systems vary. Such systems may also vary in how they allocate costs, for example in whether they require the losing party to bear the costs of the winner.[548] Loser pays rules may be useful ways of discouraging frivolous litigation,[549] though they may not be beneficial in the prize context for two reasons. First, loser pays rules effectively raise the stakes of litigation and thus *increase* costs in cases that are litigated[550] and also may produce lower settlement rates.[551] Second, a pure loser pays rule requires the identification of a loser, which might seem difficult when the only question in many cases will be how large a prize should be, rather than whether a prize is appropriate.

It would, however, be possible to structure the litigation so that a winner and loser could be identified. If there is a prize applicant and an opponent, each side could be required to announce the amount of money that each side thinks that the prize applicant ought to receive. The decisionmaker would then be required to pick between these alternatives (but not a number between them). For example, if the prize applicant requested two million dollars and the opponent requested one million dollars, the decisionmaker would be required to award either one or two million, and not zero or one-and-a-half or three.[552] The winner, of course, would be whichever party's submission the decisionmaker accepted. This would make it easy to implement a loser pays rule. It also might make feasible a very different sort of rule discouraging excess litigation costs. For example, a rule might provide that parties may spend no more than a specified percentage of the amount of money sought, or no more than a specified percentage of

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Resolution and Adjudication, 10 OHIO ST. J. ON DISPUTE RESOL. 211, 246-53 (1995) (considering a variety of arguments that ADR may produce better decisions than adjudication). If a lower-quality decision is simply a noisy decision, then arbitration may be more acceptable in the patent prize context than in a context in which we care about the compensation that any individual receives rather than just that the average prize is appropriate.

[548] Loser pays is often called the British rule, though variants of the British rule exist. On the economic choice among the various alternatives, see Richard D. Cooter & Daniel L. Rubinfeld, *Economic Analysis of Legal Disputes and Their Resolution*, 27 J. ECON. LIT. 1067 (1989); John J. Donohue III, *Opting for the British Rule, or If Posner and Shavell Can't Remember the Coase Theorem, Who Will?*, 104 HARV. L. REV. 1093 (1991); John P. Gould, *The Economics of Legal Conflicts*, 2 J. LEGAL STUD. 279 (1973); William M. Landes, *An Economic Analysis of the Courts*, 14 J.L. & ECON. 61 (1971); A. Mitchell Polinsky & Daniel L. Rubinfeld, *Does the English Rule Discourage Low-Probability-of- Prevailing Plaintiffs?*, 27 J. LEGAL STUD. 519 (1998); Richard A. Posner, *An Economic Approach to Legal Procedure and Judicial Administration*, 2 J. LEGAL STUD. 399 (1973); I.P.L. P'ng, *Strategic Behavior in Suit, Settlement, and Trial*, 14 BELL J. ECON. 539 (1983); Steven Shavell, *Suit, Settlement, and Trial: A Theoretical Analysis Under Alternative Methods for the Allocation of Legal Costs*, 11 J. LEGAL STUD. 55 (1982); Edward A. Snyder & James W. Hughes, *The English Rule for Allocating Legal Costs: Evidence Confronts Theory*, 6 J.L. ECON. & ORG. 345 (1990); Mark S. Stein, *The English Rule with Client-to-Lawyer Risk Shifting: A Speculative Appraisal*, 71 CHI.-KENT L. REV. 603 (1995); and Bradley L. Smith, Note, *Three Attorney Fee-Shifting Rules and Contingency Fees: Their Impact on Settlement Incentives*, 90 MICH. L. REV. 2154 (1992).

[549] For a fee shifting proposal that seeks to avoid frivolous suits while avoiding the problems of other such proposals, see Lucian Arye Bebchuk & Howard F. Chang, *An Analysis of Fee Shifting Based on the Margin of Victory: On Frivolous Suits, Meritorious Suits, and the Role of Rule 11*, 25 J. LEGAL STUD. 371 (1996).

[550] *See, e.g.*, Ronald Braeutigam et al., *An Economic Analysis of Alternative Fee Shifting Systems*, 47 J.L. & CONTEMP. PROBS. 173 (1984); John C. Hause, *Indemnity, Settlement, and Litigation, or I'll Be Suing You*, 18 J. LEGAL STUD. 157 (1989); Avery Katz, *Measuring the Demand for Litigation: Is the English Rule Really Cheaper?*, 3 J.L. ECON. & ORG. 143 (1987).

[551] *See, e.g.*, Richard A. Posner, *Comment on Donohue*, 22 LAW & SOC'Y REV. 927, 928 (1988) (suggesting that lower settlement rates are likely); Steven Shavell, *Suit, Settlement, and Trial: A Theoretical Analysis Under Alternative Methods for the Allocation of Legal Costs*, 11 J. LEGAL STUD. 55, 65 (1982) (providing a model in which loser pays could lower settlement rates).

[552] Given such a system, the auction to pick an opponent might be modified. *See supra* text accompanying notes 538-539. The auction could occur after the prize applicant originally submitted a proposal, with the auction winner entitled to some prespecified percentage of any money below the amount requested that is ultimately awarded. Suppose, for example, that the percentage is 25% and the applicant requested two million dollars. A potential bidder would first determine the amount with which it would counter, say $1 million. The bidder would then estimate the probability of winning and the cost of litigating the case. If there would be a 50% chance of winning and a $100,000 cost, then the bidder would bid .50*.25*($2,000,000 - $1,000,000) - $100,000 = $25,000.

the difference between the two submitted amounts, on litigation costs, with significant mandated increases in prizes for excessive litigation expenditures.

Though uncommon,[553] and though not traditionally used as a vehicle for enabling enactment of a rule that would effectively reduce litigation costs, this is not a novel system. Indeed, the system is used in one well-known application, arbitration decisions to determine salaries of arbitration-eligible professional baseball players, thus giving the system the name "baseball arbitration."[554] Commentators have emphasized that baseball arbitration promotes revelation of information and thus may facilitate settlement. In typical settlement negotiations, both parties have incentives to puff, claiming their positions to be stronger than they are, and such strategic bargaining sometimes will prevent the parties from reaching a settlement.[555] With baseball arbitration, parties may still exaggerate, but only so much, because exaggeration increases the chance that the other party's figure will be selected. Baseball arbitration cases often settle at the midpoint of the requests by each of the opposing parties.[556] By allowing and through baseball arbitration encouraging settlement, the prize system could substantially reduce litigation costs.

The disadvantage of baseball arbitration, of course, is that the decisionmaker must choose one of the two proffered options even if some other figure would better promote justice. Presumably, this would be the objection to using baseball arbitration in tort cases.[557] The disadvantage, however, is not significant with prize systems, because achieving accurate decisions on average is all that matters. In addition, the disadvantage also can be seen as a strength, in that it reduces the probability of extreme outcomes. If different decisionmakers arrive at prize numbers from scratch, it is possible that one decisionmaker will arrive at a number orders of magnitude higher than the number that approximates other decisionmakers would produce.[558] The possibility of massive aberrations is of greater concern than more modest noise, because such extreme decisions, if unsystematic, turn prizes into lottery tickets. Though prize applicants sometimes might gamble by submitting an extreme number even in baseball

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[553] It may indeed become increasingly rare in the future. *See Commission Votes to Eliminate Baseball Arbitration from Workers' Compensation Cases*, 11 WORLD ARB. & MEDIATION REP. 241 (2000). *But see* Jay A. Soled, *Transfer Tax Valuation Issues, the Game Theory, and Final Offer Arbitration: A Modest Proposal for Reform*, 39 ARIZ. L. REV. 283, 305 (1997) (noting the use of final offer arbitration in a wide range of employment disputes); Elissa M. Meth, Note & Comment, *Final Offer Arbitration: A Model for Dispute Resolution in Domestic and International Disputes*, 10 AM. REV. INT'L ARB. 383 (1999) (advocating the use of final offer arbitration in a variety of decisionmaking contexts); Paul M. Gordon, Comment, *Submitting "Fire Value" to Final Offer Arbitration*, 63 U. COLO. L. REV. 751 (1992) (advocating expansion of final offer arbitration to corporate law context).

[554] The system sometimes is also called "final-offer arbitration." For a comparison of final-offer arbitration to other forms of arbitration, see Jonathan M. Conti, *The Effect of Salary Arbitration on Major League Baseball*, 5 SPORTS L.J. 221, 230-31 (1998).

[555] As Kent Syverud explains, "Defendant may in some instances refuse the settlement demand, and inadvertently force a trial, even where the demand is lower than the costs of going to trial, because of a mistaken belief that further bargaining will lead to an even more favorable demand." Kent D. Syverud, *The Duty to Settle*, 76 VA. L. REV. 1113, 1129 (1990); *see also* Robert Cooter, *The Cost of Coase*, 11 J. LEGAL STUD. 1, 17-29 (1982); Robert Cooter et al., *Bargaining in the Shadow of the Law: A Testable Model of Strategic Behavior*, 11 J. LEGAL STUD. 225 (1982).

[556] *See, e.g.*, *Cameron Gets 1-Year, $2.225 Million Pact*, AP, Feb. 15, 2000, *available at* 2000 WL 7580410 (describing the resolution of two baseball arbitration cases, both of which settled at the midpoint).

[557] For a proposal to use baseball arbitration to determine damages in tort trials, see Jason Micah Ross, Note, *"Baseball Litigation": A New Calculus for Awarding Damages in Tort Trials*, 78 TEX. L. REV. 439 (1999).

[558] Some commentators have argued that baseball arbitration has not been successful in inducing offers that are close together. *See, e.g.*, John P. Gillard, Jr., *An Analysis of Salary Arbitration in Baseball: Could a Failure to Change the System Be Strike Three for Small-Market Franchises?*, 3 SPORTS L.J. 125, 131 (1996) (noting that by 1993, "the average differential between players' requests and owners' offers in salary arbitration was . . . $1,660,560," with players' requests on average 63% higher than clubs' offers). Requests and offers, however, never differ by orders of magnitude, so the system has been successful if the goal is seen as eliminating rare but drastic errors.

arbitration,[559] the incentives to make reasonable suggestions seem likely to reduce the probability of extreme outcomes.

It is also possible that the baseball arbitration approach will reduce legal expenses in cases that are not settled. The reason is that parties might choose to omit or curtail presentation of evidence or arguments that would have only a small effect on the decisionmaker's calculation of the optimal prize. A prize applicant, for example, would have an incentive in an open-ended litigation system to argue for a relatively insignificant upward adjustment in a prize, as long as the money spent on the litigation is less than the expected upward adjustment. With baseball arbitration, such a minor adjustment plausibly will often have no effect on the probability that the decisionmaker would choose one submission or the other, a choice that will depend primarily on the resolution of larger disputes. Of course, there may be some cases that are so close that the resolution of a small issue could be just enough to tip the balance all the way from one submission to another, and here the parties would spend more than in open-ended litigation on advancing this issue. This seems likely to be the smaller effect, however, since there are likely to be diminishing returns to developing minor issues in a case.[560]

A final virtue of the baseball arbitration approach is that it might help overcome a problem identified earlier, uncertainty among potential prize applicants about the likely value of other applications if prizes are distributed from a fixed fund.[561] With the baseball arbitration approach, prize applicants might be required to announce prize valuations as soon as they submit applications, thus making possible fairly accurate estimates of the value of all applications submitted so far. The chief drawback of this approach is that prize applicants would not have the benefit of the delay in choosing an appropriate figure. This drawback, however, affects all prize applicants equally and thus should not significantly affect the proportion of the fund that any applicant will expect on average to receive. Moreover, opponents might be required to submit their figures early too, shortly after applications are filed, offsetting any advantage and encouraging settlements before the entire delay period has even elapsed.[562] Alternatively, prize applicants might be allowed to change their submissions for a fee depending on the magnitude of the change, perhaps a dime for each dollar change, thus ensuring at least a modest incentive for accuracy when initially filing an application.

Baseball arbitration, of course, is not the only approach that might be used to discourage socially excessive litigation spending. A simple alternative or supplement would be to encourage decisionmakers to take the patent applicant's spending on litigation into account in calculating

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[559] For example, suppose an applicant believes that the vast majority of decisionmakers would give somewhere about $1 million. The applicant still might submit a bid of $100 million if more than one of every hundred decisionmakers would grant the request. The more risk-averse the applicant, the less likely such a go-for-broke strategy would be. Evidence for this can be seen in that the percentage difference between players' owners and owners' requests has risen dramatically from 1974 to 1993. *See id.* at 131-32. While Gillard seems to view this change as indicative of some flaw in baseball arbitration itself, this explanation makes little sense, given that baseball arbitration was used in 1974 too. What has changed is that salaries and team values have increased by so much that the participants in baseball arbitration are less risk averse.

[560] The tradeoffs are similar to those involved in the choice between all-or-nothing verdicts and compromise verdicts in civil litigation. With the more familiar all-or-nothing verdicts, a determination that the defendant more likely than not engaged in acts resulting in liability, results in full damages for the plaintiff, while compromise verdicts apportion liability to the probability of guilt. A system of all-or-nothing verdicts may make it less likely that a party will introduce a relatively minor issue. *See* Abramowicz, *supra* note 425, at 296.

[561] *See supra* text accompanying note 487.

