

THE PENGUIN'S PARADOX: THE POLITICAL ECONOMY OF INTERNATIONAL INTELLECTUAL PROPERTY AND THE PARADOX OF OPEN INTELLECTUAL PROPERTY MODELS

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I. INTRODUCTION

A serious game is underway in which the world's intellectual capital is at stake. On one side of the game, advocates of "open" intellectual property rights (IPR) models suggest that opening the intellectual commons will spur development and promote a more equitable distribution of the world's resources. Developing countries, which lack strong domestic IPR-producing industries, often favor more open IPR systems that allow them to adopt, at minimal cost, technologies and IPR-rich products that are produced in the developed world.

On the other side, many IPR-rich industries and market economy advocates view policy initiatives in favor of open IPR models with suspicion, if not hostility. For these players in the global IPR game, strong IPRs are the foundation of an economy characterized by growth, prosperity and innovation, and represent the best path forward for both the developed and developing world. Developed countries, such as the United States and the European Union, tend to favor relatively "closed" IPR systems, which reflect the interests of domestic IPR-rich industries, such as the pharmaceutical, biotechnology, and entertainment industries.

For certain goods, such as medicines and basic scientific research, this disparity becomes more than an arcane question of trade economics. It is, rather, a question basic to human health and dignity. From the "digital divide," to biotechnology, to medical research, open source and open access have

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become key components in the strategy to boost the fortunes of developing countries.¹ For many open IPR or “access to knowledge” advocates, open models are seen as the means to break the developed world’s hegemony over essential information and technology. In contrast, many closed IPR proponents view open models as, at best, potentially useful adjuncts to a strong IPR system in niche markets, which can be voluntarily developed but should not be imposed or supported by government intervention.

The game plays out in the dusty and remote arena of international IPR treaty negotiations. The history of the international IPR treaty system suggests that it has trended towards a strong requirement of minimum IPR standards, largely in response to the concerns of IPR-rich industries in developed countries.² Advocates of open IPR models have recently focused on public policy strategies concerning open source production and open access publishing in an effort to mitigate this trend.³

Open source production seems like a politically attractive option to many open IPR advocates because it could potentially achieve greater openness without eliminating the perceived benefits of IPRs. These advocates seek to portray open source as an alternative means of production that is both economically efficient and more socially equitable than the existing proprietary framework. Their policy proposals focus on incremental changes that would facilitate open source production in ways that are palatable, or at least not nauseating, to strong IPR advocates.⁴ Similarly, policy proposals concerning open access publishing have been tied to public funding of scientific research, as a secondary or alternative source of access to research papers published by traditional publishers.⁵ Open access advocates argue that the public has a right to free access to research findings resulting from the use of tax dollars, even while commercial publishers retain the right to control copyrights in the articles they publish.⁶

These seemingly moderate efforts to reform IPR rules, however, have met

1. As discussed more fully in Part II.A. *infra*, “open source” refers to a good that is produced under a peer production method and distributed under a “viral” license; “open access” publishing implies that a given set of information is available to the public free of charge and with minimal transaction costs. The “digital divide” refers to the disparity in access to digital information between the global North and South. See Peter K. Yu, *Bridging The Digital Divide*, 20 CARDOZO ARTS & ENT. L.J. 1 (2002).

2. See *infra* Part II.D.

3. See *infra* Part II.

4. See, e.g., YOCHAI BENKLER, *THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM* 5 (2006) (noting that the Internet, by facilitating peer production, “promises to enable social production and exchange to play a much larger role, alongside property and market-based production, than they ever have in modern democracies.”).

5. See *infra* Part II.

6. *Id.*

with only marginal success, despite strong support from other stakeholders such as the scientific research community.⁷ What interests are at play in this policy game that seem so consistently to tip the balance towards a strong IPR solution? How does a careful study of these competing interests inform a constructive approach to international IPR policy? Game theoretic political economy models help answer these questions.

Recent efforts to construct a political economy of intellectual property have focused on the power relationships between intellectual property producers and consumers.⁸ The standard narrative is that large corporate interests, such as pharmaceutical companies and the entertainment industry, have been able to capture the lawmaking process such that the law has increasingly come to favor stronger intellectual property protection. This narrative has been extended to the international intellectual property framework with the observation that industrialized developed countries, which are home to most of these large corporate interests, have been able to dominate the trade negotiation process so that intellectual property treaties now largely reflect the interests of the developed countries.

This account of how intellectual property laws and treaties have developed has significant empirical support. However, it overlooks some important market dynamics. In particular, none of the existing political economies of intellectual property account for the price elasticity of demand of an innovation product, the presence of network effects in some markets, or the potential influence and role of open source production or open access distribution of that product. These factors influence the international IPR treaty game in some unexpected ways. Indeed, when these additional factors are considered, a paradox emerges: the political economy of intellectual property can tend towards “strong” intellectual property rules despite, or perhaps even in some ways because of, a persistent open source ethic.⁹ The results of the game in different industries lead to suggestions for how public policy, intended to make the knowledge commons accessible, could be pursued more efficiently and effectively.

Part II of this Article describes the open source and open access IPR models and summarizes recent proposals and efforts to encode these models

7. See *infra* Part II.D-E.

8. See, e.g., GLOBAL INTELLECTUAL PROPERTY RIGHTS: KNOWLEDGE, ACCESS AND DEVELOPMENT (Peter Drahos & Ruth Mayne eds., 2002); ROBERT L. OSTERGARD, JR., THE DEVELOPMENT DILEMMA: THE POLITICAL ECONOMY OF INTELLECTUAL PROPERTY RIGHTS IN THE INTERNATIONAL SYSTEM (2003); MEIR PEREZ PUGATCH, THE INTERNATIONAL POLITICAL ECONOMY OF INTELLECTUAL PROPERTY RIGHTS (2004); MICHAEL P. RYAN, KNOWLEDGE DIPLOMACY: GLOBAL COMPETITION AND THE POLITICS OF INTELLECTUAL PROPERTY (1998); SUSAN K. SELL, POWER AND IDEAS, NORTH-SOUTH POLITICS OF INTELLECTUAL PROPERTY AND ANTITRUST (1998).

9. See *infra* Part IV.C; V.

into public policy and positive law. Part III sets up a game theory model of international intellectual property rules by identifying the players, strategies, and payoffs. The discussion of payoffs reviews the various factors that can influence a state's choice of strategy during the game. That discussion includes three factors that have been neglected in existing political economies of intellectual property: the importance of price elasticity of demand, the influence of network effects, and the prospect of open source development and/or open access distribution. In Part IV, after a brief historical review that illustrates how the game is played and how the payoffs are calibrated, the international IPR treaty game is played out in six key contexts: entertainment, computer software, computer databases, traditional pharmaceuticals, biotechnology, and scientific publishing. Part V suggests some conclusions and policy approaches drawn from the models presented in Part III.

II. THE MOVE TOWARDS OPEN IPR MODELS

A. TYPES OF OPEN IPR MODELS

This Article focuses on two types of open IPR models: open source and open access. Open source, for the purposes of this analysis, refers to a good that is produced by a peer production method and distributed under a "viral" license.¹⁰ The peer production method implies that production, monitoring, and improvement of the product are distributed in relatively small input units across a relatively large, heterogeneous population of workers who are motivated to perform the work largely by non-monetary rewards.¹¹ A viral license means that anyone who receives the product is free to modify and redistribute it, provided that the good as modified and redistributed is offered to others under the same license terms.¹²

Open access means that a given set of information is available to the public free of direct charge and with minimal transaction costs. Information made available on an open access basis may or may not be produced via a peer production method, and may or may not carry a viral license.¹³ It is possible, for example, for information to be open access and yet to be protected by traditional copyright, such that a user of the information cannot reproduce it

10. See David W. Opderbeck, *The Penguin's Genome, or Coase and Open Source Biotechnology*, 18 HARV. J.L & TECH. 167, 180-82 (2004) for a brief description of the open source model.

11. *Id.*

12. *Id.* at 198-200 & n.170.

13. See, e.g., Bethesda Statement on Open Access Publishing (June 20, 2003), available at <http://www.earlham.edu/~peters/fos/bethesda.htm>; *Open Access*, Wikipedia, http://en.wikipedia.org/wiki/Open_access (last visited Aug. 10, 2006).

except as permitted under copyright law.

Although the differences between open source production and open access publishing are significant, there is a sense in which they share a common ethos. As John Willinsky has argued, "open source and open access are nothing less than two practical and proven means of resisting [the] constant capitalization of knowledge work."¹⁴ Willinsky notes that both open source and open access include key elements of freedom of entry, free speech, and non-economic motivations.¹⁵ Willinsky draws on Paul David's assessment of the motivations for openness in scholarly work.¹⁶ David locates the motivation for openness in scholarly work in peer approval and the claim to "moral possession" of a discovery or insight based on priority of publication.¹⁷ David notes that "moral possession" "is particularly important, as it connects the incentives for disclosure of findings under the collegiate reputational reward system of open science with the social efficiency of sharing new information."¹⁸

This family resemblance between open source and open access models suggests that both could play an important role in international IPR policy. The next Subparts describe efforts to code this ethic of openness, both in terms of open source and open access models, into public policy and positive law.

B. MOVES TOWARDS OPEN SOURCE MODELS

The open source movement arguably is as old as innovation itself. According to one narrative of how IPRs developed, innovation was once a communal endeavor, until the notion of the "imperial author" fostered the increasing enclosure of the public domain.¹⁹ According to this narrative, open, commons-based production of ideas and cultural products was the norm, until modern notions of intellectual "property" began to enclose the commons. As James Boyle put it, "[w]e are in the middle of a second enclosure movement. It

14. John Willinsky, *The Unacknowledged Convergence of Open Source, Open Access, and Open Science*, 10 FIRST MONDAY 8 (Aug. 2005), http://www.firstmonday.org/issues/issue10_8/willinsky/index.html.

15. *Id.*

16. *Id.*

17. Paul David, *The Economic Logic of "Open Science" and the Balance Between Private Property Rights and the Public Domain in Scientific Data and Information: A Primer*, in *THE ROLE OF SCIENTIFIC AND TECHNICAL DATA AND INFORMATION IN THE PUBLIC DOMAIN: PROCEEDINGS OF A SYMPOSIUM* 19, 22 (Julie M. Esanu & Paul F. Uhler, eds., 2005), available at <http://www.nap.edu/catalog/10785.html>.

18. *Id.*

19. See, e.g., JAMES BOYLE, *SHAMANS, SOFTWARE, AND SPLEENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY* xii (1996) (stating "this, then, is the story of the *imperial author* and the role that the *ideology of authorship* might play in an information society.") (emphasis in original); James Boyle, *The Second Enclosure Movement and the Construction of the Public Domain*, 66 *LAW & CONTEMP. PROBS.* 33 (2003).

sounds grandiloquent to call it ‘the enclosure of the intangible commons of the mind,’ but in a very real sense that is just what it is.”²⁰

In some ways, the development of the open source software movement is like a chapter in this metanarrative. In the early days of computing and software, programmers, who were mostly academics, freely shared source code and developed a culture of testing, tweaking, and improving each others’ codes.²¹ The free and open source software movement developed organically from these norms and later became a mainstay of resistance to the enclosure of the intellectual commons of software code.²²

As the open source model gained prominence in the software field, advocates have explored how open source principles could be hardwired into public policy and positive law. Most of the movement towards government promotion of open source models has been made in the context of general public statements and procurement decisions concerning software used by government agencies, rather than hard policy. For example, the “software libre” movement in Brazil advocates open source software as a means of escaping intellectual property colonialism. The European Commission and European Parliament have published studies that support open source software. Germany, France and Venezuela have implemented procurement policies in favor of open source software. An initiative in Taiwan requires all schools and government agencies to migrate to open source software.²³

Other policy proposals that can be seen as favorable to open source methods involve efforts to roll back some recent gains by the enclosure movement. The Digital Millennium Copyright Act (DMCA), copyright term extensions, and provisions for software patents in the United States, for example, represent key areas in which open source advocates argue that IPRs have become too strong and could stunt the growth of open source communities.²⁴

At the international level, however, support for open source methods is somewhat lukewarm. The United Nations World Summit on the Information Society Geneva Plan of Action, for example, states only that governments should “[e]ncourage research and promote awareness among all stakeholders of

20. Boyle, *The Second Enclosure Movement*, *supra* note 19, at 37. The “first” enclosure movement is the privatization of common land. *Id.* at 34-36.