[562] In effect, this approach partly neutralizes one of the benefits of delay, allowing the decisionmaker to take into account information emerging after the application is filed. *See supra* Part III.B.1. This, however, is a concern only if this better information ex post makes decisionmaking ex ante seem more efficient on average, for example because it offsets the adverse selection problem. The adverse selection problem, however, is of lesser concern when an opponent to the prize applicant is incentivized to consider and seek out all relevant information.

prizes.[563] Because such spending offsets any social benefit of activity designed to decrease deadweight loss, a prize based on social benefit should subtract concomitant social costs. The logic underlying this suggestion is the same logic underlying the broader proposal, that broad discretion is useful when only accurate results on average need to be achieved. A decisionmaker might even be permitted to award a negative dollar value prize (in which case, the applicant in effect would pay a fee), if the administrative cost of processing an application exceeded the social benefit of the action performed. This would help limit frivolous applications. At the same time, a decisionmaker also might increase a prize (or lean toward the higher submitted value if baseball arbitration is used) if the opponent's spending is excessive.[564]

J. Assessment

With the proposal developed, we can now summarize by considering how it responds to problems of the patent prize systems that others have proposed, after which we can consider anew the general hurdles for patent prize systems discussed in Part II.

The technical problems with the proposals considered in Part I vary, but in the end all of the proposals fail to prevent possible large and systematic errors in patent prizes. The Guell and Fischbaum proposal was problematic primarily because it was underspecified, assuming that the government would be able to extrapolate from a "test market" without explaining how. The risk was thus that the government might do a poor job of estimating patent value, and inaccuracies in such decisionmaking might distort investment.[565] The Shavell and van Ypersele proposal might seem at first to overcome this problem by creating a specific formula for disbursing prizes. Ultimately, though, it produced a similar problem, that of deliberate manipulation of the formula by the government, since decisionmakers would have considerable discretion in determining the a priori family of demand curves.[566] The Kremer market mechanism sought to eliminate governmental discretion but in the end required considerable human intervention to counter collusion and other manipulations of the mechanism.[567] Finally, Lichtman's proposal risks providing coupons without significantly reducing deadweight loss if the government's information is poor.[568] We also saw that Lichtman's argument might indirectly support some form of prizes for patent holders that agree to sell their products at low prices, though the government might err by providing too high a prize for too small a price concession.[569]

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[563] Of course, the government would not need to tell decisionmakers to take this consideration into account, since decisionmakers might do so on their own. As argued above, however, there is a strong argument for specifically identifying factors that are clearly relevant but that some percentage of decisionmakers otherwise would be expected to ignore. *See supra* text accompanying note 421.

[564] The opponent's spending, however, is less of a concern, since that can be controlled indirectly by altering the percentage or other incentive that the opponent has to oppose the prize application. An opponent guaranteed 25% of any savings relative to the prize applicant's suggested price will invest less in litigation than one guaranteed 50%. A. Mitchell Polinsky has made a similar point concerning qui tam litigation, noting that if qui tam litigation would produce socially undesirable overenforcement of law by private parties, paying qui tam plaintiffs only some percentage of any judgment, with the remainder going to the government, can overcome this problem. *See* A. Mitchell Polinsky, *Private Versus Public Enforcement of Fines*, 9 J. LEGAL STUD. 105, 108 (1980) ("Regulating private enforcers by paying them something different [from] the fine for each violator detected can achieve the socially most preferred outcome . . . .").

[565] *See supra* text accompanying note 81 (noting the danger of distorting investment decisions).

[566] *See supra* text accompanying note 123.

[567] *See supra* text accompanying notes 165-166.

[568] *See supra* text accompanying notes 190-191.

[569] *See supra* notes 192-195 and accompanying text.

My proposal answers these problems by giving up on the challenge of developing a perfect formula or algorithm. By giving great discretion and by delaying award of prizes sufficiently so that patent holders will not be able to predict who the decisionmakers will be or what formulas they will use, the government eliminates the need for creating such a formula. As long as inventors and patent holders cannot predict any systematic biases in the ultimate prize awards, the system will be as good as one that they would believe incorporates a hypothetical formula for providing socially optimal prizes immediately.[570] In addition, the system allows patent holders to choose the most efficient path for eliminating deadweight loss, including approaches similar to those recommended by the proposals discussed in Part I,[571] and it encourages the patent holders who are capable of producing the greatest ratio of social to private benefit to opt into the system.[572] The proposal, of course, is not a free lunch. Some systematic biases may be predictable, and flexibility may produce uncertainty that the government indirectly will have to pay patent holders to bear.[573]

My proposal responds to many of the general hurdles for patent prize systems by allowing decisionmakers to adjust prizes after taking them into account and thus indirectly by incentivizing patent holders and other innovators to consider them. For example, a patent holder will continue to invest in commercializing and promoting a product if doing so is necessary to receive a prize.[574] This flexibility also addresses the common pool problem, as long as government decisionmakers will take it into account on average, for example by penalizing a prize applicant whose release of a patent into the public domain produced wasteful rent-seeking.[575] In addition, because the proposal would not require an applicant to obtain a patent, it would encourage inventors to consider the tradeoffs between obtaining patents and simply releasing research results. This would reduce redundant research by competitors and encourage research activities that might produce social benefit even if they do not result in patentable discoveries. Researchers also might anticipate that decisionmakers would award less than the total social value of an innovation that otherwise would produce a patent race to discourage such an occurrence.[576]

The proposal clears other hurdles identified through a variety of strategies. It accomplishes the screening function that Kieff deemed essential to the patent system by creating opponents to prize applications who would have an incentive to point out any weaknesses, including nonpatentability.[577] The delay before patents are awarded combats the adverse selection problem[578] and prevents a natural monopolist from obtaining a patent prize while still charging monopoly prices.[579] Delay also may reduce the administrative and litigation costs of operating the patent agency, since the expense is discounted into the future.[580] The alternative

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[570] *See supra* text accompanying note 449.

[571] *See supra* text accompanying notes 417-418.

[572] *See supra* text accompanying note 483.

[573] *See supra* text accompanying notes 493-494.

[574] *See supra* text accompanying notes 225-227.

[575] *See supra* text accompanying note 418.

[576] *See supra* text accompanying notes 294-295.

[577] *See supra* Part III.H.

[578] *See supra* Part II.C.

[579] *See supra* text accompanying and following note 328.

[580] This will be true unless the cost of operating the administrative agency rises by more than the interest that the fund will earn. That might occur if a large portion of the costs are for paying decisionmakers; because the labor productivity of such decisionmakers may not increase with improvements in technology, their salaries will tend to increase at a rate faster than inflation. Lack of improvement in labor productivity similarly explains why the cost of higher education has generally outpaced

dispute resolution techniques may reduce litigation costs by encouraging settlement,[581] and the independence of the prize agency reduces the possibility and magnitude of rent-seeking costs.[582] The use of a fund, meanwhile, allows the government to budget for patent prizes, eliminating concern about a potentially open-ended liability.[583] Even with all of these improvements, of course, it may be impossible to estimate precisely what the costs of operating this patent prize system will be, or how much adverse selection if any will survive. Nor is it possible to prove mathematically that the benefits of the prize system in reducing deadweight loss will be worth it. The large size of such deadweight losses, however, suggests that the patent prize system I have described will be a significant improvement.

IV. APPLICATIONS FOR PRIZE SYSTEMS

So far, I have developed a prize system that is likely to be both simpler to implement and more flexible than the prize proposals that other commentators have offered. In addition, the Article has shown that establishing a prize fund as an adjunct to the patent system is likely to have greater benefits than costs, especially because a relatively small fund will tend to induce actions with the highest ratio of social benefit to private cost.[584] This conclusion, however, leaves much unanswered, especially given the argument that it may be better to adopt a prize system for a specific purpose than for patents or intellectual property in general.[585] Even a modest prize fund experiment seems more likely to come as a response to a specific need than from a generalized desire to tweak our intellectual property institutions. This Part describes several potential applications from a wide range of possibilities, with two principal considerations dictating the choice of examples. First, the examples all reflect current controversies and problems, illustrating how prize systems might be used to address specific issues of contemporary concern. Second, and more importantly, each of the examples presents different challenges, showing both the potential flexibility of prize systems and how they might be modified depending on the purposes for which they are used.

Of course, I have also chosen the specific examples because they allow for a positive portrayal of prize systems in general and my proposal in particular. Many governmental programs would not be suitable candidates for the creation of prize systems. One criterion is that a program be one in which the government cares more about the investments made in anticipation of receiving prizes than in the fairness of any awards to the ultimate prize applicants.[586] A second criterion is that there should be no easily administrable alternative to a prize system. A prize system, after all, involves costs,[587] and if there is a simple program that

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inflation. *See, e.g.*, D. Bruce Johnstone, *Learning Productivity: A New Imperative for American Higher Education*, at http://www.educause.edu/nlii/articles/johnstone.html (last visited Sept. 15, 2001).

[581] *See supra* Part III.I.

[582] *See supra* Part III.G.

[583] *See supra* Part III.C.

[584] *See supra* text accompanying notes 481-483.

[585] *See supra* Part III.E.

[586] Fairness should be a relatively small concern in the patent context if the goal of the patent system is utilitarian rather than natural rights. *See supra* note 433; *see also supra* note 365 (arguing that due process is not a significant goal in the prize context). Inventors who are concerned about arbitrary treatment may sell their claims to someone willing to bear the risk. *See supra* Part III.D.

[587] Some of these costs are discussed *supra* Part II.D. My proposal also introduces an additional type of cost, that of uncertainty, since third party purchasers of rights to prizes would insist on some compensation for the uncertainty of those prizes. *See supra* text accompanying note 494. An additional criterion to evaluate proposals would be consideration of the uncertainty involved in investments in an alternative regime.

effectively achieves social goals by inducing the government to make direct payments at the time the benefit is intended, there is no need to incur these costs. These criteria provide a strong argument against establishment of a prize system, say, for providing retirement benefits in lieu of Social Security. Though we could imagine allowing each retiree to request a "retirement prize," we would sensibly worry about inequities in treatment, and we may feel that existing formulas are fairer than any subjective alternative.[588]

A. Patent Proposals

1. Prescription Drugs for Senior Citizens

Among the most salient issues in the 2000 Presidential campaign was creation of a governmental program to extend prescription drug coverage to senior citizens.[589] The debate was not on whether to create such a program, but what form the program should take.[590] As an interim measure following his election, President Bush approved a zero-cost program to allow senior citizens to pool their purchasing power for prescription drugs,[591] but critics have questioned the legality of Bush's decision to act in the absence of new legislation,[592] and no one has argued that it serves as a comprehensive reform alternative. Although the September 11 terrorist attacks may have placed the issue on the back burner,[593] the apparent popularity of the concept makes it seem likely as a future governmental initiative.

The problem, of course, is what form the program will take.[594] President Bush's announced plan has emphasized the provision of block grants to states.[595] Some legislators,

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[588] Retirees in such a hypothetical program in theory could sell their claims to third parties, and third parties would have strong incentives to be methodical in predicting how much each retiree would be likely to receive. Thus, it is possible that among all retirees who sell to third parties, results could be quite consistent, or at least more consistent than the unguided administrative agency deciding how much each retiree deserves. One problem with relying on such sales, however, is that the endowment effect suggests that some retirees would be hesitant to sell their rights to retirement prizes to third parties. *See generally* Jack L. Knetsch, *The Endowment Effect and Evidence of Nonreversible Indifference Curves*, 79 AM. ECON. REV. 1277 (1989) (providing experimental evidence of an endowment effect); Jeffrey J. Rachlinski & Forest Jourden, *Remedies and the Psychology of Ownership*, 51 VAND. L. REV. 1541, 1551-59 (1998) (discussing the endowment effect). Among such retirees, the prize system would produce considerable uncertainty. At the same time, there do not seem to be any major problems with the distribution of retirement benefits, aside perhaps from arguments about distribution that Congress presumably could address if it wanted to do so. In contrast to the various patent cases, the system does not eliminate any deadweight loss, and there thus seems to be little reason to adopt it.

[589] *See, e.g.*, *Poll: Prescriptions 'Very Important' to 6 in 10 Americans*, CHI. TRIB., Oct. 16, 2000, at 8 (reporting that 60% of Americans considered the issue of prescription drug coverage to be "very important" in their vote for President).

[590] Governor Bush maintained in television advertisements that Vice President Gore's plan would give too much of a role to "Washington bureaucrats" in deciding what prescriptions would be covered, while Gore complained that Bush's plan would leave many senior citizens with no assistance and force others to obtain coverage through private companies. *See, e.g.*, *Dueling over Drug Coverage*, http://cbshealthwatch.medscape.com/cx/viewarticle/221865 (last visited Sept. 25, 2001).

[591] *See, e.g.*, Shailagh Murray & Laurie McGinley, *Bush Plans to Propose a Discount Card to Cut Medicare Beneficiaries' Drug Costs*, WALL ST. J., July 11, 2001, at A2.

[592] *See, e.g.*, Sarah Lueck, *Groups File Suit over Drug Discounts*, WALL ST. J., July 18, 2001, at B2; *see also* Sarah Lueck, *Judge to Block White House Proposal to Issue Medicare Discount Drug Cards*, WALL ST. J., Sept. 7, 2001, at B5 (reporting the issuance of a preliminary injunction).

[593] *See, e.g.*, Adam Clymer, *Democrats' Wish Lists Relegated to Back Burner*, N.Y. TIMES, Sept. 30, 2001, at 29 (reporting Senate Majority Leader's statement that bills on issues including prescription drugs for the elderly were in a "'maybe' category or worse").

[594] Commentators have noted the existence of a wide variety of proposals, worrying that the diversity may impede efforts to arrive at a consensus solution. *See, e.g.*, Michael Pretzer, *Will an Abundance of Ideas Kill Prescription Drug Legislation?*, MED. ECON. MAG., Mar. 20, 2000, at 51.

[595] For a brief overview, see *Bill Introduces Prescription Drug Plan*, ALMANAC POL'Y ISSUES, *available at* http://www.policyalmanac.org/health/prescription_drugs.shtml (last visited Sept. 25, 2001).

meanwhile, have supported plans that would result in the imposition of price controls on the drug industry.[596] A relatively modest price control requirement, called a best-price provision, would require drug manufacturers to sell prescription drugs to Medicare at the lowest price available to any private party.[597] Meanwhile, some commentators have suggested an insurance plan modeled on the Federal Employees Health Benefits Program,[598] which allows beneficiaries to choose from various private providers. One such approach would rely on the use of private pharmacy benefit management companies, which seek to steer covered individuals toward preferred drugs, such as generics and other drugs specifically listed on a "formulary."[599] This approach would borrow these cost-saving techniques from the managed care industry while offering coverage at a subsidized rate.[600]

Any solution that relies on explicit price controls inevitably will produce the usual set of problems associated with such controls.[601] Perhaps of greatest concern, price controls would likely result in reduced research and development expenditures, which is particularly problematic given the concern that the patent system already results in suboptimal investment.[602] Critics of the pharmaceutical industry maintain that the industry historically has enjoyed high returns on investment.[603] Even if the industry's profits are "too high" in the sense that the industry would have made the same investments ten or twenty years ago if they could have been assured a return on investment lower than the one that they have actually received, that is irrelevant to future investment. The higher the prospective returns, the more pharmaceutical companies will invest, and a policy that companies must bear unexpected losses but will be forced to give up unexpected gains would reduce investment. It is theoretically possible that these negative consequences in present discounted value terms are worth the immediate benefits that price controls would produce, but a solution that would lower deadweight costs without reducing future investments would be preferable or, at the least, more politically palatable.

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[596] Congressman Bernie Sanders, Independent of Vermont, argues that "despite funding the development of these drugs, American consumers pay outrageously high prices for them because the government has not imposed a reasonable pricing clause on the industry." Bernie Sanders, *Prescription Drug Benefit Under Medicare*, *available at* http://bernie.house.gov/statements/2001-08-01-Rx-Drugs_under_medicare.asp (last visited Sept. 25, 2001).

[597] Such a requirement already exists in the Medicaid program. *See* Omnibus Budget Reconciliation Act of 1990, Pub. L. No. 101-508, 104 Stat. 1388, § 4401(b)(4)(C), sec. 1927. A potential problem with this approach is that if the government is a sufficiently important consumer, drug companies may respond by raising their prices to private parties to the level at which they would like to sell drugs to the government. *See, e.g.*, ROBERT GOLDBERG, TEN MYTHS ABOUT THE MARKET FOR PRESCRIPTION DRUGS (National Center for Policy Analysis No. 230, 1999), *available at* http://www.ncpa.org/studies/s230/s230.html (last visited Oct. 16, 2001) (noting that if required to "offer all seniors the discounts now offered only to a very few government agencies, primarily the Veterans Administration," then "drug manufacturers would steeply increase prices charged the VA"). For a statement by Congressman Henry Waxman advocating a best-price provision, see *Prescription Drug Price Discrimination*, http://www.house.gov/waxman/drugs/body_index.html (last visited Oct. 16, 2001).

[598] *See, e.g.*, JAMES FROGUE, THREE MORE STRIKES ON PRESCRIPTION DRUGS (Heritage Found. Executive Memorandum No. 683, 2000); Citizens Against Government Waste, *A Better Prescription for Seniors*, *available at* http://www.cagw.org/publications/lookinglass/pubs.looking.better-prescription.htm (last visited Sept. 25, 2001).

[599] *See generally* Joshua P. Cohen, *PBMs and a Medicare Prescription Drug Benefit*, 55 FOOD & DRUG L. 311, 313-15 (2000) (describing the techniques used by PBMs); Kevin J. Dunne & Ciara R. Ryan, *How Management of Medical Costs Is Revolutionizing the Drug Industry*, 62 DEFENSE COUNSEL J. 177, 178-79 (1995) (describing the operation of PBMs).

[600] *See* Cohen, *supra* note 599, at 319-20 (discussing the use of PBMs in a governmental program).

[601] *See, e.g.*, EKELUND & TOLLISON, *supra* note 42, at 107-10. Many economists have opposed price controls in health markets. *See Economists: Outlook Grim Under Health Plan*, ATLANTA J. CONST., Jan. 13, 1994, at F1 (reporting the issuance of a letter signed by 565 economists opposing medical price controls); *see also* Thomas W. Merrill, *Constitutional Limits on Physician Price Controls*, 21 HASTINGS CONST. L.Q. 635 (1994) (considering the implication of the Takings Clause and other constitutional provisions).

[602] *See supra* text accompanying note 88.

[603] *See, e.g.*, *New Report Links High Prescription Drug Prices to Marketing Costs, Profits and Enormous Executive Compensation*, http://www.namiscc.org/newsletters/July01/DrugPrices.htm (last visited Oct. 16, 2001).

The proposals based on some form of government subsidization of prescription drugs without price controls, meanwhile, impose large informational burdens on federal government agencies. In some proposals, a government agency would negotiate prices directly with pharmaceutical companies.[604] Even in proposals seeking to harness competitive forces, the government would have to choose among prospective subsidized insurance carriers in different geographic areas, considering a wide range of factors.[605] Such programs presumably could be functional and provide prescription drug benefits as promised, lowering deadweight loss by reducing the number of senior citizens who obtain drugs that otherwise they would not be able to afford. The programs, however, would necessarily spawn complex bureaucracies with little incentive to minimize administrative costs. While the agency presumably would seek to achieve the greatest social benefit at lowest possible cost in negotiating prices, it might err, for example by paying too much to a particular drug manufacturer or by selecting an inferior private provider.

Missing among the proposals being considered by Congress is any form of patent prize system, and, at first glance, there is a good reason for this. The patent prize systems discussed in Part I could be used for all patents or for all patents of a particular type (such as all pharmaceutical patents), but none seems suitable for the narrower goal of reducing prescription drug costs for a particular segment of the population, senior citizens. If any of the three buyout proposals were used, all consumers would share in the benefits of the government's largesse, and Lichtman's proposal could channel benefits specifically to senior citizens only if that segment of the population happens to constitute roughly the lowest-valuing quarter of consumers of any particular drug.[606] Even then, the benefits of the induced lower price would be shared by all higher-valuing consumers. An incidental benefit to all consumers presumably would not be objectionable, but a principal virtue of Lichtman's proposal is the multiplier effect that makes coupons a cheap way of reducing deadweight loss when the government has good information, and the decrease in deadweight loss cannot be directed to benefit any group more narrow than the users of the particular drug.[607]

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[604] *See, e.g.*, H.R. 1512, 107th Cong. § 3, sec. 1860G(b)(1)(A) (2001) (requiring the Administrator to "[e]stablish, through negotiations with medicine manufacturers and wholesalers and pharmacies, a schedule of prices for covered prescription medicines"). Another difficult task in the bill is calculation of rebates based on factors such as "increases in utilization due to promotion activities of the manufacturer, wholesaler, or retailer" and "launch prices of new drugs at the same or higher prices as similar drugs already in the marketplace (so-called 'me too' or 'copy-cat' drugs)." *Id.* sec. 1860I(3)(D)(ii)-(iii).

[605] *See, e.g.*, S. 1135, 107th Cong. § 301, sec. 1860F(c)(2) (2001) (describing the information that bids would be required to contain, including inter alia "a proposal for the estimated prices of covered outpatient drugs and the projected annual increases in such prices, including differentials between formulary and nonformulary prices, if applicable" and "if the entity utilizes a formulary, a detailed description of the procedures and standards the entity will use for . . . adding new drugs to a therapeutic class within the formulary").

[606] This seems unlikely. First, senior citizens form a significant portion of the market for prescription drugs. *See, e.g.*, Kathi Fairman, *Fact Sheet: High Cost Prescription Drug Users*, *available at* http://www.express-scripts.com/other/news_views/outcomes2001/highcost.pdf (last visited Oct. 16, 2001) (noting that about 33% of prescription drug expenditures are for just 2% of patients and that "46% of the highest-cost patients are age 55 or older"); *Bush Introduces Prescription Drug Plan*, *available at* http://www.policyalmanac.org/health/prescription_drugs.shtml (reporting that 42% of drug expenditures in 1998 were spent on senior citizens, who comprise 13% of the population). Second, senior citizens are not necessarily any poorer than other segments of the population. *Cf.* Robert M. Goldberg, *The 'Gerontocracy' Won't Swallow Clinton's Drug Plan*, WALL ST. J., June 28, 1999, at A26 (noting that 70% of senior citizens are able to afford prescription drug coverage and that "[t]he average net worth for households in the 65-to-74 age group is $331,600, about twice as high as for younger people"). Of course, some type of coupon scheme might result in only low-income seniors receiving coupons, but for this to induce a patent holder to lower the price, there would have to be a large number of such coupons, perhaps with some bonus payable to the patent holder but not serving as an additional discount. *See supra* text accompanying notes 186-190.

[607] At least one country has used a coupon scheme that has much in common with that proposed by Lichtman, but the scheme was not specifically targeted at any segment of the population. *See* MARK JOHNSTON & RICHARD ZECKHAUSER, THE AUSTRALIAN PHARMACEUTICAL SUBSIDY GAMBIT: TRANSMUTING DEADWEIGHT LOSS AND OLIGOPOLY RENTS TO CONSUMER SURPLUS (National Bureau Econ. Research Working Paper No. 3783, 1991).

The incompatibility of earlier patent prize proposals with a plan to provide prescription drugs to senior citizens may provide a hint that the narrow restriction is unjustified. Why should a senior citizen be entitled to cheap prescription drugs when a younger person with the misfortune to suffer a serious illness is not? On the other hand, there may be some normative justification, albeit probably a justification sounding in fairness or distributive concerns rather than economic efficiency. Perhaps senior citizens deserve special treatment because of the investments that they have made in the past, investments that should lead to a higher standard of living among the younger and future generations who will be obliged to bear the tax bill for seniors.[608] Or perhaps the limited term of patent monopolies poses an unfair burden particularly on senior citizens, whose lower life expectancies mean that they will not share in the benefits when patents pass into the public domain.[609]

Regardless of whether the plan is normatively justified or an interest-group resource grab, if it is to be enacted, better that the plan be more efficient than less. Providing a prescription drug benefit using a mechanism similar to that described in Part III likely would be more efficient than alternatives currently discussed and could be targeted directly at senior citizens. In describing the activities that would receive prizes, the government could simply provide that prizes would be awarded to entities improving senior citizens' access to pharmaceuticals. Congress could establish a fund for actions taken in a set year, and it could promise that the fund would be distributed in proportion to the social benefit provided to senior citizens. This approach would avoid the negative effects of price controls and indeed would likely encourage greater research and development expenditures by subsidizing the pharmaceutical industry. At the same time, the proposal would avoid burdening government with the informational complexities of a government-sponsored insurance plan, as the only decisions to be made would be the eventual distribution of prize money.[610]

The flexibility provided awarders of prizes will lead companies to seek the most efficient way of providing benefits to senior citizens.[611] Some pharmaceutical companies might directly release patents into the public domain, especially if the drugs patented are used largely by senior citizens. Because pharmaceutical companies would expect prizes to depend solely on benefits to senior citizens,[612] however, other approaches would likely dominate. For example,

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[608] *See generally* Lior Jacob Strahilevitz, Shades of Gray: Intergenerational Equity in the Era of Entitlement Reform (1997) (considering such arguments in the context of the entitlements debate). Some who purport to advocate intergenerational equity, however, argue that the elderly already receive too large a portion of governmental benefits. *See, e.g.*, Paul Samuelson, *Pampering the Elderly*, Newsweek, Oct. 29, 1990, at 61.

[609] This argument might seem to imply that all of those with limited life expectancies should be subsidized, and this in turn might seem to suggest that all people benefiting from prescription drugs should receive the same benefits. It is theoretically possible, however, that status as a senior citizen is a better proxy for limited life expectancy than a desire to take a particular drug. Status as a senior citizen may well be a better proxy for many drugs, either because the population taking the drug is not at significantly elevated risk of early death or because the drug might help provide a cure for a particular illness. If this is the justification, though, there would be a ground for expanding the relevant program to include, for example, drugs generally taken by people with terminal illnesses without offering the possibility of a cure.

[610] Commentators have noted that rules for government payment of pharmaceuticals in contexts in which the government purchases pharmaceuticals are extraordinarily complex. *See* Richard J. Wall & Christopher B. Pockney, *Pricing Pharmaceuticals for the Government (Where Policy Quirks and Economic Realities Collide)*, 29 Pub. Cont. L.J. 91, 92 (1999) ("The Federal Government's pharmaceutical pricing rules are perhaps the most complex set of pricing rules imposed on a commercial company doing business with the Government.").

[611] *See supra* notes 412-416 and accompanying text (noting that the prize approach will lead private parties to choose among patent buyouts and other schemes).

[612] It is possible that some awarders of prizes might ignore the specified purpose of the program and award prizes on broader criteria, for example by providing prizes for provision of prescription drugs to individuals other than senior citizens. The prize approach is thus prone to mission creep. *Cf.* Todd J. Zywicki, *Environmental Externalities and Political Externalities: The Political Economy of Environmental Regulation and Reform*, 73 Tul. L. Rev. 845, 891 (1999) (providing an example of the

pharmaceutical companies might offer discounts to either all senior citizens or to specific groups of senior citizens.[613] Likely the most common approach would be the advent of third-party insurance companies that would sell plans to senior citizens at below-market rates.