21. *See, e.g.*, Opderbeck, *The Penguin’s Genome*, *supra* note 10, at 192-95.

22. *Id.*

23. *See* David S. Evans & Bernard J. Reddy, *Government Preferences for Promoting Open-Source Software: A Solution in Search of a Problem*, 9 MICH. TELECOMM. & TECH. L. REV. 313, 373-78 (2003); Klaus M. Schmidt & Monica Schnitzer, *Public Subsidies for Open Source? Some Economic Policy Issues of the Software Market*, 16 HARV. J.L. & TECH. 473, 493-94 (2003); Paul Festa, *Governments Push Open-Source Software*, NEWS.COM, Jan. 16, 2002, http://news.com.com/2102-1001_3-272299.html.

24. *See, e.g.*, BENKLER, *supra* note 4, at 383-95 & tbl.11-1.

the possibilities offered by different software models, and the means of their creation, including proprietary, open-source, and free software.”²⁵ An earlier draft of the Geneva Plan contained stronger language in favor of open source models, but was softened at the request of U.S. and EU delegates who were concerned that commercial software interests be represented in the plan.²⁶

During the debates over a “development agenda” for the World Intellectual Property Organization (WIPO), some developing countries pressed for “activities with a view to exploring the promise held by open collaborative projects to develop public goods, as exemplified by the Human Genome Project and Open Source Software.”²⁷ WIPO development advocates’ most direct attacks on proprietary production methods were proposals to limit the scope and term of copyright and to restrict digital rights management licensing terms that preclude the use of proprietary code in free or open source software projects.²⁸

These efforts to encode and protect open source norms through public law and policy are only one aspect of the open IPR movement’s strategy in the IPR game. The next Subpart discusses another equally significant component—the effort to promote open access distribution models.

C. MOVES TOWARDS OPEN ACCESS PUBLISHING

1. GRASSROOTS SUPPORT AND MAJOR PUBLIC STATEMENTS

The open access movement began to gain momentum in 1998 through the efforts of the Scholarly Publishing and Academic Resources Coalition (SPARC).²⁹ In 2001, a group of researchers founded the Public Library of

25. World Summit on the Information Society, Dec. 10-12, 2003, *Geneva Plan of Action*, ¶ 10, U.N. Doc. WSIS-03/GENEVA/DOC/0005 (Dec. 12, 2003), available at <http://www.itu.int/wsis/docs/geneva/official/poa.html>.

26. See John Blau, *WSIS—Some Open-Source Boosters See Missed Chance*, COMPUTERWORLD, Nov. 11, 2005, <http://www.computerworld.com.au/index.php/id;1656186986;fp;16;fpid;0>.

27. WIPO General Assembly, 31st (15th Extraordinary) Sess., Sept. 27-Oct. 5, 2004, *Proposal by Argentina and Brazil for the Establishment of a Development Agenda for WIPO*, Annex p. 3, U.N. Doc. WO/GA/31/11 (Aug. 27, 2004) (prepared by the Secretariat), available at http://www.wipo.int/documents/en/document/govbody/wo_gb_ga/pdf/wo_ga_31_11.pdf [hereinafter “WIPO Proposal by Argentina and Brazil”].

28. See, e.g., Treaty on Access to Knowledge, Draft, May 9, 2005, Pt. 3, Arts. 3-1, 3-6, 3-9 to 3-11, available at http://www.cptech.org/a2k/a2k_treaty_may9.pdf [hereinafter “A2K Draft Treaty”]. See discussion *infra* Part II.C.3., concerning the history of the A2K Draft Treaty.

29. See European Commission Directorate-General for Research, *Study on the Economic and Technical Evolution of the Scientific Publication Markets in Europe*, 17 (Jan.

Science (PLoS) and circulated an open letter advocating an open publishing model.³⁰ Eventually, the letter was signed by nearly 34,000 scientists from 180 countries.³¹ In 2003, PLoS launched a group of open access journals, and now publishes open access journals in biology, medicine, computational biology, genetics, pathogens, and clinical trials.³²

The movement towards open access carried through to three major public statements, the Budapest Open Access Initiative (Budapest Initiative), the Bethesda Statement on Open Access Publishing (Bethesda Statement), and the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities (Berlin Declaration). The Budapest Initiative, sponsored by the Soros Foundation, was signed on February 14, 2002.³³ It calls for self-archiving standards and for the creation of open access journals.³⁴ The Initiative has been signed by over 4000 individuals and 365 organizations.³⁵ The Bethesda Statement was released on June 20, 2003.³⁶ Its signatories included academics and researchers, mostly from the United States. It commits its signatories to encourage their faculty and grant recipients to utilize open access publishing methods.³⁷ The Berlin Declaration was signed on October 22, 2003, by the Max Plank Society in Germany and by other leading German, French and Swiss research organizations.³⁸ It has subsequently been signed by over 160 research organizations, mostly from Europe, but also including the Chinese Academy of Sciences, the Indian National Science Academy, and the National Science

2006) [hereinafter "EC Report"], available at http://ec.europa.eu/research/science-society/pdf/scientific-publication-study_en.pdf. For information on SPARC see About SPARC, <http://www.arl.org/sparc/about/index.html> (last visited July 27, 2006).

30. See EC Report, *supra* note 29, at 17; Public Library of Science, About PLoS, <http://www.plos.org/about/index.html> (last visited July 27, 2006).

31. See EC Report, *supra* note 29, at 17; see also Public Library of Science, *supra* note 30. The text of the open letter is available on the PLoS website at <http://www.plos.org/about/letter.html> (last visited July 27, 2006).

32. See Public Library of Science, *supra* note 30; Public Library of Science, PLoS Journals, <http://www.plos.org/journals/index.html> (last visited July 27, 2006) (claiming that PLoS Biology is "ranked as the most-highly-cited-general-biology journal by the Institute for Scientific Information (ISI), with an impact factor of 14.7").

33. Budapest Open Access Initiative, Feb. 14, 2002, <http://www.soros.org/openaccess/read.shtml>.

34. *Id.*

35. Budapest Open Access Initiative, View Signatures, <http://www.soros.org/openaccess/view.cfm> (last visited Mar. 17, 2007).

36. See Bethesda Statement on Open Access Publishing, *supra* note 13.

37. *Id.*

38. Conference on Open Access to Knowledge in the Science and Humanities, Berlin, F.R.G., Oct. 20-22, 2003, *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities* (Oct. 22, 2003), http://oa.mpg.de/openaccess-berlin/berlin_declaration.pdf [hereinafter, "Berlin Declaration"]. See also Press Release, Conference on Open Access to Knowledge in the Science and Humanities, Science and Culture Accessible to all Internet Users (Oct. 22, 2003), <http://www.zim.mpg.de/openaccess-berlin/presstatement.html>.

Foundation of China.³⁹ The Berlin Declaration commits its signatories to encourage researchers and grant recipients to publish their research results using open access paradigms.⁴⁰

The principles reflected in these public declarations have been put into action by some large private grant funders. In 2003-2004, for example, the Wellcome Trust, the United Kingdom's largest private funder of life sciences research, issued reports on the economics of science, technology and medical (STM) publishing, which led to a policy in favor of an open access model.⁴¹ The Wellcome Trust policy requires deposit of copies of research papers "supported in whole or in part by Wellcome Trust funding," and accepted for publication in peer-reviewed journals, into PubMed Central, an open access repository.⁴²

D. EFFORTS TO ENCODE OPEN ACCESS MODELS INTO PUBLIC POLICY AND POSITIVE LAW

1. EUROPE

In Europe, the prospect of encoding open access principles into law first began to gain traction in the United Kingdom. The UK Parliament's Select Committee on Science and Technology issued a report in 2004 that promoted open access models.⁴³ The Committee noted that "the issue of scientific publications is extremely low on the Government's agenda."⁴⁴ The Committee stated its strong support for an "author pays" open access publishing model, including the possibility of government funding to encourage publishers and authors to participate in such models.⁴⁵ The Committee noted that international coordination of science, technology and medical journal publishing policy was

39. Conference on Open Access to Knowledge in the Science and Humanities, Berlin, F.R.G., Oct. 20-22, 2003, Signatories, <http://www.zim.mpg.de/openaccess-berlin/signatories.html> (last visited July 20, 2006).

40. Berlin Declaration, *supra* note 38.

41. See EC Report, *supra* note 29, at 18; Wellcome Trust Position Statement in Support of Open and Unrestricted Access to Published Research, http://www.wellcome.ac.uk/doc_WTD002766.html (last visited July 27, 2006).

42. Wellcome Trust Position Statement, *supra* note 41. See also Wellcome Trust, Authors' Guide and FAQ, http://www.wellcome.ac.uk/doc_wtd018855.html (last visited July 27, 2006). For information on PubMed Central, see PubMed Central, PMC Overview, <http://www.pubmedcentral.nih.gov/about/intro.html> (last visited July 27, 2006).

43. SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY, TENTH REPORT, 2003-4, H.C. 399-I, at ¶ 26, available at <http://www.publications.parliament.uk/pa/cm200304/cmselect/cmsstech/399/399.pdf> [hereinafter "UK Report"].

44. *Id.* ¶ 23.

45. *Id.* ¶ 184.

required, and committed the UK to leadership over this in the international arena.⁴⁶

In 2005, the House of Commons Report was followed by action from the Research Councils UK (RCUK), a partnership of the United Kingdom's principal sources of public funding for scientific research.⁴⁷ In a draft position statement, RCUK proposed that "any published journal articles or conference proceedings resulting from Research Council funded research" should be published in an open access archive.⁴⁸ In June 2006, after a period of public comment, RCUK issued an updated position statement, which states that each individual Research Council will issue guidelines that will require publication in an open access repository "where appropriate" and subject to any copyright limitations imposed by primary publishers.⁴⁹ As of this writing, three of the Research Councils have adopted policies requiring open access deposits, four are studying different options, and one requires deposit in a database maintained by the Research Council.⁵⁰ European countries outside the EU that

46. *Id.* ¶¶ 25, 215.

47. For information on the Research Councils UK, see Research Councils UK, <http://www.rcuk.ac.uk> (last visited July 28, 2006). The individual Research Councils are Arts and Humanities, Biotechnology and Biological Sciences, Council for the Central Laboratory of the Research Councils, Engineering and Physical Sciences, Economic and Social Research, Medical Research, Natural Environment, and Particle Physics and Astronomy. *See id.*

48. Research Councils UK, RCUK Consultation on Access to Research Outputs, <http://www.rcuk.ac.uk/research/outputs/access/2005.htm> (last visited Nov. 15, 2006).

49. RESEARCH COUNCILS UK, UPDATED POSITION STATEMENT ON ACCESS TO RESEARCH OUTPUTS (June 2006), <http://www.rcuk.ac.uk/cmsweb/downloads/rcuk/documents/2006statement.pdf>.