While these companies presumably would negotiate to purchase drugs from pharmaceutical companies at wholesale market prices much as in existing proposals, the companies would have stronger incentives than a government agency to minimize administrative and drug purchasing costs and maximize benefits to covered senior citizens. The better the benefits provided to senior citizens, the higher the anticipated prize, even if the government's eventual decisions in awarding prizes turn out to be poor approximations of the social optimum. A third party also might have a stronger credible threat than the government not to include a drug or group of drugs in its discount program if pharmaceutical companies do not offer sufficiently large discounts, because an agency might feel political pressure to make available at least one remedy per malady.

Adopting such an approach would save Congress from having to resolve several divisive issues and thus potentially could make a bill easier to pass into law.[614] For example, one debate in Congress is whether a prescription drug plan should cost beneficiaries $53 a month and cover half the cost of prescriptions or offer premiums of $30 to $35 a month with greater out-of-pocket costs.[615] With a prize system, third parties providing coverage would have an incentive to weigh the costs and benefits of different approaches. Different companies might well seek to serve different portions of the market by offering different plans, thus allowing for some consumer choice. Senior citizens who could not afford a relatively high monthly fee, or who do not anticipate needing the benefits of a program with such a fee, might be able to enroll in programs that offer lower fees, in exchange for higher copayments or reduced coverage. At the same time, this approach substantially answers two objections, both related to the adverse selection problem, to providing prescription drugs through subsidization of insurance companies.

The first objection is that any subsidization would lead to market failure, as only the individuals most likely to need coverage will seek to obtain it. "[P]eople are likely to know more than the insurance companies that cover them about their future drug costs," argues Paul Krugman, continuing, "[T]his puts retirees seeking drug insurance in the same position as people trying to sell used cars."[616] Insurance companies would thus only offer plans with high out-of-

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phenomenon of mission creep). Mission creep can be seen as a cost, at least to those who would like to channel benefits to specific groups, or as a benefit, since mission creep would only occur when some decisionmakers believe that a specific limitation by Congress is normatively unjustifiable. Of course, mission creep is hardly unique to this system, as any statutory program leaving room for agency or judicial decisionmaking ultimately may change or expand its mission as a result of creative rulemaking or creative statutory interpretation.

[613] One company recently announced such a program, presumably because of the price discrimination and reputational benefits that it will obtain from it. *See* Melody Petersen & Milt Freudenheim, *GlaxoSmithKline Plans Drug Discount Program for Low-Income Elderly*, N.Y. TIMES, Oct. 3, 2001, at D1 (announcing the plan to reduce drug prices for low-income senior citizens by 25% or more). Drug companies also provide benefits to a relatively small number of consumers through patient assistance programs. *See generally* GOV'T ACCTG. OFFICE, DRUG COMPANY PROGRAMS HELP SOME PEOPLE WHO LACK COVERAGE (GAO-01-137, 2000) (describing such programs).

[614] Congress is often more willing to pass legislation when the legislation does not resolve controversial issues. For example, supporters of the Civil Rights Act of 1991 could not agree on whether the legislation should be retroactive, and passage was assured only by leaving the issue open. *See* Rivers v. Roadway Express, Inc., 511 U.S. 298 (1994) (resolving the issue by finding the statute nonretroactive). Of course, sometimes Congress may anticipate how an issue would be resolved if left to an administrative agency or to courts, and the option of leaving an issue undecided is thus not available.

[615] *See* Robert Pear & Robin Toner, *Despite High Hopes, Drug Plan May Be Disappointing to Elderly*, N.Y. TIMES, July 22, 2001, at A1.

[616] Paul Krugman, *Harvest of Lemons*, N.Y. TIMES, Oct. 14, 2001, at 13. Krugman is referring to George Akerlof's observation about adverse selection in the used car market. *See* Akerlof, *supra* note 313.

pocket expenses, for fear of drawing insureds who are bad risks. The second, related objection is that insurance companies might "cherry pick" by seeking to cover only healthy seniors.[617] They might do so, for example, by omitting coverage for drugs that relatively sick seniors are likely to need, or through stringent rules on pre-existing conditions. Although a potential answer to both of these objections is that the government could regulate the terms and prices of subsidized insurance, this eliminates much of the purpose of harnessing competition among insurance companies rather than offering a centralized single-payer plan.

Adverse selection, however, is not a significant problem with the approach suggested here, as long as insurers anticipate that prize awarders will consider the characteristics of the population served, as well as examination of the drugs actually provided at discounted rates, rather than just the number of enrollees. Insurers should be happy to enroll bad risks if they expect to receive a higher prize as a result. The social benefit that a third party provides depends ultimately on the medical benefit provided to enrollees, and medical benefit should be easier to assess a decade after drugs are provided than at the time of enrollment in a plan. If a third party attempted to enroll only healthy individuals, or provided drugs irrespective of need, its opponent in prize arbitration would have a strong incentive to point this out and those awarding prizes would be expected to take the argument into account. Unlike any system operating according to a predetermined formula, this approach eliminates loopholes by granting great flexibility in considerations potentially relevant for the awarding of prizes.[618]

At the same time, Congress would not need to decide how benefits should vary depending on income or wealth. Just as the prize system gives insurers an incentive to serve the sick as well as the healthy, so too does it give them an incentive to prioritize the poor above the rich. Insurers would consider to what extent prize givers on average would consider social benefit to be higher when the recipient of the services is poorer, and the compromise is thus what the average prize awarder would decide. The more limited the fund for prizes, the more third parties are likely to focus on serving relatively poor senior citizens. This is just a generalization of the point that prize funds will induce actions having the highest possible ratio of social benefit to private cost.[619]

Expenditures on pharmaceuticals, like those on any product, produce declining marginal benefits. Third parties would thus anticipate the argument that the benefit provided from spending a dollar on an essential drug needed by someone who cannot afford the drug is greater than that provided by spending money on a recipient who generally can afford drugs but either would prefer not to pay for them or would find that the costs of a certain drug exceed the benefits. Even a prize awarder focusing solely on the amount of deadweight loss eliminated, rather than on improvement in medical outcomes, should prioritize poor senior citizens, because deadweight loss is eliminated only when someone who values a drug above marginal cost but below the monopoly price receives a discount that enables purchase.

On this issue and others, using the prize approach will lead third parties to recognize the possibility of disagreement among awarders of prizes and to calculate social benefit as an average of what different decisionmakers would be expected to decide. If some decisionmakers would be expected to count social benefits from two competing uses of funds as equal while

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[617] For a discussion of and sources on cherry picking, see Andre Hampton, *Markets, Myths, and a Man on the Moon: Aiding and Abetting America's Flight from Health Insurance*, 52 RUTGERS L. REV. 987, 1003 & n.70 (2000).

[618] *Cf.* THE AMERICAN HERITAGE DICTIONARY 1061 (3d ed. 1992) (defining "loophole" as "[a] way of escaping a difficulty, especially an omission or ambiguity in the wording of a contract or law that provides a means of evading compliance").

[619] *See supra* text accompanying notes 481-483.

other decisionmakers systematically would value one of the uses over the other, funds will tend to flow initially toward the favored use. Some lawmakers, of course, might prefer a program that would have no such bias, for example if they believe that pharmaceutical benefits should not depend on income at all, while others might prefer strict means testing. If there are enough such lawmakers, though, they could specify the restriction in the legislation creating the prize system. Thus, assuming that prize awarders would be expected to honor legislative restrictions as much as judges, using the prize system does not prevent Congress from setting criteria. If lawmakers cannot agree on certain issues, however, a system of retrospective prizes will effect compromise on controversial issues.

Given congressional and presidential disagreement on the form that a full program should take, the prize system could serve as an interim solution, perhaps with relatively modest funding. This interim solution, however, might well prove more attractive than any alternatives, and it easily could be expanded simply by increasing the size of the fund for a particular year. Because it would induce relatively few releases of patents into the public domain, the program likely would not eliminate deadweight loss nearly as efficiently as a patent prize program not geared specifically toward senior citizens. From the perspective of consumers, the program would not look so different from a governmental one, with prices for pharmaceuticals lower than they otherwise would be. The difference would not be in the form of the program as much as in perceived quality, especially in reaching those most rather than least in need.

Because the system would stimulate competition among private companies to provide high-quality services efficiently, rather than competition encouraging exploitation of loopholes and imperfections in governmental rules, the social benefit, and thus the perceived quality among consumers on average, would be higher per dollar spent on benefits. And while only actual experimentation with a prize system can provide definitive proof, the costs of the system, even including the amount that must implicitly be paid to third parties that will bear some risk because of the uncertainty of prize awarders' decisions,[620] seem likely to be less than the costs of running a bureaucracy charged with the gargantuan task of making ex ante decisions about benefits. It is simply easier to approximate how much good a particular insurance company providing drug coverage did than to craft rules providing funding in proportion to how much good each insurance company can be predicted to do.

2. Genomics

The above analysis indicates that the pharmaceutical market is amenable to a patent prize system, even if the products are targeted at particular groups of consumers, and that a prize system might increase the incentives to convert basic scientific research into potentially life-saving consumer products. It might seem, however, that a patent prize system would be less successful at encouraging basic research itself, much of which is funded by ex ante government grants.[621] Indeed, the patent prize proposals discussed in Part I would be difficult to modify to encourage basic research. It would make little sense for Guell and Fischbaum to recommend eminent domain seizure of the results of basic research, or for Shavell and van Ypersele to measure demand curves for such results, since basic research is not traded in markets, or at least

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[620] *See supra* note 494 and accompanying text.

[621] *See generally* Center for Scientific Review, National Institutes of Health, *A Straightforward Description of What Happens to Your Research Project Grant Application (R01/R21) After It Is Received for Peer Review*, at http://www.csr.nih.gov/REVIEW/peerrev.htm (last visited Oct. 16, 2001) (providing a description of how NIH considers grant proposals).

not in conventional ones. Similarly, while Kremer might recommend auctioning off patents on basic research, we would first need a patent regime that could encourage all socially useful forms of basic research. Coupons, finally, will do little good, because basic research is not sold directly to the poor.

A prize system along the lines proposed in this Article, however, easily could be used to encourage basic research in particular areas, such as genomics. To understand the benefits of using a prize system in this area, consider first a capsule history of gene research.[622] The Human Genome Project was initially a congressionally funded joint effort of the National Institutes of Health and the Department of Energy,[623] dedicated to the task of mapping and sequencing the human genome.[624] Many other countries soon started their own limited genome projects, which the Human Genome Organization helped coordinate.[625] A more serious participant was Celera Genomics, a private concern headed by Dr. J. Craig Venter, a defector from NIH who believed that different techniques could lead to a more rapid conclusion of the project.[626] Eventually, Celera Genomics cooperated with the government,[627] and a joint "working draft" of the genome was published years ahead of schedule.[628]

One lesson from this experience is that private entities may be capable of innovating and producing research results faster than government-sponsored laboratories. It would be hazardous to draw too much from a single anecdote; it is possible, after all, that some government-sponsored projects are more successful than private ones. Nonetheless, the history shows that profit incentives can be powerful motivators for research, and there are high transactions costs associated with government-sponsored grants.[629] Even if peer review is successful at identifying the most promising research projects,[630] the recipient of a government grant has little incentive once a project has begun to shift course if a methodological change promises a faster route to a conclusion.

Private initiative cannot be counted on to act as an effective substitute for governmental programs in general, at least absent some type of reform. A primary motivation for Celera, or at least its financiers, was the possibility of obtaining patent protection for the sequences that it had

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[622] For a more complete history, see Leslie Roberts et al., *A History of the Human Genome Project*, 291 SCIENCE 1195 (2001).

[623] *See, e.g.*, Francis Collins & David Galas, *A New Five-Year Plan for the U.S. Human Genome Project*, 262 SCIENCE 43 (1993).

[624] Among the articles suggesting that such a project might be a useful step in advancing medical research was Renato Dulbecco, *A Turning Point in Cancer Research: Sequencing the Human Genome*, 231 SCIENCE 1055 (1986).

[625] For an early history of international involvement in the Human Genome Project, see G. Kenneth Smith & Denise M. Kettelberger, *Patents and the Human Genome Project*, 22 AIPLA Q.J. 27, 32-37 (1994).

[626] *See* Robert Langreth, *Gene-Sequencing Race Between U.S. and Private Researchers Is Accelerating*, WALL ST. J., Mar. 16, 1999, at B5.

[627] *See* Nicholas Wade, *Rivals in the Race to Decode Human DNA Agree to Cooperate*, N.Y. TIMES, June 22, 2000, at A20.

[628] *See* Nicholas Wade, *Genetic Code of Human Life Is Cracked by Scientists*, N.Y. TIMES, June 27, 2000, at A1.

[629] For a consideration of whether the government would be better off directly funding institutions employing scientists than funding particular projects selected through peer review, see Paula E. Stephan, *The Economics of Science*, 34 J. ECON. LIT. 1199, 1226-27 (1996).

[630] Peer review may not be successful in doing so if it favors unambitious projects over more ambitious ones. As Thomas McGarity explains:

> The most frequently identified bias among the scientists interviewed for this article was the subtle bias that the scientific peer review bodies exert against "mavericks" who reject conventional assumptions and approaches. Several researchers and grant administrators interviewed in connection with this article observed the projects well within the "mainstream" of previously funded research have a much better chance of being funded than research that rejects conventional wisdom. The result can be a big fraternity of scientists all reaching the same conclusions and not testing each others' hypotheses.

McGarity, *supra* note 37, at 40.

discovered.[631] Some types of basic research, however, might not be amenable to patent protection, because the research, though potentially useful to the scientific community at large in identifying relatively fruitful areas of research, might not point directly to any particular patentable product or process. It would have been difficult to imagine an intellectual property regime that could have given James Watson and Francis Crick the power to exclude others from taking advantage of their discovery,[632] despite its importance to future scientific development. Even the patentability of naked DNA sequences, absent a specific claim to utility, is now suspect,[633] even though such sequences may be useful as scientific building blocks. Intellectual property can protect some forms of research, but venture capital will flow only to such uses. While governmental decisionmakers at least in principle would consider the social benefits from different forms of innovation, private researchers will focus on potential profits. They thus will eschew forms of research that would produce social benefit but little possibility of private benefit.

A prize system in which prizes are given based on social benefit, regardless of whether the underlying research is patentable, provides a way of harnessing private incentives to innovate while still giving incentives to choose projects providing the greatest social returns. Investors in search of prize money will seek to engage in research that has the highest expected social benefit, as long as they cannot predict any biases in the eventual distribution of the prize money. This observation also addresses an early critique of the Human Genome Project, that it was not prudent to seek to sequence the entire genome instead of focusing on interesting parts.[634] With hindsight, some argue that sequencing even the "junk" portions of DNA has paid dividends,[635] but this does not answer the criticism that the project was too ambitious based on information available at the time. Had the prize system that I have described been used to reward genomics research, scientists and investors would have had incentives to try to anticipate whether intensive analysis of certain portions of the genome would be likely a decade later to have seemed more cost-efficient than comprehensive sequencing of the entirety. The answer to that question might have changed over time, and investors and scientists might have changed course accordingly.

The limitations of the Human Genome Project approach are interesting as more than a matter of history. Even once a final draft of the human genome is published, work on genomics will continue on a variety of fronts. For example, researchers are seeking to identify the approximately 300,000 single nucleotide polymorphisms (SNPs), the locations on the genome where humans differ in their genetic code,[636] and the task of identifying the structure of proteins coded for by genes is just beginning.[637] In addition, even entities that have released results of their DNA sequencing have maintained as trade secrets annotated versions providing

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[631] *See, e.g.*, Justin Gillis, *Gene Researcher Draws Fire on Filings*, WASH. POST, Oct. 26, 1999, at E1 (reporting that Celera had filed over 6500 patent applications).

[632] *See generally* JAMES D. WATSON, THE DOUBLE HELIX (1968) (describing the discovery of the structure of DNA).

[633] *See infra* text accompanying notes 654-656.

[634] *See, e.g.*, Smith & Kettleberger, *supra* note 625 ("Is extracting 2-5% information from the entire genome worth this mammoth sequencing effort at such an exorbitant cost?").

[635] *See* Gretchen Vogel, *Why Sequence the Junk?*, 291 SCIENCE 1184 (2001) (arguing that some of the most significant discoveries may come from the "junk" portion of the human genome).

[636] *See generally* Arti Kaur Rai, *Regulating Scientific Research: Intellectual Property Rights and the Norms of Science*, 94 NW. U. L. REV. 77, 105 (1999) (describing research into SNPs).

[637] Identifying how proteins "fold" requires extraordinary computational resources. *See generally* ALAN FERSHT, STRUCTURE AND MECHANISM IN PROTEIN SCIENCE: A GUIDE TO ENZYME CATALYSIS AND PROTEIN FOLDING (1998); Andy Patrizio, *Protein Fiends Join the Fold*, WIRED NEWS, Sep. 26, 2000, *available at* http://www.wired.com/news/technology/0,1282,39035,00.html (last visited Oct. 8, 2001).

supplemental information. [638] The government might seek to subsidize research in all of these areas or to induce private entities to release any research results that they have already produced into the public domain. A prize system could accomplish this, even if (indeed, especially if) the government is ill situated to decide today which of various potential avenues of research is most promising. The lower our confidence in governmental decisions on funding science, including decisions on when to shift course, the higher the likelihood that a prize system will be superior to funding through grants.

The choice, however, is not just between a prize system and a grant system. Intellectual property law also might be used to encourage research, at least for some types of investigation into genomics. It is easy to imagine, for example, a regime in which the first researchers to identify an SNP would be entitled to prevent anyone from offering a product pertaining to that SNP. The law could provide that a third party sale of any cure, remedy, or diagnostic test targeting the specific SNP would be an infringement of the intellectual property right. The question is thus whether patent law, or some actual or hypothetical alternative form of intellectual property, is sufficient. If intellectual property protection could provide adequate incentives for research, than any further government subsidization of research would be excessive. Social resources would be better spent in other ways. [639]

A preliminary answer is that a prize system might be useful, at least as a supplement to intellectual property protection, for the same reason that it is useful in other areas. Unless researchers can exploit their inventions to receive the full social benefit that they have produced, they will underinvest in research, and there will be deadweight loss attributable to high licensing fees. [640] A possible rejoinder is that researchers who obtain intellectual property protection may be able to price discriminate more effectively than the sellers of consumer-oriented products, because the number of contracts to negotiate might be quite small and the value of the discovery to potential purchasers might be readily apparent. Such price discrimination would offset both problems. [641] It would, however, increase the cost of developing downstream products, [642] and the prices of such products might be higher as a result. Because a prize system, by contrast, results in the placement of discoveries into the public domain, the costs of one stage of discovery will not cumulate into the next stage.

If prices of downstream goods are above marginal cost, however, the problem could be solved with a prize system for the downstream market rather than for the initial discovery

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[638] *See, e.g.*, *Pioneering on the Genomics Frontier*, http://www.merck.com/overview/98ar/p17.htm (last visited Oct. 8, 2001) ("Merck Gene Index has placed the majority of available information on human gene sequences in a public database for all scientists to use.").

[639] Some critics might argue that the government should spend more on research and development than revealed preferences of consumers would suggest because the health benefits of genomics are incommensurate with other economic goods. *See* Lewis A. Kornhauser, *No Best Answer?*, 146 U. PA. L. REV. 1599, 1621 (1998) (noting that advocates of incommensurability generally seek to defend judicial autonomy in areas such as health and safety, rather than conclude that because choices are incommensurable, they should be left to legislative resolution). *See generally, e.g.*, Matthew Adler, *Law and Incommensurability: Introduction*, 146 U. PA. L. REV. 1169 (1998) (discussing a variety of views on the concept of incommensurability). *But see* Leo Katz, *Incommensurable Choices and the Problem of Moral Ignorance*, 146 U. PA. L. REV. 1465 (1998) (providing a skeptical account of incommensurability). Even if we accept the incommensurability argument, however, there are a variety of potential projects to benefit public health that might be better areas for government spending, if intellectual property protection were adequate. *See generally* Cass R. Sunstein, *Health-Health Tradeoffs*, 63 U. CHI. L. REV. 1533 (1996) (explaining that even if the only policy maximand is health, administrative agencies should carefully consider the health consequences of different policy options).

[640] *See supra* text accompanying notes 87-88.

[641] *See supra* text accompanying notes 171-172.

[642] *See, e.g.*, Molly A. Holman & Stephen R. Munzer, *Intellectual Property Rights in Genes and Gene Fragments: A Registration Solution for Expressed Sequence Tags*, 85 IOWA L. REV. 735, 789-92 (2000).

market. Pharmaceutical companies may have to license genomic data, but in theory the government can compensate for this by offering generous buyouts of the patents protecting the drugs that they produce. There are, however, three reasons to think that intellectual property protection will be particularly problematic in the market for the products of basic research, even assuming that unambiguous property rights in such products could be established.

The first problem is a holdup problem.[643] In some cases, a researcher may not be able to determine who the appropriate licensor is until after considerable research. For example, researchers seeking to identify the gene associated with a particular disease would not be able to determine before beginning the research who has a patent on the underlying sequence.[644] Once research is invested, however, the firm "is more susceptible to opportunistic behavior from the patent holder,"[645] who can charge more than would have been possible if negotiation occurred ex ante. This problem exposes a weakness in assurances than intellectual property clearing houses, similar to those used for copyrighted music, would allow for efficient licensing of genomic patents.[646] A radio station could survive without the right to play any given song, but a researcher investigating a particular disease cannot simply decide to work on a different gene after having spent time locating the gene of interest.[647]

The second problem is an "anticommons" problem. An anticommons problem occurs when each of a number of parties has a right to exclude a third party from use of property. Michael Heller's classic example of an anticommons problem was the widespread presence of empty storefronts in Moscow, because "almost any use of [a] storefront requires the agreement of multiple parties."[648] As Heller and Rebecca Eisenberg point out, a similar problem may exist in the genomics area, if a project cannot proceed without approval from each of a large number of rightsholders.[649] For example, a single gene may subsume or overlap with various portions of the genome sequenced by different groups.[650] Though it may be possible for researchers to obtain licenses from owners of every Expressed Sequence Tag (EST), such negotiations will be difficult, because each owner effectively has the power to terminate the project. Often,

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[643] *See, e.g.*, Oliver E. Williamson, *Transaction-Cost Economics: The Governance of Contractual Relations*, 22 J.L. & ECON. 233, 234 (1979) (discussing holdup problems that may exist when investments depending on continuing access to certain resources have already been made).

[644] "A biotechnology company cannot know which ESTs are on the same gene until it or some other firm sequences the entire gene." Holman & Munzer, *supra* note 642, at 786.

[645] *Id.* at 779.

[646] Robert Merges has shown how collective rights institutions can and often do arise in settings involving repeat players in intellectual property transactions. *See* Robert P. Merges, *Contracting into Liability Rules: Intellectual Property Rights and Collective Rights Organizations*, 84 CAL. L. REV. 1293 (1996) (arguing that the existence of such institutions exposes a flaw in arguments for compulsory licensing). Professor Merges, however, recognizes that Congress sometimes must "create the conditions for private parties to bargain into contractual liability rules." *Id.* at 1391. Those conditions may not exist, and arguably may not be capable of creation, in the genomics context.

[647] There are other reasons as well to believe that such institutions will arise. Maureen O'Rourke explains:

Because the rights are spread broadly across both public and private institutions that vary widely in their interests and abilities to negotiate, accumulating the required rights is particularly difficult. Moreover, valuation difficulties may prove intractable as the rights cover a large range of technologies, and cognitive biases lead patentees to overvalue their own inventions and undervalue another's. The net result is that the combination of high transaction costs and strategic behavior may prevent licensing from occurring.

Maureen A. O'Rourke, *Toward a Doctrine of Fair Use in Patent Law*, 100 COLUM. L. REV. 1177, 1237 (2000).

[648] *See* Michael A. Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 HARV. L. REV. 621, 639 (1998).

[649] Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698, 699 (1998).

[650] For further discussion, see Alexander K. Haas, *The Wellcome Trust's Disclosures of Gene Sequence Data into the Public Domain and the Potential for Proprietary Rights in the Human Genome*, 16 BERKELEY TECH L.J. 145, 159-61 (2001).

agreement will be reached, but sometimes aggressive negotiating by one or more rights owners seeking to obtain as great a portion of the rent from the project as possible may cause negotiations to break down.

The third problem, a familiar one,[651] is the possibility that excessive research will dissipate rents. Though competition in sequencing the genome may have accelerated completion relative to the initial approach, the redundant sequencing of genes may have been socially inefficient.[652] As Matthew Erramouspe notes, a patent race also occurred in an effort to find a gene involved in breast cancer.[653] Though patent races may occur in any area of inventive activity, they may be particularly likely to occur in the genomics area. The challenges of genomics, such as identifying SNPs associated with certain illnesses, are often fairly clearly defined, and because some discoveries are likely to be considerably more profitable than others, researchers may decide to race rather than work on separate tasks. In addition, if there is a single correct answer to a particular problem, then researchers will be likely to be working on precisely the same solution, rather than on discovering slightly different solutions to the problem. A race for patents on antidepressants at least results in the creation of a variety of antidepressants that may have different benefits and costs for different patients.

The patent system can respond to these problems principally by changing the scope of protection. Indeed, the Patent and Trademark Office recently issued guidelines concerning when examiners should grant patents on genomic discoveries, specifying that to obtain a patent on a gene or EST, an inventor must establish a specific and credible way in which the gene is useful, rather than simply spelling out the genetic code.[654] The tougher criteria may well mitigate the holdup, anticommons, and rent dissipation problems, but they are more a compromise rather than a solution. On one hand, the guidelines may provide insufficient incentive for research unlikely to lead directly to discovery of useful functions, and Celera might well not have invested in sequencing had the guidelines been in place earlier.[655] On the other hand, the guidelines do not solve these problems altogether, especially given criticisms that the PTO has set too low a threshold for the utility requirements.[656]

A prize system, by contrast, is directly responsive to the concerns. If adequately funded, such a system can provide incentives for research at whatever level is deemed desirable, including research for which there currently would be no reward under the patent system. At the same time, because the prize system results in discoveries being placed in the public domain, holdup and anticommons problems will occur less often. In addition, the prize system could mitigate the problems associated with patent races.[657] Groups that would be competitors in a

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[651] *See supra* Part II.B.1.

[652] Michael Malinowski and Professor O'Rourke suggest that federal government initiatives might succeed in eliminating the duplication of effort, and, if complemented by vigorous antitrust enforcement, in ensuring public availability of genomic information. *See* Michael J. Malinowski & Maureen A. O'Rourke, *A False Start? The Impact of Federal Policy on the Genotechnology Industry*, 13 YALE J. ON REG. 163, 232 (1996).

[653] *See* Matthew Erramouspe, *Staking Patent Claims on the Human Blueprint: Rewards and Rent-Dissipating Races*, 43 UCLA L. REV. 961, 996 (1996). "[N]umerous teams involving hundreds of researchers raced to stake their claims and capture the coveted prize." *Id.*

[654] *See Utility Examination Guidelines*, 66 Fed. Reg. 1092, 1098 (2001). The Federal Circuit has not yet ruled on the validity of the guidelines.