50. Councils that require open access deposits include the Biotechnology and Biological Sciences, Central Laboratory, and Medical Research Councils. *See* Biotechnology and Biological Sciences Research Council, BBSRC's Position on Deposit of Publications, http://www.bbsrc.ac.uk/news/articles/28_june_research_access.html (last visited July 28, 2006); Medical Research Council, MRC Guidance on Open and Unrestricted Access to Published Research, <http://www.mrc.ac.uk/PolicyGuidance/EthicsAndGovernance/OpenAccessPublishingandArchiving/MRCGuideforResearchersonOpenAccessPublishing/index.htm> (last visited Nov. 15, 2006). Councils that are studying possible options include the Arts and Humanities, Engineering Physical Sciences, Natural Environment, and Particle Physics and Astronomy Councils. *See* Art and Humanities Research Council, AHRC Guidance on Access to Research Outputs, http://www.ahrc.ac.uk/about/policy/ahrc_guidance_on_access_to_research_outputs.asp (last visited July 28, 2006); Engineering and Physical Science Research Council, EPSRC Statement on Access to Research Outputs, <http://www.epsrc.ac.uk/AboutEPSRC/ROAccess.htm> (last visited July 28, 2006); Natural Environment Research Council, NERC Position on Access to Research Outputs, <http://www.nerc.ac.uk/about/access/statement.asp> (last visited Jan. 9, 2007); Particle Physics and Astronomy Research Council, PPARC Research Councils UK Position on Access to Research Outputs, <http://www.pparc.ac.uk/Rs/Fs/openaccess.asp> (last visited Jan. 9, 2007).

have voiced support for open access models include Finland, Norway, and Denmark.⁵¹

In January 2006, the European Commission (EC) published a Report on scientific publication markets which addressed the open access question.⁵² The EC Report argues that the market for scientific journals represents a case of market failure because purchasing decisions are mediated by large institutional library buyers, the reputation effects of prestige journals distort the market, and journal publishers engage in anticompetitive bundling practices.⁵³ The Report concludes that it is “crucial for public authorities to form a view on the relative efficiency of the scientific publication process” because of the vital nature of the scientific publishing endeavor and the substantial public funding that supports scientific research.⁵⁴ The Report recommends that the EC adopt a mandatory deposit policy, regulate anticompetitive pricing practices of traditional journals, and provide infrastructure and tax incentives for electronic journals.⁵⁵

2. THE UNITED STATES

In the United States, an initial foray into the open access debate was made by Representative Martin Olav Sabo, who sponsored a bill in 2003 that would have eliminated copyright protection for “any work produced pursuant to scientific research substantially funded by the Federal Government,” and would have encouraged federal funding agencies to develop “support mechanisms” for public access to such research.⁵⁶ The Sabo bill did not receive wide support, even from open access advocates, and remained in committee.⁵⁷

The focus of the debate then shifted to the National Institutes of Health

The Economics and Social Research Council requires deposit in the UK Data Archive. See Economic and Social Research Council, ERSC Guidance on Access to Research Outputs, <http://www.esresocietytoday.ac.uk/ESRCInfoCentre/Support/access/> (last visited July 28, 2006). The UK Data Archive is funded in part by ERSC. See About the UK Data Archive, <http://www.data-archive.ac.uk/about/about.asp> (last visited July 28, 2006).

51. See EC Report, *supra* note 29, at 18, 64-66.

52. *Id.*

53. See *id.* at 6-13.

54. *Id.* at 5.

55. *Id.* at 11-13.

56. H.R. 2613, 108th Cong. §§3(b)(1), 4 (2003).

57. See Peter Suber, *The open-access plan from the House Appropriations Committee*, SPARC OPEN ACCESS NEWSLETTER (Scholarly Publ'g and Academic Res. Coalition, Washington, D.C.), Aug. 2, 2004, <http://www.earlham.edu/~peters/fos/newsletter/08-02-04.htm>. The open access community was uncomfortable with the Sabo bill's direct attack on copyright and its narrow definition of what would be required to be published according to an open access model. *Id.*

(NIH), a major federal funding agency.⁵⁸ In 2004, the U.S. House Appropriations Committee, in its recommendations for the 2005 federal budget, instructed the NIH to adopt a free online access policy for articles produced using NIH-funded research, including a provision that such articles be made available in a public database no later than six months after publication in a peer-reviewed journal.⁵⁹ In September 2004, the NIH released a draft policy for public comment.⁶⁰ The draft policy stated that the NIH would “request” that researchers submit final versions of manuscripts accepted for publication for inclusion in the public database.⁶¹ President Bush signed the appropriations bill on December 8, 2004, with instructions to the NIH from the House-Senate Conference Committee “to give full and fair consideration to all comments before publishing its final policy” on open access, and “to continue to work with the publishers of scientific journals to maintain the integrity of the peer-review system.”⁶² The NIH’s final policy requests voluntary submissions “as soon as possible” after an author’s completion of the final manuscript, “and within twelve months of the publisher’s official date of final publication.”⁶³

Not satisfied with the voluntary nature of the NIH policy, Senators John Cornyn and Joseph Lieberman introduced the Federal Research Public Access Act of 2006 (the FRPAA) on May 2, 2006. The FRPAA would require any federal agency with outside research expenditures of over one hundred million dollars to implement an open access publishing policy.⁶⁴ This would encompass key funding agencies such as the NIH, National Science Foundation, the Department of Energy, the Department of Agriculture, and NASA.⁶⁵ Under the FRPAA, authors would have to ensure free public online

58. For background information concerning the NIH, see Nat’l Insts. of Health, U.S. Dep’t of Health and Human Servs., National Institutes of Health (NIH) Homepage, <http://www.nih.gov> (last visited July 18, 2006).

59. See H.R. REP. NO. 108-636, at 104 (2005). See also Nat’l Insts. of Health, U.S. Dep’t of Health and Human Servs., NIH Public Access Background Information, http://publicaccess.nih.gov/publicaccess_background.htm (last visited July 1, 2006); Peter Suber, NIH Public-Access Policy: Frequently Asked Questions, <http://www.earlham.edu/~peters/fos/nihfaq.htm> (last visited July 18, 2006).

60. Enhanced Public Access to NIH Research Information, 69 Fed. Reg. 56074-01 (notice Sept. 17, 2004), available at <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-04-064.html>.

61. *Id.*

62. H.R. REP. NO. 108-792, at 1177 (2004) (Conf. Rep.).

63. Policy on Enhancing Public Access to Archived Publications Resulting from NIH-Funded Research, 70 Fed. Reg. 6891-01 (notice Feb. 9, 2005), available at <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-05-022.html> [hereinafter “NIH Policy”].

64. Federal Research Public Access Act of 2006, S. 2695, 109th Cong. § 4(a) (2006) [hereinafter “FRPAA”].

65. 152 CONG. REC. S3896-01, S3898 (daily ed. May 2, 2006) (statement of Sen. Cornyn).

access to any peer-reviewed article resulting from “research supported, in whole or in part, from funding by the Federal Government.”⁶⁶ In addition, the sponsoring agency would be required to ensure that copies of the research were available in a stable digital repository.⁶⁷ However, the FRPAA would not require public access to “research resulting in works that generate revenue or royalties for authors (such as books) or patentable discoveries, to the extent necessary to protect a copyright or patent.”⁶⁸ As of this writing, the FRPAA remains in committee.

3. INTERNATIONAL IPR POLICY

In addition to these initiatives from private and national funders of scientific research, there has been a move towards embedding open source/open access principles into the international policy-making framework.

In the United Nations, the Declaration of Principles of the World Summit on the Information Society (WSIS) included a statement supporting open access publishing.⁶⁹ The WSIS Working Group subsequently recommended that the United Nations and other private and public funding organizations support open source and open access models.⁷⁰ Through its Health InterNetwork Access to Research Initiative (HINARI), the World Health Organization (WHO) offers access to certain scientific and medical journals for free or for a low fee to local, not-for-profit institutions in developing countries.⁷¹ A similar model is employed for food, agriculture and environmental science literature by the UN's Access to Global Online Research in Agriculture (AGORA) database.⁷²

The Organisation for Economic Co-operation and Development (OECD) Committee for Scientific and Technological Policy concluded in January 2004 that coordination was required to broaden access to data from publicly-funded research.⁷³ OECD members, including the European Commission, the United

66. FRPAA, *supra* note 64, § 4(b)(1).

67. *Id.* §4(b)(6).

68. *Id.* §4(d)(2).

69. UN World Summit on the Information Society, *supra* note 25; World Summit on the Information Society, Dec. 10-12, 2003, *Declaration of Principles of the World Summit on the Information Society*, art. 28, U.N. Doc WSIS-03/GENEVA/DOC/4-E (Dec. 12, 2003).

70. International Conference UNESCO Between Two Phases of the World Summit on the Information Society, St. Petersburg, Russ., May 17-19, 2005, *Resulting Document*, <http://www.ifap.ru/wsis/reseng.htm>.

71. See World Health Organization, Health InterNetwork Access to Research Initiative, <http://www.who.int/hinari/en> (last visited July 28, 2006).

72. See About AGORA, <http://www.aginternetwork.org/en/about.php> (last visited July 28, 2006).

73. Meeting of the Organisation for Economic Co-operation and Development

Kingdom and the United States, signed a “Declaration on Access to Research Data from Public Funding,” in which they pledged to work towards better digital access to data derived from public funding.⁷⁴

In the recently collapsed General Agreement on Tariffs and Trade (GATT) Doha round, there were several important agenda items relating to the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS), but none concerned open source or open access models. Instead, the principal move towards encoding open source/open access models into law in the international arena has been framed in terms of “access to knowledge,” or “A2K,” and has been focused on influencing the WIPO development agenda towards an A2K treaty.⁷⁵

With respect to copyrighted works, the 1971 Paris Act of the Berne Convention provides an annex that permits compulsory licensing for teaching, research or scholarship, subject to just compensation to the copyright owner.⁷⁶ However, because the annex’s procedures are complicated and include many restrictions, they have seldom been used.⁷⁷ Moreover, the compulsory license procedures likely would be subject to the further restriction in TRIPS that exceptions to exclusive rights can be made available only in “special cases” that “do not conflict with a normal exploitation of the work.”⁷⁸

Discussion concerning the proposed A2K treaty was spearheaded by Argentina and Brazil at a 2004 WIPO General Assembly.⁷⁹ A draft treaty was prepared during a series of meetings in 2005, which included representatives from Brazil, India and other developing countries, as well as representatives

(OECD) Committee for Scientific and Technological Policy at Ministerial Level, Jan. 29-30, 2004, *Final Communiqué*, (Jan. 30, 2004) http://www.oecd.org/documentprint/0,2744,en_2649_34487_25998799_1_1_1_1,00.html [hereinafter, “OECD Report”]. See also UK Report, *supra* note 43.

74. OECD Report, *supra* note 73, Annex p. 1.

75. See, e.g., Margaret Chon, *Intellectual Property and the Development Divide*, 27 CARDOZO L. REV. 2821, 2845-46 (2006) (discussing WIPO development agenda).

76. Berne Convention for the Protection of Literary and Artistic Works, Paris, Fr. Appendix, art. III, 1 B.D.I.E.L 715 (July 24, 1971).

77. See UNCTAD-ICTSD Project on Intellectual Property Rights and Sustainable Development, Policy Discussion Paper: Intellectual Property Rights: Implications for Development, 130 (Aug. 2003), available at <http://www.iprsonline.org/unctadictsd/policyDpaper.htm> [hereinafter “UNCTAD-ICTSD Discussion Paper”].

78. Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) art. 13, Apr. 15, 1994, 1869 U.N.T.S. 299, 33 I.L.M. 1125, 1202, available at http://www.wto.org/English/docs_e/legal_e/27-trips.pdf. See also UNCTAD-ICTSD Discussion Paper, *supra* note 77, at 131-132.