[655] Wall Street has become increasingly skeptical of genomics firms' ability to generate profits. *See* David Malakoff & Robert F. Service, *Genomania Meets the Bottom Line*, 291 SCIENCE 1193 (2001).

[656] *See, e.g.*, Mattias Luukkonen, Note, *Gene Patents: How Useful Are the New Utility Requirements*, 23 THOMAS JEFFERSON L. REV. 337, 338 (2001) ("[T]he current utility guidelines, when applied to gene patents, allow patent applications to be granted without a substantial demonstration or disclosure of a gene's actual utility.").

[657] *See supra* notes 292-294 (explaining how a prize system could mitigate the problems associated with patent races).

patent system might instead effectively work collaboratively by releasing information as it is developed, rather than waiting to file a patent application, and by specializing, either through explicit or implicit agreement, in different parts of a given task. When prizes can be shared, companies will no longer need to arrive at a complete solution first or expect such a first-place finish to result in the whole prize. The prize system also reduces the danger that cooperative research programs will lead to litigation over ensuing patent rights.[658]

3. *Business Methods*

The example of genomics suggests that a prize system may be useful in an area in which patent law helps provide incentives for research but creates a market that may inhibit the transformation of research into useful products. Business methods potentially present the opposite problem, given the concerns of many commentators that the patent system would be better off without business method patents at all.[659] Commentators have suggested that many business method patents issued are, at least in the lay sense, obvious. Margo Bagley, for example, suggests that the problem with business method patents stems from decisions by the Federal Circuit and the Patent and Trademark Office to be generous to patent applicants and holders in determining whether an earlier reference invalidates a patent.[660] For example, the PTO awarded Amazon.com its controversial "1-click" patent on a method for online purchasing using just a single click of the mouse without considering potentially invalidating references from the bricks-and-mortar world of commerce.[661] Unless the PTO responds to such critiques by looking more broadly for prior art,[662] the courts respond by construing prior art broadly in patent cases litigated,[663] or Congress passes legislation restricting business method patents,[664] then many e-commerce patents that simply involve the translation of common business techniques onto the Web will raise the cost of doing Internet business.

Whether the costs of business method patents exceed the benefits is difficult to gauge. As Robert Merges has noted, the long history of innovation in commercial affairs may make these patents seem unnecessary.[665] Professor Merges, however, also observes that provision of patent protection might increase the quantity of innovation, perhaps even dramatically: "[I]f we thought

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[658] *See* Malinowski & O'Rourke, *supra* note 652, at 224 (describing a controversy over ownership of intellectual property rights after a joint research effort).

[659] *See* sources cited *supra* note 6.

[660] *See* Margo A. Bagley, *Internet Business Model Patents: Obvious by Analogy*, 7 MICH. TELECOMM. TECH. L. REV. 253, 263-78 (2001) (explaining why business method patents generally clear the novelty and nonobviousness hurdles).

[661] *See* Amazon.com, Inc. v. Barnesandnoble.com, Inc., 239 F.3d 1343, 1360 (Fed. Cir. 2001) (vacating the district court's ruling in favor of Amazon.com, but providing that validity was for resolution at trial"). As Professor Bagley points out, the e-commerce 1-click approach is not so different from familiar methods in commerce: "Take for example the experience of a frequent visitor to a high-end hotel. Such guests, known by sight to the concierge, whose address and credit card information is on file and available to the hotel, are able to implement single-action ordering of goods and services throughout the hotel." Bagley, *supra* note 660, at 272-73.

[662] Criticism of the Patent and Trademark Office for awarding business method patents too easily ultimately led the Office to appoint more examiners with business training and slow down the issuance of awards. Applications are now reviewed by two examiners rather than one, and examiners receive more time to consider applications than in other fields of invention. *See* William M. Bulkeley, *Fewer Patents on Methods Get Clearance*, WALL ST. J., March 21, 2001, at A3; Kent Hoover, *Legislation to Curb Abuse of Business Method Patents*, MEMPHIS BUS. J., April 13, 2001, at 13.

[663] Professor Bagley recommends that courts consider prior art broadly and apply the doctrine-of-equivalents narrowly to cure some of the problems of business method patents. *See* Bagley, *supra* note 660, at 265-85.

[664] Congress has amended the Patent Code to allow a prior use exception for business method patents, but the exception is quite limited. *See* American Inventors Protection Act of 1999, Pub. L. No. 106-113, § 4302, 113 Stat. 1501A, 1501A-555 (1999) (codified at 35 U.S.C. § 273).

[665] *See* ROBERT P. MERGES, PATENT LAW AND POLICY: CASES AND MATERIALS 156 (2d ed. 1997).

entrepreneurs rapidly introduced new ideas such as overnight package delivery and 1-800-Flowers without patents, then Watch Out!, because we haven't seen anything yet in this field!"[666] While the apparent lax enforcement of the non-obviousness requirement may lead to awards of patents for some business methods that would have been introduced even in the absence of a patent system,[667] it also might lead to patents protecting some business methods that would not be introduced in the absence of a patent regime.[668] Even with time, a final assessment of the relative costs and benefits will be difficult to conduct, because it is impossible to determine which business methods would have been introduced in the absence of patent system protection.

Nonetheless, there is a strong argument that even if patent protection for business methods is desirable, the patent system is not optimally calibrated for encouragement of experimentation with new business models. On this theory, the scarce resource in the business field is not ideas but willingness to experiment. Vincent Chiapetta argues that "the majority of competitive arts innovations will be readily amenable to lower-cost emulation, making investment in such innovations self-defeating."[669] Second-mover advantages may be sufficiently robust to outweigh first-mover advantages in the absence of patent protection,[670] especially in the Internet context, where potential consumers can conduct searches to obtain the most competitive prices from a range of merchants who might copy the business model of the original innovator.[671] Patent doctrine, however, does not directly consider first- and second-mover advantages. Tightening the nonobviousness requirement might prevent patents on some ideas that would have been brought to market, but it also might leave some ideas with no one willing to take a chance on them in the absence of assurances of being able to capture the upside rent if the ideas turn out to be successful.

In theory, of course, Congress could modify the patent law to place more emphasis on relative first-mover and second-mover advantages. It might even do so in the business method context alone, though many commentators are wary of having customized patent law for different areas.[672] Any such step seems unlikely, however, in part because of the difficulty of

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[666] Robert P. Merges, *As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 BERKELEY TECH. L.J. 577, 582-83 (1999).

[667] Glynn Lunney, for example, argues:

The traditional perspective identified and assigned nonobviousness a central role of separating those inventions where the patent bargain made sense from those where it did not. In contrast, nonobviousness appears to have no sensible role under the simply-property perspective [adopted by the Federal Circuit]. . . . [T]o promote allocative efficiency, we should extend patent protection only to those e-commerce inventions not likely to have occurred but for the expectation of a patent.

Glynn S. Lunney, Jr., *E-Obviousness*, 7 MICH. TELECOMM. TECH. L. REV. 363, 421 (2001). Professor Lunney recommends an objective test for nonobviousness, assessing the percentage of resources invested in research and development that are attributable to creative production factors. *Id.* at 413 ("[T]he dominant consideration should be the creativity invested in the new product or process as a fraction of the invention's total cost as marketed (the 'creative investment fraction').").

[668] The question is thus whether the patent system's errors are worthwhile. *See generally* Maureen A. O'Rourke, *Evaluating Mistakes in Intellectual Property Law: Configuring the System to Account for Imperfection*, 4 J. SMALL & EMERGING BUS. L. 167 (2000) (discussing the problem of and responses to mistakes in various areas of intellectual property law).

[669] Vincent Chiappetta, *Defining the Proper Scope of Internet Patents: If We Don't Know Where We Want to Go, We're Unlikely to Get There*, 7 MICH. TELECOMM. TECH. L. REV. 289, [TAN 159] (2001).

[670] On first-mover and second-mover advantages, see *supra* text accompanying notes 205-217.

[671] *But see* Erin White, *Comparison Shopping: No Comparison*, WALL ST. J., Oct. 23, 2000, at R18 (reporting that Internet comparison-shopping services have not undermined more traditional approaches to e-commerce).

[672] *See, e.g.*, John J. Doll, *The Patenting of DNA*, 280 SCIENCE 689, 689 (1998) ("[N]ew areas of technology do not create the need for a whole new specialized patent law."). *But see* Himanshu S. Amin, *The Lack of Protection Afforded Software Under the Current Intellectual Property Laws*, 43 CLEV. ST. L. REV. 19 (1995) (suggesting a sui generis form of protection for computer software); Jane C. Ginsburg, *Copyright, Common Law, and Sui Generis Protection of Databases in the United States and Abroad*, 66 U. CIN. L. REV. 151, 171-76 (1997) (arguing for a distinctive form of protection for databases); J.H. Reichman &

producing a definitive test. Even if the non-obviousness test is more an art than a science, there are a standard set of factors that courts consider, including prior art, differences between the art and the claimed invention, the level of ordinary skill in the art, and secondary considerations such as commercial success.[673] The relative weight of first-mover and second-mover advantages is more difficult to reduce to a similar test, because it is based on predictions of consumer and market reactions to new developments. The PTO and courts presumably would make a large number of errors in assessing these factors, thus producing only modest gains over the existing regime.

Decisionmakers in a prize system, however, would be able to consider whether a prize applicant deserved a prize as a result of taking a chance on a risky business venture susceptible to copying. In part this is because prize systems, in which final decisions are based on dollar amount approximations, can take into account factors like first-mover and second-mover advantages more easily than a legal system that must make binary determinations. More importantly, decisions could be made ex post rather than ex ante, with a delay that would allow the prize decisionmakers to assess fairly objectively the relative weight of first-mover and second-mover advantages. A prize applicant that introduced a successful business method but was unable to make a corresponding profit because of copying would receive a prize to compensate for the contribution. In contrast, a prize applicant who reaped large first-mover advantages or who introduced a business method that produced no commercial or social value would receive a much smaller prize, if a prize at all.

Such a prize system would also be useful for the same reason that other patent prize systems are useful, contributing to the reduction of deadweight loss as the cost of using building blocks for e-commerce and other purposes would decline. There is a strong argument, however, that such a prize system, if adopted, should be mandatory rather than opt-in. An opt-in system would allow encouragement of the development of business methods that would not be pursued in the absence of a patent or prize system, but it would not eliminate the false positive problem of a patent being granted unnecessarily. A mandatory system, by contrast, would allow prize decisionmakers to focus on the variables most relevant to encouraging innovation in business methods, and thus would lead potential innovators in business methods to anticipate what those variables are likely to be. More generally, mandatory systems will be relatively attractive in any context in which the private returns from patents do not correlate well with the social benefits provided. A drawback of mandatory systems is that Congress may be more hesitant to adopt them because of those who would lose as a result, but if the fund supporting such a prize system is sufficiently large, such opposition might be overcome.

B. Beyond Patent

1. Copyright in Digital Recordings

Although I have focused so far on patent law, much of the analysis applies comfortably to copyright law as well.[674] Though perhaps receiving less scholarly attention,[675] deadweight loss

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Pamela Samuelson, *Intellectual Property Rights in Data?*, 50 VAND. L. REV. 51, 130-37 (1997) (considering the implications of a sui generis database regime).

[673] *See, e.g.*, Graham v. John Deere Co., 383 U.S. 1, 17 (1966).

[674] Others have recognized the potential applicability of a prize system to copyright. *See, e.g.*, Shavell & van Ypersele, *supra* note 18, at 545 ("[T]he price of computer software is generally nontrivial even though its marginal production cost is essentially zero (it can be downloaded from the Internet), and similar statements can be made about CD recordings, cable TV broadcasts, and first-run movies."); Calandrillo, *supra* note 19, at 334-36 (discussing problems with the copyright system that might justify a

will arise from a copyright monopoly as much as from a patent monopoly. Once a movie is produced, for example, the marginal cost of distributing and exhibiting it is lower than the cost of a typical seat at a movie theater, with the differential allowing producers to recoup the costs of making the picture. With a copyright prize system, a movie could be placed in the public domain, and theater tickets would be cheaper, as would be premium cable stations like HBO. With marginal cost pricing of movies, books, computer games, and music, consumers who would value these products at great than marginal cost would happily indulge. Though these products may be substitutes for one another, total consumption of these forms of entertainment would rise, and the corresponding increase in these individuals' utility would rate as a social benefit.[676]

While the relevant theory is the same, some considerations empirically may differ from the patent context to the copyright one, though it is difficult to determine whether these considerations make the case for copyright prizes stronger or weaker than that for patent prizes. It may be, for example, that price discrimination is more likely with some copyrights than would usually be the case with patents, as lower-valuing viewers can wait longer to see a particular movie or attend the theater at a relatively inconvenient time.[677] On one hand, this might weaken the case for a copyright prize system, because price discrimination helps to eliminate deadweight loss.[678] On the other hand, price discrimination conceivably could decrease allocative efficiency.[679] For example, an increase in movie price for relatively convenient showtimes and a decrease for inconvenient ones will reduce the consumer surplus of high-valuing users and will produce less consumer surplus for low-valuing users than paying marginal cost at a convenient showtime.

In addition, the common pool problem may be more severe in a copyright regime than in a patent regime. The relative narrowness of rights in copyright reduces the possibility of a copyright *race* but increases the possibility that largely redundant copyrighted works will be published.[680] If you and I are both writing articles on patent prizes, each of us may wish to obtain the prestige and first-mover advantages associated with publishing first, but the first to publish will not be able to stop the other from publishing too.[681] Thus, while the prospect of losing a

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prize approach).