79. See WIPO Proposal by Argentina and Brazil, *supra* note 27; Natali Helberger, *A2K: Access to Knowledge—Make it Happen*, INDICARE, July 21, 2006, http://www.indicare.org/tiki-read_article.php?articleID=102.

from the United States, the United Kingdom, and other developed countries.⁸⁰ The draft treaty includes a list of exceptions to copyright that essentially mirror “fair use” and “fair dealing” provisions under existing copyright law in most developed countries.⁸¹ It also includes a “general exception” to copyright law akin to existing compulsory licensing provisions.⁸²

A section of the A2K draft treaty on digital rights management (DRM) would significantly weaken permissible restrictions on circumvention of DRM and technological protection measures (TPM). It would be lawful to circumvent DRM/TPM if the licensing terms preclude implementation in free and open source software, the restricted content is marketed without “adequate disclosure” of the restrictions, and for other similar reasons.⁸³ In addition, “[u]nless the use of DRM/TPM measures do not substantially interfere with uses that are authorized by the right holders or permitted by law,” it would be lawful to circumvent DRM/TPM for “works of medical and scientific literature,” “works substantially financed by national governments or international organizations,” and works that are primarily factual or predominantly consist of public-domain material.⁸⁴

Another section of the draft treaty concerns copyright term. It would limit the copyright term to the minimum required under TRIPS (currently the life of the author, plus fifty years) and would convert subsisting copyrights that have enjoyed protection for a term beyond the TRIPS minimum—in other words, works protected under U.S. copyright law that would have expired but for the Copyright Term Extension Act of 1998⁸⁵ (also known as the Sonny Bono Copyright Term Extension Act)—into a more limited type of *sui generis* right.⁸⁶ In addition, the draft treaty acknowledges that the Berne Convention’s existing compulsory licensing mechanism does not work, and calls for more efficient compulsory licensing procedures.⁸⁷ The draft treaty also includes a section on patents which, among other things, would include an experimental use exception.⁸⁸

Finally, the draft treaty features a group of provisions titled “Expanding and Enhancing the Knowledge Commons.”⁸⁹ The treaty would provide free

80. A2K Draft Treaty, *supra* note 28; Helberger, *supra* note 79.

81. See A2K Draft Treaty, *supra* note 28, art. 3-1.

82. *Id.* art. 3-1(d).

83. *Id.* art. 3-6(b).

84. *Id.*

85. Pub. L. No. 105-298, 112 Stat 2827 (codified as amended in scattered sections of 17 U.S.C.).

86. See A2K Draft Treaty, *supra* note 28, art. 3-10.

87. *Id.* art. 3-12.

88. *Id.* art. 4-1(b).

89. *Id.* pt. 5.

access to “works resulting from government-funded research.”⁹⁰ In addition, the treaty would encode into law restrictions on obtaining patents based on data from open source databases.⁹¹

Although, or perhaps because the draft A2K treaty reflected input from disparate groups, it reads more like a wish list for development advocates than a realistic proposal. In fact, the details of a WIPO development agenda were discussed during a series of meetings in 2006. The first group of meetings, in February 2006, resulted in the presentation of over one hundred different proposals by various member nations and interest groups.⁹² The proposals ranged from calls by some developing countries for significant changes in the existing international IPR balance,⁹³ to a proposal by the United States for an IPR database and “partnership program” without further changes in the international IPR treaties.⁹⁴

The second group of meetings, in June 2006, degenerated into procedural wrangling, culminating in a proposal by the Committee Chair to move forward only on proposals that had received consensus support.⁹⁵ This proposal was rejected by the developing countries that favored significant IPR reforms.⁹⁶ These developing countries viewed this as a back-room maneuver that gave the developed countries a veto over the agenda.⁹⁷ An analysis of the proposals for

90. *Id.* art. 5-2. Certain information is excluded from this provision, most notably discoveries that are subject to patent protection. *See id.*

91. *Id.* art. 5-6.

92. *See* Provisional Committee on Proposals Related to a WIPO Development Agenda, First Session, Feb. 20-24, 2006, *Summary by the Chair*, available at http://www.wipo.int/edocs/mdocs/mdocs/en/pcda_1/pcda_1_www_56972.pdf.

93. *See* Inter-Sessional, Intergovernmental Meeting on a Development Agenda for WIPO, First Session, Apr. 11-13, 2005, *Proposal to Establish a Development Agenda for the World Intellectual Property Organization (WIPO): An Elaboration of Issues Raised in Document WO/GA/31/11*, Submission by the Group of Friends of Development (prepared by the Secretariat), available at http://www.wipo.int/edocs/mdocs/mdocs/en/iim_1/iim_1_4.pdf.

94. Provisional Committee on Proposals Related to a WIPO Development Agenda, *supra* note 92; Provisional Committee on Proposals Related to a WIPO Development Agenda, First Session, Feb. 20-24, 2006, *Proposal by the United States of America to Establish a Partnership Program in WIPO: An Elaboration of Issues Raised in Document IIM/1/2 WIPO PCDA/1/4* (Feb. 17, 2006) (prepared by the Secretariat), available at http://www.wipo.int/edocs/mdocs/mdocs/en/pcda_1/pcda_1_4.pdf.

95. *See* Elec. Frontier Found., *Blogging WIPO: Development Agenda Talks Edge Forward*, DEEP LINKS, June 26, 2006, <http://www.eff.org/deeplinks/archives/004776.php>; Elec. Frontier Found., *Blogging WIPO: The Development Agenda by the Numbers*, DEEP LINKS, June 28, 2006, <http://www.eff.org/deeplinks/archives/004779.php>; Elec. Frontier Found., *Blogging WIPO: Development Agenda Deadlocked*, DEEP LINKS, June 29, 2006, <http://www.eff.org/deeplinks/archives/004782.php>.

96. Elec. Frontier Found., *Blogging WIPO: Development Agenda Deadlocked*, *supra* note 95; *WIPO Development Agenda Meeting Breaks Down Over Chair's Text*, BRIDGES, July 5, 2006, <http://www.ictsd.org/weekly/06-07-05/story1.htm>.

97. *See* Elec. Frontier Found., *Blogging WIPO: Development Agenda Deadlocked*,

which the Chair indicated consensus existed shows that the United States and European perspective in fact would dominate the agenda under the Chair's proposal.⁹⁸

E. RESISTANCE TO OPEN ACCESS MODELS

The move towards government promotion of, and treaty support for, open access models has generated significant resistance from the established publishing community.⁹⁹ The prospect of a formal NIH open access policy in

supra note 95; Freedom Bits Blog, WIPO PCDA2: Escalation on Day Four: What is the Future of the Development Agenda? (June 29, 2006), http://www.fsfe.org/en/fellows/greve/freedom_bits/wipo_pcda2_escalation_on_day_four_what_is_the_future_of_the_development_agenda.

98. Freedom Bits Blog, *supra* note 97.

99. With respect to the NIH Policy, see, for example, Elsevier, Enhanced Public Access to NIH Research Information: A Response from Elsevier, 2 (Nov. 15, 2004), http://www.elsevier.com/authoried_news/corporate/images/ELSresponsetoNIH041115.pdf (stating that STM publishing is "a finely balanced, high quality system that works well, and whose rapid transformation is delivering ever wider access at increasingly lower costs."); Statement of the Association of American Publishers/Professional and Scholarly Publishing Division Regarding the National Institutes of Health's Public Access Policy (Mar. 7, 2005), http://www.pspcentral.org/publications/open_access.html (follow "Statement of the AAP/PSP Division regarding the NIH's Public Access Policy" hyperlink) (stating that "NIH fostering immediate free public access to content would risk undermining free market investments and models that have proven essential to authors and researchers."). *See also* Letter from Marc Brodsky, Chair, Executive Council, Prof'l/Scholarly Publ'g Div. of the Ass'n of Am. Publishers, et. al. to Dr. Elias Zerhouni, Director, Nat'l Insts. of Health, (Aug. 23, 2004), *available at* http://www.pspcentral.org/publications/open_access.html (follow "Open letter to Dr. Elias Zerhouni, Director, NIH, from a coalition of PSP Publishers" hyperlink) (noting that the signatories of the letter "encompass the majority of the nation's leading journal publishers in biomedicine"); Letter from Marc Brodsky, Chair, Prof'l/Scholarly Publ'g Div. of the Ass'n of Am. Publishers to Elias A. Zerhouni, Director, Nat'l Insts. of Health (Apr. 8, 2005), *available at* http://www.pspcentral.org/publications/open_access.html (follow "Letter to Dr. Zerhouni – Re: NIH Public Access Policy" hyperlink); Letter from Brian D. Crawford, President, Am. Med. Publishers Ass'n to Elias Zerhouni, Director, Nat'l Insts. of Health (Nov. 16, 2004), *available at* http://www.pspcentral.org/publications/open_access.html (follow "American Medical Publishers Association (AMPA)" hyperlink); Letter from Thomas B. Lanigan, Vice President of Elec. Publ'g & Mktg., Humana Press Inc., to the Nat'l Insts. of Health (undated), *available at* http://www.pspcentral.org/publications/open_access.html (follow "Humana Press, Inc." hyperlink) ("This debate should not be a discussion about what is perceived right and wonderful in a perfect world . . . it is a discussion about finances."); Letter from Alan I. Leshner, Chief Executive Officer & Publisher, Science, to the Nat'l Insts. of Health (July 21, 2006), *available at* http://www.pspcentral.org/publications/open_access.html (follow "American Association for the Advancement of Science (AAAS)" hyperlink) (stating that "[w]e estimate that it may take upwards of four or five years before the economic consequences of this [open access] model are realized and understood"); Letter from Christopher Lynch, Vice President for Publ'g, The New England Journal of Med., to Elias Zerhouni, Director, Nat'l Insts. of

the United States, for example, drew significant public comment from the science journal publishing industry. Some of these comments focused on concerns such as public misunderstanding of research findings, the politicization of scientific research, and implementation costs.¹⁰⁰ Another, perhaps more direct, cluster of comments focused on the economic impact on journal publishers and the policy's effect on copyright and patent rights.¹⁰¹

Journal publishers argued that the public database would erode their subscription bases and drive smaller publishers out of business.¹⁰² The NIH sought to answer these concerns by extending the six-month publication window to a more flexible requirement.¹⁰³ Others argued that the policy infringes copyrights by enacting a forced license.¹⁰⁴ This was linked to an argument that the policy, although framed in voluntary terms, was in fact mandatory.¹⁰⁵ The NIH reiterated that the policy was voluntary and, as such, did not violate any authors' copyrights.¹⁰⁶

The concerns regarding patent rights focused on the statutory bars under U.S. patent law.¹⁰⁷ These commentators were concerned that submission of a final manuscript to the public database would constitute a "printed publication"

Health (Nov. 16, 2004), available at http://www.pspcentral.org/publications/open_access.html (follow "New England Journal of Medicine (NEJM)" hyperlink) (stating that "[t]he current proposal would diminish both publishers' ability and incentive to protect the integrity of their portion of the scientific record"); Letter from William J. Pesce, President & Chief Executive Officer, John Wiley & Sons, Inc., to Elias A. Zerhouni, Director, Nat'l Insts. of Health (Nov. 15, 2004), available at http://www.pspcentral.org/publications/open_access.html (follow "John Wiley & Sons, Inc." hyperlink) (stating that "[t]he NIH policy appears to have been conceived in haste" and that the NIH proposed policy "presents the risk of unintended consequences that could compromise the integrity of the scientific record and disrupt both the fabric of global scientific communication and the biomedical research enterprise that has been a hallmark of strength for the United States").

100. See Elsevier, Enhanced Public Access to NIH Research Information, *supra* note 99; see also Letter from Thomas B. Lanigan to the Nat'l Insts. of Health, *supra* note 99; Letter from Christopher Lynch to Elias Zerhouni, *supra* note 99; Letter from William J. Pesce to Elias A. Zerhouni, *supra* note 99.

101. See Statement of the Association of American Publishers/Professional and Scholarly Publishing Division. Regarding the National Institutes of Health's Public Access Policy, *supra* note 99; see also Letter from Alan I. Leshner to the Nat'l Insts. of Health, *supra* note 99.

102. *Id.*

103. *Id.*

104. *Id.*

105. *Id.*

106. NIH Policy, *supra* note 63.

107. See Letter from the Am. Physiological Soc'y to the Nat'l Insts. of Health 13 (Nov. 16, 2004), available at <http://www.dcpinciples.org/responses/aps.pdf>. The statutory bars prohibit the patenting of an invention that, among other things, is disclosed in a printed publication anywhere in the world more than one year prior to the application for a U.S. patent. See 35 U.S.C. § 102 (2006).

that would trigger the statutory bar clock.¹⁰⁸ In response, the NIH stated that it believed courts would continue to interpret the publication date as the date of the journal publication because the database would not have the same indicia of public accessibility as a printed journal.¹⁰⁹

The NIH policy has remained controversial and has enjoyed only limited success. The NIH submitted a report to Congress in January 2006, in which it concluded that only four percent of eligible articles had been submitted to the database.¹¹⁰ An NIH advisory working group concerning the program noted that some publishers had amended their author agreements to include restrictions on how and when manuscripts can be submitted to the database.¹¹¹ Such restrictions commonly include a twelve-month embargo, a requirement that only accepted, unedited manuscripts be submitted to the database, a link to the publisher's website where the copyedited version of the article can be obtained, and a disclaimer stating that the database version of the manuscript is un-copyedited.¹¹²

Similar concerns were raised by publishing groups about the proposed U.S. open access bill and the prospect of open access regulation by the United Kingdom and the European Commission.¹¹³ The Association of American

108. See Letter from the Am. Physiological Soc'y to the Nat'l Insts. of Health, *supra* note 107, at 13.

109. NIH Policy, *supra* note 63.

110. NAT'L INSTS. OF HEALTH, DEP'T OF HEALTH AND HUMAN SERVS., REPORT ON THE NIH PUBLIC ACCESS POLICY 3 (2006), available at http://publicaccess.nih.gov/Final_Report_20060201.pdf.

111. *Id.*

112. *Id.*; see also, Society for Neuroscience, NIH Public Access Policy, http://www.sfn.org/index.cfm?pagename=guidelinesPolicies_nihpolicy (last visited July 18, 2006). *Journal of Neuroscience* authors who wish to submit to the public database under the NIH policy must include the following disclaimer on the public version of the manuscripts:

This article is an un-copyedited author manuscript that has been accepted for publication in *Journal of Neuroscience*, copyright 200_ Society for Neuroscience. The Society for Neuroscience disclaims any responsibility or liability for errors or omissions in this version of the manuscript or any version derived from it by NIH or other parties. *Id.*

113. With respect to the FRPAA, see, for example, Press Release, Am. Ass'n of Publishers, Scholarly Publishers Oppose Senate Bill 2695 (May 9, 2006), available at <http://www.publishers.org/press/releases.cfm?PressReleaseArticleID=327> (“[T]he provisions of S.2695 threaten to undermine the essential value of peer review by removing the publishers’ incentive and ability to sustain investments in a range of scientific, technical, and medical publishing activities.”); Letter from Ass’n of Am. Publishers to Sen. Susan M. Collins (May 23, 2006) (on file with author), available at <http://www.idsociety.org/Template.cfm?Section=Home&Template=/ContentManagement/ContentDisplay.cfm&ContentID=16265> (“This unnecessary legislation would adversely impact the existing peer review system that ensures the high quality of scientific research in the United States. In addition, it would impose costly new mandates on federal agencies.”). With respect to the EC Report and the RCUK Proposal, see, for example, INT’L ASS’N OF SCIENTIFIC, TECHNICAL & MED. PUBLISHERS (STM), STUDY ON THE ECONOMIC AND

Publishers stated that the FRPAA, “if passed, will seriously jeopardize the integrity of the scientific publishing process, and is a duplicative effort that places an unwarranted burden on research investigators.”¹¹⁴ The International Association of Scientific, Technical and Medical Publishers criticized the EC Report as “flawed,” “inconsistent,” and not supported by adequate data.¹¹⁵

It is clear, then, that opponents and advocates of open IPR models are at odds in the IPR policy game. But if open IPR models have gained such strong support in the academic and scientific communities, why have open IPR models thus far not seriously influenced international IPR policy? The next Part of this Article begins to answer this question by discussing the political economy of international intellectual property and establishing the parameters of the game theoretic models presented in Part IV.

III. INTELLECTUAL PROPERTY AND THE INTERNATIONAL TRADE GAME: THE POLITICAL ECONOMY OF OPEN SOURCE AS PUBLIC POLICY

Economists routinely model international trade negotiations as a non-cooperative game. Game theory is also proving to be a useful tool for analyzing how intellectual property policy impacts decisions concerning innovation, secrecy, and disclosure.¹¹⁶ Recent insights regarding game theory and

TECHNICAL EVOLUTION OF THE SCIENTIFIC PUBLICATION MARKETS IN EUROPE: A RESPONSE BY THE INTERNATIONAL ASSOCIATION OF SCIENTIFIC, TECHNICAL & MEDICAL PUBLISHERS (STM) 3 (2006), available at <http://www.stm-assoc.org/documents-statements-public-co/stm%20response%20to%20EU%20publishing.pdf> [hereinafter “STM Response”]

(Given the remarkable success of science publishing, the enormous pro-competitive and pro-consumer benefits of its innovations over the past several years, it is remarkable that the Study suggests an interventionist approach with mandated business models, an emphasis on cost management, and the like. Science publishing (as the Study itself says) is not like the utility company sector, as energy or telephony are, and, we submit, requires no such regulation.);

Letter from Peter S.H. Bolman, Chief Executive Officer, INT’L ASS’N OF SCIENTIFIC, TECHNICAL & MED. PUBLISHERS, to Prof. Ian Diamond 2 (Aug. 22, 2005) (on file with author), available at <http://www.stm-assoc.org/documents-statements-public-co/8-05%20stm%20letter%20to%20rcuk%20.pdf>

(In our view, the RCUK conclusions are precipitous and lack scientific rigour . . . the creation of a new more routinised publishing system through RCUK-mandated repositories and systems as proposed will decrease diversity in journals and the peer review process, will threaten the value of investments made by STM publishers, and will improve neither access nor quality for scholars.);

114. Press Release, Am. Ass’n of Publishers, *supra* note 113.

115. STM Response, *supra* note 113, at 5-6.

116. DOUGLAS G. BAIRD, ROBERT H. GERTNER & RANDAL C. PICKER, *GAME THEORY AND THE LAW* (1994); David W. Opderbeck, *Patents, Essential Medicines, and the Innovation Game*, 58 VAND. L. REV. 501 (2005). As Baird et al. note, “[g]ame theory, like all economic modeling, works by simplifying a given social situation and stepping back from the many details that are irrelevant to the problem at hand.” BAIRD ET AL., *supra*, at 7.

intellectual property can be combined with traditional game theoretic analysis of international trade negotiations to test how different factors can affect negotiations of intellectual property treaties and conventions. Although this sort of analysis is not necessarily predictive or precise, it provides a unique means for testing how certain variables affect the parties' expected payoffs and change the game's solution. This analysis will provide insight into how the two factors identified above—price elasticity of demand and the potential for open source development—affect the international intellectual property system.

A. THE PLAYERS

The model presented here assumes two blocs of nations: a Developed Country bloc and a Developing Country bloc. The Developed Country bloc corresponds to groups of nations that possess advanced technology, strong manufacturing capabilities, stable governments, and growing economies (relative to the time in history being addressed). The Developing Country bloc corresponds to groups of nations that lag behind the Developed Countries in these areas. For simplicity of modeling, the member countries of each bloc are assumed to have relatively homogenous preferences. In some instances I will describe, however, there are diverging preferences within a bloc, and in those instances I model separate intra-bloc games.

B. THE RULES

The players can choose among three types of international intellectual property rules. These choices can be made either by advocating a position during treaty or trade negotiations, or by refusing to join a treaty or trade pact. One choice is to reject international intellectual property standards altogether. The other two choices reflect typical components of international intellectual property treaties and agreements. The first component is "national treatment," under which a citizen of any member state is entitled to the same rights and privileges under the laws of another member state as is a national of that state. The second component is "minimum standards," under which all member states must adopt intellectual property laws that meet certain minimum requirements that are specified in the treaty or agreement.

There are two possible combinations of the national treatment and minimum standards components: national treatment without minimum standards, or national treatment with minimum standards. Although it is conceivable that a regime involving minimum standards without national treatment could be adopted, in practice, minimum standards regimes have always included a national treatment component. This is because the move towards minimum standards is always a move towards a generally stronger

intellectual property regime.

At this point, I am almost ready to identify the rules, but with one further nuance. As noted above, a move towards a minimum standards regime typically involves minimum standards that reflect a relatively high level of IPR protection. However, it is possible to include strong minimum rights with meaningful exceptions, such as compulsory licenses, when the right implicates an important public policy interest, such as public health. Depending on the scope of any such exceptions, a minimum standards regime could be considered either “medium” or “strong.”

I can then conveniently characterize the different combinations as follows:

Weak = no international standards.

Medium = national treatment, no minimum standards; or, national treatment and minimum standards, with significant exceptions.

Strong = national treatment and minimum standards, with relatively insignificant exceptions.¹¹⁷

C. THE PAYOFFS

The payoffs are set based on a common agency lobbying model of the political economy of international trade.¹¹⁸ In the common agency model, domestic special interest groups use political contributions to influence the government’s trade policy choices. Trade negotiations can be modeled as a non-cooperative game, with the payoffs representing the interest group contributions expected as a result of adopting a particular policy.¹¹⁹ Payoffs can be mapped onto a four-by-four matrix to determine the equilibrium solution for

117. A final possibility would be a system involving complete harmonization of national intellectual property laws. Harmonization means that all national laws are the same. In effect, harmonization would replace national intellectual property law with international law. Because harmonization involves deeper questions of state sovereignty than minimum standards or national treatment, the political economy of negotiations over harmonization is more complex than that involving the Weak, Medium, and Strong regimes characterized above. Therefore, harmonization is not included as an option in this model.

118. The seminal papers developing the common agency lobbying model in the international trade negotiation context are Gene M. Grossman & Elhanan Helpman, *Protection for Sale*, 84 AM. ECON. REV. 833 (1994) [hereinafter Grossman & Helpman, *Protection*]; Gene M. Grossman & Elhanan Helpman, *Trade Wars and Trade Talks*, 103 J. POL. ECON. 675 (1995) [hereinafter Grossman & Helpman, *Trade Wars and Trade Talks*].

119. See Grossman & Helpman, *Trade Wars and Trade Talks*, *supra* note 118, at 682 (“Facing the contribution schedules offered by the various lobbies, the incumbents set trade policy—either unilaterally or through a process of international bargaining—so as to maximize their political welfare.”).

a given set of variables.

1. BASIC FACTORS AFFECTING THE PAYOFFS

Suzanne Scotchmer has identified a number of factors that can affect the payoffs relating to intellectual property treaties and agreements.¹²⁰ These include market size, innovation capacity (including the availability of public sponsorship and industrial capacity), domestic industry lobby pressure, and the value of reduced trade barriers for exports and imports.¹²¹ All of these factors are discussed in varying degrees in the existing literature concerning the political economy of intellectual property.¹²² In general, larger market size, higher innovation capacity, stronger domestic industry lobby pressure, and greater value of reduced trade barriers will result in higher payoffs for stronger intellectual property protections.

2. THE PRICE ELASTICITY FACTOR

While Scotchmer's summary is helpful, it is not complete. As I have demonstrated elsewhere, differing elasticities of demand for a good in different national markets will affect how intellectual property rules incentivize innovation.¹²³ In markets where demand is relatively inelastic, a patentee can charge a price premium and obtain rents.¹²⁴ In markets where demand is relatively elastic, it is more difficult to obtain monopoly rents, and the justification for patent protection becomes less compelling.¹²⁵

The same sort of analysis should apply to a nation's incentive to negotiate for stronger international intellectual property protection. If the national market is generally price inelastic in a particular sector, we should predict that nation, other things being equal, to expect a relatively high payoff for strong intellectual property protection. If the national market is generally price elastic in that sector, other things being equal, we should expect that the payoffs for strong protection will decrease. Therefore, when payoffs are established, payoffs for strong intellectual property protection will be higher when the national market is generally price inelastic and lower when the national market is generally price elastic.