[675] For an article that pays close attention to the issue of deadweight loss, see Michael J. Meurer, *Copyright Law and Price Discrimination*, CARDOZO L. REV. (forthcoming 2001).

[676] At least this is so if there are no negative externalities in consumption of these products, though some critics would argue that increased consumption of products like violent movies will have negative consequences for society that consumers do not internalize. *See, e.g.*, Jonathan Selden, Comment, Scream-*ing For a Solution: Regulating Hollywood Violence: An Analysis of Legal and Legislative Remedies*, 3 U. PA. J. CONST. L. 1010 (2001) (recognizing the existence of such externalities, but arguing that tort liability is an inappropriate response). A counterargument is that the consumers most likely to copy behavior in violent movies will tend to be high-valuing consumers of those movies and thus not affected by the prize program, but it is conceivable that low-valuing consumers might be affected on the margins.

[677] This is a form of second-degree price discrimination, which applies when a seller separates buyers whose valuations are hidden, typically by altering some aspect of the quality of the product sold. *See* Meurer, *supra* note 675 (manuscript at 13).

[678] *See supra* note 171 and accompanying text.

[679] *See* Meurer, *supra* note 675 (manuscript at 35) (noting that price discrimination by copyright owners can reduce allocative efficiency).

[680] *See* Edwin Baker, *Giving the Audience What It Wants*, 58 OHIO ST. L.J. 311, 339 (1997) (noting the existence of the rent dissipation problem in copyright); Meurer, *supra* note 675, at 32 (noting that "the duplicative investment by competing producers is wasteful").

[681] This will be so even if by extraordinary coincidence each of us chooses to express our ideas in the same way. *See* 17 U.S.C. § 102(a) (1994); Sheldon v. Metro-Goldwyn Pictures Corp., 81 F.2d 49, 54 (2d Cir. 1936) (L. Hand, J.) ("[I]f by some magic a man who had never known it were to compose anew Keats's Ode on a Grecian Urn, he would be an 'author,' and, if he copyrighted it, others might not copy that poem, though they might of course copy Keats's.").

patent race sometimes may discourage a party from even participating, the possibility of a prize for even the second-place finisher in a copyright competition may be sufficient to encourage duplicative effort. Increased variety presumably has some benefit, but how many of us needed to see both *Armageddon* and *Deep Impact*?[682] Whether the increased severity of the common pool problem argues for or against a copyright regime is unclear. A prize system, particularly of the opt-in variety, might exacerbate already excessive spending of resources in these areas, but it also might make the problem less severe.

Perhaps the most significant difference between the cases for a prize system in patent and copyright, however, is the increased difficulty of detecting infringement in copyright. If I photocopy a book that you have purchased, in all likelihood no one will ever know.[683] Patent infringement, by contrast, in general will be detectable and potentially lead to litigation. Moreover, the problem of copyright infringement is becoming more significant with the advent of peer-to-peer networked computer programs, which allow copying of music files and increasingly can be used to copy even full-length movies.[684] Although legal action by recording companies succeeded in eliminating most infringement on the Napster network,[685] these companies may be less successful in stopping infringement in networks like Gnutella, which does not operate via a centralized index.[686] This makes a contributory infringement case more difficult to win,[687] and more significantly it makes the network more difficult to shut down.[688] Unless copyright owners are successful in developing effective copy-protection technologies,[689] we may end up in a world in which only the scrupulous pay for copyrighted products rather than infringe.

Production of copyrighted material might continue to exist in such a world. The possibility of earning revenues through concert performances might be sufficient to keep the music scene almost if not quite as vibrant as today, losing perhaps not much more than the Backstreet Boys and the Spice Girls. In addition, advertising might become more prominent, though technologies allowing consumers to skip advertisements in television programs place the soundness of this model in question too.[690] Perhaps product placement could fill the void, and a

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[682] *See* DEEP IMPACT (Paramount Pictures 1998) (depicting a heroic effort to save the world from an oncoming comet). *But don't see* ARMAGEDDON (Touchstone Pictures 1998) (depicting a heroic effort to save the world from an oncoming comet).

[683] For an assessment of the economic implications of sharing of copyrighted works, see Yannis Bakos et al, *Shared Information Goods*, 42 J.L. & ECON. 117 (1999), which emphasizes that sharing of goods may increase profit for sellers.

[684] *See, e.g.*, John Markoff, *Disputed Software to be Used for Online Film Distribution*, June 14, 2000, at C16 (noting the increasing distribution of movies on peer-to-peer networking services).

[685] *See* A&M Records, Inc. v. Napster, Inc., 239 F.3d 1004 (9th Cir. 2001) (granting of preliminary injunction against Napster service).

[686] *See* Lee Gomes, *Renegade Gnutella May Become a Web Standard*, WALL ST. J., May 29, 2001, at B6 (explaining the difference between Napster and Gnutella). Perhaps the most significant barrier to Gnutella is not legal but economic, as many downloaders free-ride off the relatively small number of users who upload copyrighted material. *See* John Markoff, *Many Take, but Few Give on Gnutella*, Aug. 21, 2000, at C4. *But see* Strahilevitz, *supra* note 8 (arguing that peer-to-peer services have been able to develop norms that lead to sufficient uploading).

[687] *See* Gomes, *supra* note 686 ("Gnutella software developers aren't believed to be at legal risk, because their programs can be used for many things, and because, unlike Napster, they don't maintain any sort of database of copyrighted material.").

[688] "Those considering legal action against Gnutella . . . would not have the luxury of an easy target to sue, since the infringers and their computers may be located around the world and could number in the millions." Damien A. Riehl, *Peer-to-Peer Distribution Systems: Will Napster, Gnutella, and Freenet Create a Copyright Nirvana or Gehenna?*, 27 WM. MITCHELL L. REV. 1761, 1778 (2001).

[689] For discussion of technological solutions, including encryption and digital watermarks, see *id.* at 1790-92. One problem with these solutions, is that even if they prevent unauthorized digital duplication, there is no way to stop someone from playing the music or movie and rerecording it with a different device, such as a camcorder. Rerecording may diminish quality, but with sufficiently sophisticated equipment, this obstacle could be overcome.

[690] *See* N'Gai Croal, *2001: A Tech Odyssey*, NEWSWEEK, Dec. 4, 2000, at 48 (discussing digital video recorders featuring 30-

world in which the next Beethoven produces an Ode to Joy™ Dishwashing Detergent might not be so bad.[691] But such a world might seem unfair to those who dutifully follow copyright law, and government may have an interest in encouraging production of copyrighted goods that advance democratic goals.[692] If so, and if the death of copyright is near,[693] the establishment of a copyright prize system might be the only solution.

If a prize system is to be established because of infringement, the patent prize proposals discussed in Part I would not readily be adaptable, especially if infringement reduces the cost of infringed works to near zero. The Shavell-van Ypersele approach, for example, presumably would need to be modified to require the government to estimate the hypothetical demand curve for the product that would have existed in a world of copyright without infringement. The government, moreover, would not be able to use sales data to improve their estimates, at least for products for which there would be no more sales. Similarly, the Kremer approach would result in the vast undervaluation of work, because if a copyright were randomized to the public domain, infringement would make it worth little. Although Kremer could propose increasing the multiplier across-the-board as long as there are still some consumers who will honor a copyright, the percentage of users who pirate a work might vary considerably from one work to another, making such estimates precarious. Finally, a coupon scheme along the lines of Lichtman's proposal will do no good for works that in effect have become free.

A copyright prize system similar to the patent prize system proposed in Part III, by contrast, could function despite widespread infringement. Decisionmakers on prizes might not be able to estimate the value of works by examining marginal cost purchases as they likely would in the patent context, but they would be able to rely on other types of statistics reporting uses of copyrighted products. For example, they might consider how many people saw a particular movie, either in theaters, on videotape, or on computer. Such factors could be taken into account with a formulaic system as well, providing a set government subsidy per estimated user. The prize system described here, however, provides decisionmakers with an incentive to scrutinize numbers provided. Such scrutiny might help prevent fraud, since decisionmakers would be expected to reduce prizes as a result of such fraud. Moreover, decisionmakers might be able to estimate the importance of the work to individual users, providing perhaps a greater per user subsidy for well-leafed biochemistry textbooks than for equal length romance novels. Finally, decisionmakers might consider whether a work is original or substantially duplicative of others, thus discouraging rent dissipation. These are considerations that would be difficult to incorporate into a prize system utilizing any particular formula.

2. Anti-Terrorism Intelligence

Animating proposals for both patent prizes and copyright prizes is concern about deadweight loss, as the possibility of eliminating monopolistic pricing makes prize systems particularly attractive in these contexts. Prize systems, however, exist in areas in which monopolistic pricing is not a concern as well. Perhaps the most obvious example is programs that offer rewards for information leading to the capture of fugitives.[694] A prominent recent variant of

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second skip-forward buttons that allow users to skip advertisements on recorded television programs).

[691] I am grateful to David Bernstein for pointing out the possibility of product placement.

[692] *See, e.g.*, Neil Weinstock Netanel, *Copyright and a Democratic Civil Society*, 106 YALE L.J. 283, 341-64 (1996).

[693] *Cf.* Glynn S. Lunney, Jr., *The Death of Copyright: Digital Technology, Private Copying and the Digital Millenium Copyright Act*, 87 VA. L. REV. 813, 814 (2001) (concluding that "copyright is dead," though only in its present form).

[694] The Federal Bureau of Investigation, for example, offers specific rewards for each of its top ten most wanted fugitives. *See,*

such a program is the Department of State's Rewards for Justice program,[695] which provides rewards not only for information leading to specific arrests,[696] but also for any information that might stymie a terrorist attack.[697] Prize decisions are made by the Secretary of State, based on recommendations from an interagency committee consisting of representatives from a variety of governmental organizations and chaired by the Director of the Diplomatic Security Service.[698]

The theory of the program presumably is that it sometimes may be easier for the government to infiltrate terrorist organizations by giving incentives to those who have connections to such organizations than by making payments in advance to covert operatives. The contrast is similar to that between patent prize systems and grant systems for funding scientific research.[699] In both contexts, the case for a prize system is stronger the more difficult it is for the government ex ante to identify fund recipients who are most likely to provide useful information and results in exchange. The difficulty may be more profound in the terrorism context, however, because the challenge is not only identifying which of many plausible infiltrators will provide the best information for the buck, but also making contact with and communicating with potential informers. The Rewards for Justice addresses the former obstacle by giving rewards only when information turns out to be accurate or useful, and it addresses the latter by giving infiltrators an incentive to contact the government.

Restructuring the program in accordance with some of the recommendations of Part III, however, might improve the program. One problem with the program is that the total amount of money distributed has been relatively small, "over $6 million in approximately 20 cases."[700] That is over $300,000 per case, hardly trivial, but perhaps not enough to induce some people with information to turn in their acquaintances, perhaps violating their own moral principles in the process and risking retaliatory action should their involvement become known. The amount is still less impressive considering that it is unknown how many people have given information and received no prize at all. In part, the paltry funding may reflect that the program was a relatively low priority, and that may change given the sense that a failure of human intelligence contributed to the Sept. 11 terrorist attacks.[701] It also, however, may reflect that the Secretary of State has

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e.g., http://www.fbi.gov/mostwant/topten/fugitives/felix.htm (last visited Oct. 17, 2001) ("The FBI is offering a $50,000 reward for information leading directly to the arrest of Ramon Eduardo Arellano-Felix."). The word "directly" may diminish the chance that someone would offer information that would lead to an arrest only indirectly.

[695] The statutory authority for the program is 22 U.S.C.A § 4821 (West Supp. 2001), which authorizes the Secretary of State to "establish a Diplomatic Security Service, which shall perform such functions as the Secretary may determine."

[696] A Department of State press release states that "[p]erhaps the program's greatest success is the February 1995 arrest of Ramzi Yousef, the mastermind of the World Trade Center Bombing." Richard Boucher, *Rewards for Justice Program: Prevention of Terrorism Advertising Campaign*, *available at* http://secretary.state.gov/www/briefings/statements/2000/ps001214.html (last visited Oct. 3, 2001); *see also* David Johnston, *World Trade Center Suspect, One of F.B.I.'s Most-Wanted, Is Captured in Pakistan*, N.Y. TIMES, Feb. 12, 1995, § 4 (Week in Review), at 2 (reporting that Yousef "was tripped up by a tipster apparently anxious to cash in on the State Department's $2 million reward").

[697] The Program's Web site offers rewards

for information preventing, frustrating, or favorable resolving acts of international terrorism against United States persons or property, or leading to the arrest or conviction of terrorist criminals responsible for such acts, those aiding or abetting in the commission of such acts, or those conspiring or attempting to commit such acts.

Diplomatic Security Service, U.S. Department of State, *Counter-Terrorism Rewards Program*, http://www.dssrewards.net/english/background.html (last visited Oct. 3, 2001).

[698] *See id.* ("The Director of the Diplomatic Security Service, or his/her designee, chairs an interagency committee which reviews reward candidates and then recommends rewards to the Secretary of State.").

[699] *See supra* text accompanying notes 629-630.

[700] *See Fact Sheet: Rewards for Justice Program: Prevention of Terrorism Advertising Campaign*, http://www.state.gov/www/global/terrorism/fs_001214_rewards.html (last visited Oct. 3, 2001).

[701] *See, e.g.*, Greg Miller & Bob Drogin, *Overhaul Sought for Spy Agencies' Intelligence*, L.A. TIMES, Oct. 4, 2001, at A1 (reporting that the government's estimated $30 billion intelligence budget is likely to rise after the perceived failure of human

little incentive to spend money, which could be used for other departmental purposes, when it already is in possession of information. The government's promise to provide "up to $5 million for information"[702] is akin to the jar of mixed nuts that promises up to 10% cashews. Using a fixed fund, as recommended above,[703] would solve this problem by committing the government to distribute a predetermined amount of money among the various information providers.

An adequately funded prize system not only might lead individuals with information to reveal that information, but also might cause individuals to take steps, perhaps over multiple years, to be in a position to obtain such information. If it became clear that informants received prizes averaging, say, $1 million each, it is plausible that someone who otherwise might not associate with a terrorist organization would choose to infiltrate it, without entering into any prior arrangement with the United States. It is also possible that third parties might seek to bribe terrorists or their associates for information that the third parties could use in turn to obtain a portion of the fund. How much information the government would obtain is impossible to determine in advance, but such a program might well produce information that the government would not obtain through conventional approaches to intelligence gathering and the existing rewards program. The program also might lead terrorists to accept fewer members into their ranks, which would decrease the probability of uncovering their plans but also would decrease their ability to carry out attacks.

The government, of course, might make modifications to the approach described in Part III if using prizes to reward terrorist infiltrators. An obvious change is that the system would have to allow for confidentiality. As a result, using an adversarial approach to screen applications might not be practical.[704] In addition, a delay of ten years might be too long for potential terrorist infiltrators. While potential individual inventors in a patent prize system could sell their right to an eventual prize,[705] such sales might be less practical in the terrorism context, and thus capital markets arguably cannot be trusted to provide liquidity based on anticipation of future prizes. In any event, such a long delay might not be necessary. While some delay would help assure the accuracy of information provided, two years would probably be sufficient. The other principal benefit of delay in the patent context, cloaking the decisionmakers' identities,[706] is less likely to be significant in this context as well. While we might worry in the patent context that individual government officials might distort research incentives by encouraging some areas of endeavor rather than others, there is little concern that prize decisionmakers would have pet preferences for stopping one kind of terrorism rather than another.

3. Social Services by Faith-Based Organizations

That existing governmental prize systems in an area outside intellectual property usefully might be restructured is a relatively modest claim. This section will offer a more radical and admittedly more speculative claim, that a prize system usefully might substitute for existing government spending programs. That is, instead of making spending choices in a particular area ex ante, the government might choose to give retrospective prizes for actions providing social

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intelligence). Even at existing aggregate funding levels, the Rewards for Justice program is a miniscule portion of the total budget.

[702] Diplomatic Security Service, *supra* note 697.

[703] *See supra* Part III.C.

[704] *See supra* Part III.H.

[705] *See supra* Part III.D.

[706] *See supra* Part III.B.2.

benefit of a particular type in a manner similar to the patent prize system described in Part III. Because such a program would not eliminate deadweight loss, concerns about the cost of the program, in the form of the risk premia that in effect must be paid to those who will bear uncertainty about prizes,[707] may be weightier. Nonetheless, there are substantial potential public choice benefits to such a scheme if there is a concern that government otherwise would not make good ex ante funding decisions or that government involvement in such decisions is inherently problematic.

Though a number of spending programs could illustrate the point, a timely example is government subsidy of social services provided by faith-based and other organizations.[708] Such programs are based on the premise that religious providers are relatively efficient social service providers and that the government therefore should be neutral in funding as between such providers and secular ones.[709] Such government subsidies may come in two forms. The government may provide assistance to such groups only indirectly, for example through a voucher-type program in which individual beneficiaries may choose among potential providers.[710] These programs are controversial enough, but still more troubling to some are programs in which the government directly contracts with individual faith-based organizations to provide social services.[711] With this approach, the government must make an individualized decision about the individual group's ability to perform the contract, as well as about the worth of the particular project.[712] It is on the latter set of programs that I will focus here.

In a prize system alternative to contracting directly with individual groups, the government would promise some amount of money, say $1 billion, to be distributed among all groups, whether or not faith-based, who choose to advance a particular cause, such as providing food and shelter for the poor, in a given year. As with the patent prize system described above, the government would appropriate the money but invest it, with distribution delayed for approximately a decade. Each applicant eventually would receive a share in proportion to the

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[707] *See supra* text accompanying notes 493-494.

[708] *See generally* Albert R. Hunt, *Faith-Based Efforts: The Promise and Limitations*, Aug. 12, 1999, at A23 (discussing proposals to increase subsidies to faith-based organizations). For a discussion of President Bush's so-far unsuccessful efforts to pass the legislation, see Jeanne Cummings & Jim VandeHei, *Faith-Based Charity Initiative Takes Worldly, Rocky Path*, WALL ST. J., Aug. 16, 2001, at A16. The bill supported by President Bush is H.R. 7, 107th Cong. (2001). The bill does not create any new social programs, but simply allows religious organizations to participate on equal terms with secular organizations in existing federal and state assistance programs.

[709] For a representative argument by an advocacy group in favor of such funding, see THE CENTER FOR PUBLIC JUSTICE & THE CHRISTIAN LEGAL SOCIETY'S CENTER FOR LAW AND RELIGIOUS FREEDOM, A GUIDE TO CHARITABLE CHOICE 13-14 (1996). *See also* Joe Loconte, *The Bully and the Pulpit: A New Model for Church-State Partnerships*, J. AM. CITIZENSHIP, Nov./Dec. 1998, at 28. For arguments against charitable choice, see Susanna Dokupil, *A Sunny Dome with Caves of Ice: The Illusion of Charitable Choice*, 5 TEX. REV. L. & POL. 149 (2000); and Steven K. Green, *Charitable Choice and Neutrality Theory*, 57 N.Y.U. ANN. SURV. AM. L. 33 (2000).

[710] The Supreme Court has generally allowed indirect funding of religious organizations when the funding is available on the same terms to secular organizations. *See, e.g.*, Rosenberger v. Rector & Visitors of the Univ. of Va., 515 U.S. 819 (1995); Zobrest v. Catalina Foothills Sch. Dist., 509 U.S. 1 (1993); Witters v. Wash. Dep't of Services for the Blind, 474 U.S. 481 (1986). The Court's jurisprudence in the area, however, leaves much room for argument, and the Court in fact recently granted certiorari in a case concerning the constitutionality of school vouchers. *See* Simmons-Harris v. Zelman, 234 F.3d 945 (6th Cir. 2000), *cert. granted*, 70 U.S.L.W. 3035 (U.S. Sept. 25, 2001) (No. 00-1751); Linda Greenhouse, *Court Takes Case Testing the Limits of Vouchers Laws*, N.Y. TIMES, Sept. 26, 2001, at A1 (discussing the case).

[711] The Court has permitted such funding only if the recipient organization is not "pervasively sectarian." *See, e.g.*, Bowen v. Kendrick, 487 U.S. 589 (1988); Aguilar v. Felton, 473 U.S. 402 (1985); Sch. Dist. v. Ball, 473 U.S. 373 (1984); Roemer v. Bd. of Pub. Works, 426 U.S. 736 (1976). For discussion of the "pervasively sectarian" test, see Stephen V. Monsma, *The "Pervasively Sectarian" Standard in Theory and Practice*, 13 NOTRE DAME J.L. ETHICS & PUB. POL'Y 321 (1999).

[712] Congress has provided that states may contract with religious organizations in administering federal block grants for the Temporary Assistance for Needy Families program. *See* 42 U.S.C.A. § 604a (West Supp. 2001).

social benefit provided, as determined by the price decisionmakers. A service provider, however, could sell the rights to a prize, either before or after actually performing the relevant services, to a third party. Thus, the system would give service providers and third parties incentives to predict the social benefit on average that an average government decisionmaker would ascribe to any particular program.

Unlike a program in which the government makes ex ante decisions about which service organizations to fund, the decisionmakers in such a program would not have to speculate about which programs are likely to be cost-effective, because they could examine statistics and other information about the number of beneficiaries served. Just as in the patent prize system, the program may be effective even if we expect these decisions to be noisy, with decisionmakers arbitrarily finding some programs to have produced far more or less social benefit than most would ascribe to the program. As long as systematic biases are not predictable, they will not affect initial decisions about what programs to create in an effort to receive prizes. If there is a greater degree of arbitrariness in governmental decisions than in private predictions about what governmental decisionmakers will choose to do on average, then the prize approach may provide social services in a more cost-effective way than an ex ante grant approach.

Although it is beyond my scope here to analyze the constitutionality of such a prize system, structuring programs providing benefits to faith-based and other groups in this way may alleviate three related constitutional concerns. First, some worry that existing proposals may lead to excessive governmental interference with religious organizations, as faith-based groups change their practices in order to be able to receive government funds.[713] The open-ended approach of the prize system, focused on end results such as mitigation of poverty rather than on means, mitigates this worry. Though organizations would seek to maximize benefits that prize awarders likely would count, the government would not be able to specify how groups should be structured. A faith-based group might shift resources from religious education to provision of basic services, but such a decision would be a product of the organization's desire to receive a prize for achieving a nonsectarian goal rather than of coercion.

Second, and more significantly, a problem with "pervasively sectarian" groups receiving governmental funds is that those funds might be used to advance religious viewpoints.[714] Even if the government awards a grant to a church promising to run a soup kitchen, the church might divert some of these funds to religious purposes. Funds generally will not advance religious viewpoints, however, if they are given only ex post based on the extent to which the groups achieve a nonsectarian goal. A faith-based group might earn a profit from a prize system and then use these profits to advance religious purposes, but this is no more problematic than a for-profit group's decision to donate money to a religious group. The most difficult remaining question would be whether it is appropriate to award a prize if a group achieves a nonsectarian goal through religious means, for example if it turns out that religious indoctrination is more effective at leading homeless people to seek jobs and become self-sufficient than non-religious alternatives.

Third, the prize system reduces the possibility that the government will use faith-based programs as an opportunity to advance any particular religion. If governmental entities contract directly with faith-based groups to provide social services, there is a danger that decisionmakers

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[713] *See, e.g.*, Dokupil, *supra* note 709, at 197-204.
[714] As Carl Esbeck explains, if a religious organization's secular and religious services "are not separable, then the Court disallows the assistance altogether, with the explanation that the Establishment Clause will not allow the risk of governmental aid furthering the transmission of religious beliefs or practices." Carl H. Esbeck, *A Constitutional Case for Governmental Cooperation with Faith-Based Social Service Providers*, 46 EMORY L.J. 1, 3 & n.30 (1997).

will base decisions in part on their own religious preferences.[715] A decision explicitly justified on such a basis surely would be struck down, but in many cases it will be difficult to determine whether or not there was an illicit motive.[716] Did governmental officials choose the church's proposal for a soup kitchen over the mosque's because it was stronger or because of prejudice? A prize system with a substantial delay alleviates this concern, because prejudice would be relevant only if it were expected to affect ex post prize determinations. Even if the religious composition of prize decisionmakers can be guessed ex ante, prize decisions might be less prone to bias if based on actual results than on speculation about alternatives.

A modification to the prize system might further reduce concerns about religious prejudice affecting funding decisions. If the concern is that prize decisionmakers a decade from now might seek, whether consciously or unconsciously, to advance particular religions by shading prize awards, it might be useful to require religious groups to sell their right to a prize to a non-faith-based third party. Although this approach might be contrary to the spirit of current proposals that seek to save faith-based groups the trouble of creating nonsectarian for-profit subsidiaries,[717] it would ensure that no prize decision would directly lead to any religious group's receipt of funds. To be sure, some prejudice might still exist, as a prize decisionmaker might grant a larger prize to a third party that has purchased the right to a particular religious group's prize than to a corresponding third party for another religious group despite the absence of any direct effect on either group. Some such prejudice might even be anticipated and thus affect investment decisions, but this change likely would reduce the influence of religion on decisions.

V. CONCLUSION

Proponents of patent prizes have sought to avoid the deadweight losses associated with intellectual property protection by recommending that a centralized governmental spending program replace a market-based incentive. In seeking formulaic or algorithmic approaches to patent prizes, these scholars implicitly have recognized public choice concerns about government's ability to make wise spending decisions. In this Article, my concern has been less with the benefits that a governmental spending program has over the market than with the benefits that a retrospective prize system has over a typical governmental spending program. Concerns that government will misspend money, either through individual decisionmakers' incompetence or as a result of influence, are understandable. Public choice and administrative law scholars have long focused on how to overcome these problems, considering antidotes such as separation of powers and judicial review. But they have ignored the virtues of delayed retrospective decisionmaking. With a carefully designed prize system, even if an individual decisionmaker makes an error or is influenced by political considerations in calculating a prize, these flaws will not affect the decisions that matter, those made in anticipation of the eventual governmental awards. Prize systems thus hold promise as a tool for improving government's ability to reward useful private activity in patent law and elsewhere.

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[715] At least one study, however, suggests that minority religious have generally fared as well in receiving government funding as more dominant ones. *See* Monsma, *supra* note 711, at 327.

[716] The problem of determining legislative motive is, of course, a more general one. *See, e.g.*, Louis S. Raveson, *Unmasking the Motives of Government Decisionmakers: A Subpoena for Your Thoughts?*, 63 N.C. L. REV. 879 (1985); Laurence H. Tribe, *The Mystery of Motive, Private and Public: Some Notes Inspried by the Problems of Hate Crime and Animal Sacrifice*, 1993 SUP. CT. REV. 1, 16-26 (1993).

[717] *See* H.R. 7, 107th Cong. § 201(d)(2)(A) (2001) (providing that a religious organization seeking assistance under a governmental program shall not be required to "alter its form of internal governance or provisions in its charter documents").