120. Suzanne Scotchmer, *The Political Economy of Intellectual Property Treaties*, 20 J.L. ECON. & ORG. 415 (2004).

121. See generally *id.*

122. See generally GLOBAL INTELLECTUAL PROPERTY RIGHTS, *supra* note 8; OSTERGARD, *supra* note 8; PUGATCH, *supra* note 8; RYAN, *supra* note 8; SELL, *supra* note 8.

123. Opderbeck, *supra* note 116.

124. *Id.* at 525-29.

125. *Id.*

3. THE OPEN SOURCE / OPEN ACCESS FACTOR

Another important variable that has been overlooked in the existing literature is the feasibility of open source and/or open access production. Although some efforts have been made towards a political economy of open source production,¹²⁶ none of the existing work concerning the general political economy of intellectual property considers the influence of open source communities on the process of creating international intellectual property rules. The ability of open source communities to influence the politics of international intellectual property is an important question because of the hopes some scholars, activists, and policymakers are pinning on open source methods. In the area of digital communications and the Internet, where, it is said, “the code is the law,”¹²⁷ open protocols and architecture are seen as the key means of preserving the commons, fostering innovation and creativity, and preserving open public debate.¹²⁸ In biotechnology and other sciences, open source is viewed by many as a way to avoid an “anticommons” or “patent thicket,” and to make useful technologies, including basic humanitarian goods such as medicines and vaccines, available to the world.¹²⁹

A foundational question in setting payoffs for open source or open access models is whether such models are, as a practical matter, feasible in a given field. To be susceptible to open source development, a technology must be sufficiently modular and granular, there must be a plausible non-monetary reward structure, and there must be a community with authoritative voices who can aggregate and “canonize” contributions to the open source project.¹³⁰

Open access models do not necessarily entail the same requirements. In particular, a product can be produced according to a closed model and yet be publicly distributed based on an open access model. For example, scientific research at a macro level could be viewed as a sort of open source project, since the entire body of scientific knowledge is comprised of discrete contributions

126. See, e.g., Steven Weber, *The Political Economy of Open Source Software* (BRIE, Univ. of Cal., Berkeley, Working Paper No. BRIEWP140, 2000), <http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1011&context=brie>; David M. Berry, A Contribution to a Political Economy of Open Source and Free Culture (Oct. 17, 2005) (draft), available at <http://mokk.bme.hu/centre/conferences/reactivism/FP/fpBerry>.

127. See LAWRENCE LESSIG, *CODE AND OTHER LAWS OF CYBERSPACE* 6 (1999); LAWRENCE LESSIG, *THE FUTURE OF IDEAS* 35 (2001) [hereinafter LESSIG, *THE FUTURE OF IDEAS*].

128. See BENKLER, *supra* note 4; LESSIG, *THE FUTURE OF IDEAS*, *supra* note 127.

129. See, e.g., BENKLER, *supra* note 4; LESSIG, *THE FUTURE OF IDEAS*, *supra* note 127; Rebecca S. Eisenberg, *Proprietary Rights and the Norms of Science in Biotechnology Research*, 97 *YALE L.J.* 177 (1987); Arti K. Rai, *Regulating Scientific Research: Intellectual Property Rights and the Norms of Science*, 94 *NW. U. L. REV.* 77 (1999).

130. See Yochai Benkler, *Coase's Penguin, or, Linux and the Nature of the Firm*, 112 *YALE L.J.* 369, 378-80 (2002); Opderbeck, *The Penguin's Genome*, *supra* note 10, at 181-82.

distributed among diverse individual scientists. However, at the micro level—the level of any given research project that results in a publication—scientific research typically is not subject to disaggregation and distribution. The authors of a given scientific research paper typically must invest a level of time, attention, and often physical resources and equipment, that require the intense, ongoing participation of only a relatively few individuals. Nevertheless, the results of that research can be distributed on an open access basis. The only practical requirement for open access is that the good is susceptible to distribution over a publicly accessible and searchable distribution network. This is clearly the case with scientific research papers, which are easily distributed over the Internet. It is also true of entertainment products, such as movies and music. It is not true of the physical embodiment of biotechnology or traditional pharmaceutical inventions—the actual medicines or treatments people take—though it is true of documents, such as research papers and patents that describe how to make the invention.

A simple model, then, would suggest that open source will influence payoffs if the product is sufficiently modular and granular and if there is a feasible non-monetary reward structure, and that open access will influence payoffs if the product is susceptible to distribution over an existing open network. A number of other factors, however, must also be considered, particularly with regard to open source.

4. THE RELATIONSHIP BETWEEN CLOSED AND OPEN SOURCE

The first additional factor is open source's symbiotic relationship with closed proprietary models. Open source software was developed based on a set of norms that existed independent of intellectual property law. As open source methods became more widely adopted, a legal framework grew up around those norms.¹³¹ That framework, embodied in the General Public License (GPL) and the Creative Commons licenses, is grounded in the right of an author to control derivative works under copyright law.¹³² Therefore, although open source is seen as an alternative to traditional intellectual property protection, it is not a complete replacement for IPRs.

In addition, open source is unique in that open source projects can exist alongside, and often in symbiosis with, proprietary projects. In some cases, such as with the LINUX¹³³ and Windows operating systems, open source projects are substitutes for proprietary products. Often, however, open source

131. See David McGowan, *Legal Implications of Open Source Software*, 2001 U. ILL. L. REV. 241 (2001).

132. *Id.* at 253-57.

133. See Opderbeck, *The Penguin's Genome*, *supra* note 10, at 194, for a discussion of LINUX.

projects make proprietary projects feasible. For example, the open protocols that permit diverse users to connect to the Internet also supply the architecture behind, and facilitate markets for, proprietary web-based software.¹³⁴

Traditional proprietary rights are supposed to incentivize innovation through the prospect of monopoly rents. The incentive to innovate in a purely open source community, in contrast, is based on “reputational” or “psycho-social” rewards. The presence of such non-monetary rewards depends on the nature of the innovation community and not on whether or not intellectual property rights are available. Open source software has thrived even though software is subject to copyright and, more recently, patent protection. Moreover, innovators will sometimes choose to offer a product on an open source, or partially open source, basis in an effort to develop a loyal user base and generate network effects.¹³⁵ Open and closed source development can thus exist in a symbiotic relationship.

5. PRESENCE OR ABSENCE OF A MATURE OPEN SOURCE COMMUNITY

An additional factor to consider is the maturity of any existing open source communities relating to a particular technology and the corpus of existing open source or public domain material upon which later innovators can draw. Like all innovation, open source development is a cumulative effort. Later innovations build on earlier ones. If there is a body of open source or public domain material to work with, and if there is an open source licensing regime in place that is consistent with existing intellectual property rules, there is less of a need to modify existing intellectual property rules for the open source community to function well. Further, from the perspective of a developing country, resources produced through open source production will be available regardless of the intellectual property regime. However, if there is not yet such a body of materials, and significant development pathways are locked up by closed proprietary rights, some modification of existing intellectual property rules might be required to jump-start the open source development process. Developing countries will favor a move towards open source in order to unlock those resources.

6. NETWORK EFFECTS

Yet another consideration is the presence of network effects. “Direct” network effects arise if a user’s utility from using a good increases when others

134. See generally Benkler’s discussion of the “physical layer” in BENKLER, *supra* note 4, at 396-412.

135. For a discussion of network effects see *infra* Part III.C.6.

also use the good.¹³⁶ “Indirect” network effects arise if broad adoption of the good increases a user’s utility from the good by changing the behavior of third actors, such as manufacturers of compatible goods.¹³⁷

Network effects can arise in relation to platform products such as computer operating systems and certain types of basic software. The fact that the Windows operating system is installed on most personal computers increases each user’s utility from the use of Windows, both because files exchanged between users are likely to be compatible (direct network effects) and because third party software vendors are likely to produce compatible applications for the large base of Windows users (indirect network effects). This dynamic tends to make the market “tippy,” meaning that one network tends to acquire a monopoly-like market share.¹³⁸

In markets with strong network effects, where the network is based on a proprietary product such as Windows, we might expect that efforts to promote open source or open access models would fail. The success of the LINUX operating system—the poster child for open source advocates—however, suggests otherwise. This is because of three additional factors: the needs and sophistication of the network user base, the compatibility of the network with possible open source or open access rivals, and switching costs.

Computer operating systems are used both by people with little skill in programming and by information technology professionals. The professional user base has large-scale needs for product upgrades and improvements, as well as the technical skills to make those improvements.¹³⁹ This professional user base has a strong incentive to produce such upgrades and improvements if the proprietary manufacturer fails to do so in response to market demand. In fact, as is the case with computer software, the professional user base might have the expertise and equipment needed to manufacture an alternative solution on an open source basis. If the alternative can be made compatible with the existing network, and switching costs are not too high, the open source alternative can gain some traction. The compatibility question depends in large part on whether the underlying standards are open or closed.¹⁴⁰

Given dynamics like those in the computer operating system market, the presence of strong network effects might provide incentives for open source development. On the other hand, if switching costs are too high or the underlying standards are closed, strong network effects relating to a proprietary product likely will crowd out open source rivals.

To summarize, payoffs will be adjusted in favor of weaker IPR protection

136. Schmidt & Schnitzer, *supra* note 23, at 486-87.

137. *Id.*

138. *Id.* at 489.

139. *See id.* at 485-86.

140. As was the case with Microsoft, this might be a question for antitrust regulators.

if the good is susceptible to distribution over an open communication network. Any adjustment relating to the possibility of open source production will depend on the feasibility of a distributed production model, the presence or absence of an existing mature open source community, and network effects.

Part IV of this Article applies these rules and payoffs to key intellectual property industries. It begins with a brief historical survey of the United States' relationship to the international IPR system, which provides important context for the contemporary situation.

IV. THE INTERNATIONAL IPR TREATY GAME

A. A BRIEF HISTORY OF THE POLITICAL ECONOMY OF IPRS IN THE UNITED STATES

The first two case studies presented below involve industries that depend heavily on copyright protection: entertainment and computer software. In constructing a political economy of intellectual property relating to these industries, it is useful to examine briefly the historical development of intellectual property, and to analyze how the models presented here relate to that history.

Prior to the Constitutional Convention, copyright in the United States was protected by state laws, which were enacted primarily as the result of lobbying by Thomas Paine and writer Noah Webster.¹⁴¹ Webster's efforts were directed towards protecting a book of English grammar he had written, while Paine believed copyright protection would improve the state of the arts in the New World.¹⁴² Webster was among those who lobbied other intellectuals, including James Madison, to include copyright protection under the auspices of a strong national government.¹⁴³ The 1790 Copyright Act was among the first laws passed by Congress under the new U.S. Constitution.¹⁴⁴

The 1790 Copyright Act protected only domestic authors.¹⁴⁵ This permitted a bustling trade in the United States in the publication and distribution of unprotected works of popular foreign authors such as Charles Dickens.¹⁴⁶ American authors who were popular overseas, including Mark Twain and Walt Whitman, lobbied for the United States to accede to the Berne Convention so that their works would be protected in Europe. However, a reciprocal copyright

141. RYAN, *supra* note 8, at 49.

142. *Id.*

143. *Id.*

144. *Id.*; see also H.R. REP. NO. 94-1476, at 46, 47 (1976), as reprinted in 1976 U.S.C.C.A.N. 5659, 5660 (discussing history of early U.S. Copyright statutes).

145. RYAN, *supra* note 8, at 49.

146. *Id.* at 50.

law was not passed in the United States until 1890, at the behest of large U.S.-based publishing houses that wished to distribute titles in Europe.¹⁴⁷

An international framework for copyright protection has existed under the Berne Convention since 1886. National treatment and minimum standards are fundamental components of the Berne Convention. The United States, however, did not accede to the Berne Convention until 1990. Indeed, several efforts at copyright reform in the United States introduced between 1924 and 1940 failed in part because of objections to the Berne Convention's "minimum standards" requirements.¹⁴⁸ Only after World War II did the United States accept some minimum standards under the Universal Copyright Convention (UCC) relating to the term of protection and the rights to be protected. Shortly after acceding to the UCC, the United States began a long legislative march of modifications to its copyright laws in order to comply with the Berne Convention's minimum standards. A major part of this revision was achieved in the 1976 Copyright Act and its subsequent amendments, culminating in the United States formally acceding to the Berne Convention in 1990.¹⁴⁹

As this brief historical sketch shows, the road to national treatment and minimum standards for copyrighted works in the United States proceeded in four stages based on the interests of U.S. copyright industries. The first stage, from 1790-1890, rejected both national treatment and minimum standards; the second stage, from 1890-1952, accepted national treatment but rejected minimum standards; the third stage, from 1952-1990, accepted national treatment and partial minimum standards; the fourth stage, from 1990 to the present, accepted national treatment and substantially all the minimum standards set forth in Berne. Even in the present stage, the United States continues to resist proposals for harmonizing the law on database protections.

We can now use the variables we have identified to determine how the payoffs in this market affected the international IPR game at each of these stages. During the first stage, we can view the United States as a "developing" country, and France and England as "developed" countries. The market size for published works in the United States during the first stage was significant, but smaller than that of Europe. Likewise, innovation capacity in Europe, with its long tradition of scholarship and arts, outstripped that in the United States, although some entrepreneurs such as Webster were making strides, and intellectuals such as Paine and Madison desperately wanted to close that gap.¹⁵⁰ In the United States, the only domestic lobby pressure was that of Webster,

147. *Id.*

148. See H.R. REP. NO. 94-1476, at 47 (1976), as reprinted in 1976 U.S.C.C.A.N. 5659, 5660.

149. See *id.* at 47-48.

150. See *supra* notes 141-143- and accompanying text.

whose interests lay only in the U.S. market.¹⁵¹

There is little data on the price elasticity of demand for published materials in the eighteenth century. The copyright restrictions in England at the time suggest that demand was inelastic for a significant segment of the book-buying public. The monopolies given to individual publishers over certain works enabled those publishers to charge high prices to wealthy patrons. Books, in many respects, were luxury goods. During the Victorian period, the landscape began to change with the rise of the middle class, and the associated flowering of popular artistic works designed for mass consumption. Still, demand elasticity likely was tied to class. Demand became less elastic the further up the social ladder one was located.¹⁵²

Finally, there was little potential for open source production of published works during this period. The sorts of works being published—novels and treatises—were not easily divisible, communication networks were slow, and only a relatively small slice of the populace had the education needed to make a meaningful contribution.

We can now estimate payoffs. We start with a baseline of payoffs of 0 and 100, representing no interest (0) or a strong interest (100) in a policy position. Given the factors described above, the United States had a strong interest in weak international IPRs. European countries had some interest in stronger protections, particularly for the works of European authors being copied in the United States. However, the U.S. market was not very large, and the price elasticity of such goods was likely relatively high, meaning there was little prospect for windfall rents. Therefore, we assign payoffs of less than 100 to the European countries for stronger international IPRs. Using these assumptions about payoffs, the game matrix appears as follows:¹⁵³

151. *Id.*

152. For discussion of the rise of consumerism in Western society, see generally Peter N. Stearns, *Review: Stages of Consumerism: Recent Work on the Issue of Periodization*, 69 J. MOD. HIST. 102, 109-114 (1997) (describing the development of consumerism in the late nineteenth and early twentieth centuries). As Stearns notes, “[t]he range of goods available by the late nineteenth century had vastly increased, which meant that consumer interest and consumerist approaches could apply to a wider range of life activities than before.” *Id.* at 109. Among these goods was “new reading matter—the mass press” *Id.* Stearns also discusses how consumerism began to impact the middle and lower-middle classes gradually, as the industrial revolution progressed toward the end of the nineteenth century and these classes of people had more time and income but less personally rewarding work. *Id.* at 113-114.

153. The game matrices presented in this paper present the payoff to developed countries first in each cell, followed by the payoff to developing countries. The solution to the game is the combination of payoffs that represents each player’s best response to the other player’s potential moves. If one player can play a strategy that provides a maximal payoff regardless of what the other player does, that strategy is “dominant.” See BAIRD ET AL., *supra* note 116, at 11. Where there is no single dominant strategy, a solution often can

TABLE 1: The International IPR Game in the First Stage of U.S. Copyright

		Developing Countries (U.S.)		
		Weak	Medium	Strong
Developed Countries (Europe)	W	0, 100	0, 0	0, 0
	M	50, 100	75, 0	50, 0
	S	25, 100	50, 0	50, 0

The pure strategy Nash equilibrium of this game is $\{M, W\}$.¹⁵⁴ This reflects the positions of the United States and European nations as to international intellectual property protection at the turn of the eighteenth century.

During the second stage of copyright in the United States, market size, innovation capacity, and lobby pressure were growing; there was greater value to domestic industries in reduced trade barriers; and there was a growing middle class with more money and time for leisure reading. This resulted in lower price elasticity for entertainment products. There remained at this time little prospect for open source development because the technology needed for large scale publishing was controlled by commercial publishing houses. With these changes in the factors, payoffs can be adjusted accordingly. The payoff for weak international IPRs in the United States was no longer 100. In fact, there was a significant domestic interest in national treatment, so that the work of U.S. authors would be afforded protection in Europe. Given these assumptions, the game matrix changes as follows:

be found by locating the game's "Nash equilibrium" (named after the famous Princeton economist John Nash). *See id.* at 21-22. To determine the Nash equilibrium, one must identify "[t]he combination of strategies . . . in which no player could do better by choosing a different strategy given the strategy the other chooses"—in other words, to identify each player's "best response" to the other player's potential moves. *Id.* at 21.

154. A "pure strategy Nash equilibrium" is one "in which the equilibrium strategies are played with certainty, or with probability." BAIRD ET AL., *supra* note 116, at 37.

TABLE 2: The International IPR Game in the Second Stage of U.S. Copyright

		Developing Countries (U.S.)		
		W	M	S
Developed Countries (Europe)	W	0, 50	0, 50	0, 0
	M	50, 50	75, 50	50, 0
	S	25, 50	50, 50	50, 0

The pure strategy equilibria of this game are $\{M, W\}$ and $\{M, M\}$. Consistent with the history of copyright, the balance begins to shift towards a stronger regime involving at least national treatment. However, the solution could also result in the developing country choosing a weak regime. This is consistent with the United States accession to the Universal Copyright Convention even as it resisted joining the Berne Convention. The UCC is a national treatment convention with a weak minimum standards provision.

During the third stage of copyright in the United States, the United States was no longer a “developing” country. In fact, the U.S. music and film industries had come to dominate the copyright landscape. A new wave of developing countries in Asia, Africa, and South America were beginning to emerge from colonialism and to become players in international trade negotiations. The models now represent the United States and Europe as “developed” countries and these newly post-colonial societies as “developing” countries. In the remainder of Part IV, the models reflect this change in geopolitical power and account for the growth of the entertainment industry.

B. THE INTERNATIONAL IPR GAME AND THE ENTERTAINMENT INDUSTRY

The market size for entertainment products is enormous in developed countries. The innovation capacity for entertainment products in developed countries also is substantial. Although there is relatively little public sponsorship for popular entertainment, there is significant industrial capacity to produce music and movies. The strength of domestic lobby pressure relating to the entertainment industry in developed countries also is significant. One could persuasively argue that the music and movie industries were the principal architects and beneficiaries of some important recent developments in U.S. copyright law, including the Sonny Bono Copyright Term Extension Act and

the DMCA.¹⁵⁵

The value to the entertainment industry of reduced trade barriers is less clear. As the economies of developing countries continue to grow and consumers gain more disposable income, the entertainment industry faces strong incentives to make its products accessible to those markets. The prospect of billions of Chinese consumers queuing to purchase the latest Britney Spears album or to watch the next *Harry Potter* movie is a Hollywood executive's fondest fantasy. On the import side, there is perhaps some interest in finding new content indigenous to developing markets, though this is a less significant concern.

However, the desire to enter these vast new markets is blunted by the prospect of piracy. Entertainment companies fear, with justification, that any efforts to capitalize on developing markets will be undermined by loose intellectual property laws or lax enforcement.¹⁵⁶ The entertainment industry believes that access to these markets currently is outweighed by the threat of piracy. Therefore, the industry tends to favor strong intellectual property rules, even if such rules become a sort of trade barrier.

In contrast, there is significant incentive for developing countries to reduce barriers to trade in the products they export. Further, developing countries are keen to attract foreign direct investment. Developed countries seized on these concerns during the GATT Uruguay Round as they bargained for the strong intellectual property rules under TRIPS.¹⁵⁷

Entertainment products such as music and movies are moderately price elastic. Studio movies can involve significant financial risk. Recent effects-laden action movies, such as Peter Jackson's *King Kong*, topped two hundred million dollars in production costs.¹⁵⁸ In this sense, the movie industry is similar to the pharmaceutical industry, as they both rely on "blockbuster" products to finance future product development and make profits.

Major record labels also rely, to some extent, on blockbuster popular recordings. The recording industry claims that only ten percent of all CDs are

155. See, e.g., SIVA VIADHYANATHAN, COPYRIGHTS AND COPYWRONGS: THE RISE OF INTELLECTUAL PROPERTY AND HOW IT THREATENS CREATIVITY 25-26, 174-75 (2001).

156. See, e.g., *Implementing the Dominican Republic-Central America Free Trade Agreement (DR-CAFTA): Hearing Before the H. Comm. on Ways & Means*, 109th Cong. 94-98 (2005) (statement of Sheldon Presser, Senior Vice President, Warner Bros); Press Release, Recording Indus. Ass'n of Am., An Open Letter in Support of China PNTR from America's Creative Industries (Feb. 25, 2000), available at <http://www.riaa.com/News/newsletter/press2000/022300.asp>; Motion Picture Association of America, Anti-Piracy, <http://www.mpaa.org/piracy.asp> (last visited Aug. 10, 2006); Recording Industry Association of America (RIAA), Anti-Piracy, <http://www.riaa.com/issues/piracy/default.asp> (last visited Aug. 10, 2006).

157. RYAN, *supra* note 8, at 91-94.

158. See Internet Movie Database (IMDB), Business Data for King Kong, <http://imdb.com/title/tt0360717/business> (last visited Aug. 10, 2006).

profitable.¹⁵⁹ However, there are more niche markets for music than for movies, and much of the production cost of music relates to celebrity talent rather than to technology. Digital recording technology has significantly lowered the costs of producing professional-quality music.

Finally, open source has only recently begun to make inroads into movie and music production. Digital recording technology places video and music production within the reach of anyone with a desktop computer. For at least five years, starting with MP3.com, there have been communities of amateur music and video producers who distribute their works for free, often with the hope of being “discovered” by a major label or studio.¹⁶⁰ These communities are not inherently open source, however, because the production tasks relating to a given song or video are not distributed throughout the community, and the end product typically is offered with copyright restrictions on derivative works.¹⁶¹ Recently, with the increasing popularity of “podcasting,” “quasi-open” source networks have arisen for the use of music in podcasts.¹⁶² The music production itself is not distributed, but individual podcasters are free to use the music, often edited to provide transitions between spoken word segments.¹⁶³ This phenomenon, however, does not change the way music itself is produced. Thus, open source does not factor into the payoff matrix.

Given this understanding of the market, the payoff matrix is as follows:

TABLE 3: The International IPR Game and the Entertainment Industry

		Developing Countries		
		W	M	S
Developed Countries	W	0, 50	0, 50	0, 0
	M	50, 50	75, 50	50, 50
	S	75, 25	50, 50	100, 50

The pure strategy equilibria of this game are {M, M} and {S, S}. The game

159. Recording Industry Association of America, Cost of a CD, <http://www.riaa.com/news/marketingdata/cost.asp> (last visited Mar. 6, 2006).

160. One of the strongest manifestations of this model at present is the “Podsafe Music Network.” See Podsafe Music Network, <http://www.podsafemusicnetwork.com> (last visited Aug. 10, 2006).

161. See *id.*; Podsafe Music Network FAQ, <http://music.podshow.com/music/faq.htm> (last visited Aug. 10, 2006).

162. Podsafe Music Network FAQ, *supra* note 161.

163. *Id.*

is shifting towards a “Strong” solution, though some resistance remains. This reflects the move towards the TRIPS agreement, even as developing countries negotiated for extensions of time within which to implement the changes required by TRIPS and continue to engage in foot-dragging with respect to domestic enforcement.

C. THE INTERNATIONAL IPR GAME AND COMPUTER SOFTWARE

The history of international copyright law does not end with the entertainment industry. In the present stage of U.S. and international copyright policy, computer software has become a significant player along with entertainment products. The interests of the computer software and entertainment industries diverge at some points, as do the interests of the United States and Europe. Moreover, with computer software and the advent of the Internet we now include a robust factor for open source development.

The market size for computer software is large in both developed and developing countries. Likewise, innovation capacity is significant in many developing countries, particularly those such as India and China that have made computer technology a centerpiece of their development strategies.

Domestic lobby pressure in the United States for strengthening international IPRs relating to software has historically been strong. The move towards advocating a trade-related international IPR regime was spurred in the United States by Pfizer and IBM, which together used their influence on the GATT Advisory Committee on Trade Policy and Negotiation to push the U.S. Trade Representative towards a pro-intellectual property policy.¹⁶⁴ IBM's principal interest was to reform the Berne Convention to recognize an explicit copyright in software.¹⁶⁵ During the Uruguay Round, Pfizer and IBM created the “Intellectual Property Committee,” which was joined by other pharmaceutical and manufacturing companies, to advocate for an intellectual property component under GATT.¹⁶⁶

As with entertainment products, the U.S. and European software industries view developing markets like China with great hope. India notably has embraced software as an engine of economic growth and has developed robust domestic capabilities in software coding and support that exist symbiotically with U.S. and European industries.¹⁶⁷ Additionally, unauthorized copying in developing countries is also a major concern of software manufacturers because software can be copied and distributed nearly costlessly using readily available

164. RYAN, *supra* note 8, at 67-69.

165. *Id.* at 68.

166. *Id.* at 69.

167. *See, e.g.,* Embassy of India, India's Technology Industry, http://www.indianembassy.org/indiainfo/india_it.htm (last visited Aug. 10, 2006).

digital technology.¹⁶⁸ Thus, in the United States and Europe, strong intellectual property protection is viewed as a significant way to reduce trade barriers.

The price elasticity of software is not a simple question. It is complicated by the network effects that arise from an installed user base and the dominance of the Windows operating system. As a generalization, we can say that software products implicating significant network effects, such as the Windows operating system itself or the Microsoft Office suite, “tip” markets toward monopoly, such that prices tend to be inelastic.¹⁶⁹ Software products not implicating significant network effects, including utilities like FTP clients and RSS feed readers, probably tend to be price elastic.¹⁷⁰

Finally, concerning the feasibility of open source production, software, of course, is the paradigmatic example of how open source production can work. There is a strong existing open source software community. Given the assumptions we have developed about payoffs, the prospect of open source development is not likely to influence the outcome of our game. It is true that a vocal group of scholars and activists, such as Electronic Frontier Foundation,

168. See, e.g., Jesse M. Feder, Dir. of Int’l Trade and Intellectual Prop., Business Software Alliance, Testimony before the U.S.-China Economic and Security Review Commission 5 (Jan. 13, 2005), available at <http://www.bsa.org/usa/policy/upload/Testimony-Trade-Jan-2005.pdf>

(A July 2004 IDC report concluded that 92 percent of the software used in China has been illegally copied, the highest piracy rate of the 86 countries included in the survey. China is also the world’s leading producer and exporter of counterfeit software, each year flooding global markets with millions of pirate copies. Piracy on such a massive scale has significant ramifications for the U.S. software industry and our national economy, costing U.S. firms billions of dollars in revenues annually and depriving American workers of many thousands of jobs.);

Business Software Alliance, Anti-Piracy Information, <http://www.bsa.org/usa/antipiracy> (last visited Aug. 10, 2006); Business Software Alliance, Trade and E-Commerce, <http://www.bsa.org/usa/policy/Trade-E-Commerce.cfm> (last visited Jan. 11, 2007).

169. For further discussion of how network effects might influence government policy concerning open source models, see Schmidt & Schnitzer, *supra* note 23, at 486-90. As Schmidt and Schnitzer note, “strong network effects make markets ‘tippy.’ One network will tend to acquire an overwhelming market share.” *Id.* at 489. See also *Network Effects and Externalities*, in THE NEW PALGRAVE’S DICTIONARY OF ECONOMICS AND THE LAW 671 (Peter Newman ed., 1998) (discussing network effects generally); Joseph Farrell & Paul Klemperer, Coordination and Lock-In: Competition with Switching Costs and Network Effects 2 (May 2006) (unpublished draft), available at http://www.nuff.ox.ac.uk/users/klemperer/Farrell_KlempererWP.pdf

(With network effects, established firms have little incentive to offer better deals when buyers’ and complementors’ expectations hinge on non-efficiency factors (especially history such as past market shares), and although competition between incompatible networks is initially unstable and sensitive to competitive offers and random events, it later ‘tips’ to monopoly, after which entry is hard, often even too hard given incompatibility).

170. See Schmidt & Schnitzer, *supra* note 23, at 487-90.

have lobbied for legal rules that would preserve openness.¹⁷¹ This was particularly the case in the showdown in the United States concerning the DMCA and the regulations issued under it by the U.S. Library of Congress. These activists, however, were unable to win the day, in no small part because the coding communities they claim to represent ultimately are indifferent about such legal rules. Open source software will continue to flourish despite the DMCA, or perhaps because of it, because the community will continue to create open code according to its internal norms.

The closed source software community, in contrast, has a significant interest in the ability to protect its code. This is particularly the case for companies like Microsoft, whose core products are supported by substantial network effects and therefore involve little price elasticity of demand. The rents available to such companies compel them to lobby strenuously for strong international IPRs. The open source community, despite the admirable work of some vocal activists, operates under different norms without the same prospect for monopoly rents, and therefore neither has, nor employs, the resources needed to code the open source ethic into positive law.

The models in Subpart IV.C. on the international IPR game and computer software, then, reflect these assumptions. The payoffs are similar to those in the game relating to entertainment products. Indeed, the similarities should be substantial, as the entertainment industry was a primary architect of legal protections relating to digital rights management, as enacted in the United States under the DMCA. The payoffs have been modified somewhat, however, to reflect the work of open source software activists. These modifications result in higher payoffs in both developed and developing countries for “weak” protections and somewhat lower payoffs for stronger protections:

TABLE 4: The International IPR Game and Computer Software: Baseline

		Developing Countries		
		W	M	S
Developed Countries	W	25, 75	0, 0	0, 0
	M	50, 75	50, 50	75, 50
	S	75, 25	50, 50	100, 50

The pure strategy equilibria of this game are {S, M} and {S, S}. Strategies

171. See, e.g., Electronic Frontier Foundation, EFF Action Center, http://action.eff.org/site/PageServer?pagename=ADV_homepage (last visited Jan. 11, 2007).

{W} and {M} for the developed countries are strictly dominated.¹⁷² Here, then, is an illustration of one aspect of the “penguin’s paradox”: the political economy of international intellectual property can tend towards a “strong” solution despite, or perhaps even in some ways because of, a persistent open source ethic.

Given the importance of network effects in the software market, however, it is useful to adjust the game for market segments with and without strong network effects. Segments of the software industry without strong network effects are characterized by relatively high price elasticity and low barriers to entry, such that only small, if any, rents can be captured based on first-mover advantages, reputational distortions, or other exogenous factors. In such a market, the payoffs for “strong” IPRs are less pronounced, and the players will be indifferent concerning “weak” protection. As an example, the payoffs can be adjusted, then, by reducing payoffs for “strong” protection from the baseline software model by approximately ten percent:

TABLE 5: The International IPR Game and Computer Software: Reducing Payoffs

		Developing Countries		
		W	M	S
Developed Countries	W	25, 75	0, 0	0, 0
	M	50, 75	50, 50	75, 45
	S	65, 25	45, 50	90, 45

The surprising result is that this game has no equilibria in pure strategies. Strategy {W} is strictly dominated for developed countries, while {S} is weakly dominated for developing countries. Thus, we could expect that if the game is played repeatedly, the principle of iterated dominance would result in a trend towards an {M, M} solution. Thus, in software markets without strong

172. A strategy is “strictly dominated” when it is always worse than another strategy. BAIRD ET AL., *supra* note 116, at 11. A strategy is “dominated” when it is never better than, and sometimes worse than, another strategy. *Id.* A strategy is “weakly dominated” if the player has a different strategy that is “weakly dominant.” See Game Theory.net, Definition of Weakly Dominant Strategy, <http://www.gametheory.net/dictionary/WeaklyDominantStrategy.html> (last visited Jan. 11, 2007). A strategy is weakly dominant “if it is always at least as good as any other strategy, for any profile of other players’ actions, and is strictly better for some profile of others’ strategies.” *Id.*

network effects, a policy that favors open source development could be viable, but the outcome is uncertain.

By contrast, in software markets with strong network effects, the incumbent typically is able to obtain monopoly-like rents and switching costs and costs of entry are high. The best example of such a market perhaps is the market for computer operating systems, which is dominated by Microsoft's Windows software. If the market leader is located in a developed country, as is Microsoft, the payoffs to the developed country for "strong" IPRs will be higher, while developing countries will gain higher payoffs from "weak" protection because they will be able to use cheap, "pirated" copies of the software.¹⁷³ The matrix appears as follows if you provide an approximately ten percent increase from the baseline software market matrix payoffs to developed countries for "strong" protection, and to developing countries for "weak" protection (except where the baseline is the maximum of 100):

TABLE 6: The International IPR Game and Computer Software: Increasing Payoffs

		Developing Countries		
		W	M	S
Developed Countries	W	25, 85	0, 0	0, 0
	M	50, 85	50, 50	75, 50
	S	85, 30	55, 50	100, 50

The pure strategy equilibria are {S, M} and {S, W}. Strategies {W} and {M} are strictly dominated for developed countries. It is interesting to observe that, unlike the baseline software model in which there was an {S, S} solution, there is no pure strategy equilibria in the strong network effects sub-market in which the players agree on the appropriate level of protection. Strong network effects move the developing country towards a "weak" strategy in order to escape the pricing power of the dominant firm. The same dynamic is evident in the history of open source software, which boasts the LINUX operating system,

173. It should be noted that this game is vastly more complicated in the real world because developed countries do not stand as a unified bloc with respect to Microsoft and the Windows operating system. A more accurate model would divide developed countries into those that resist Microsoft's hegemony (some European and Asian countries) and those that do not (the United States and other countries, such as Ireland, in which Microsoft has headquarters or other facilities). For simplicity of illustration, the model used here presents developed countries as a unified bloc.

an open source alternative to Windows, as one of its principal achievements.¹⁷⁴

D. THE INTERNATIONAL IPR GAME AND COMPUTER DATABASES

The rules concerning computer database protection present an interesting challenge to the political economy analysis. Although a database as a whole might be protected under traditional copyright law as a compilation, individual portions of many databases are not themselves protectible in the United States because they are merely factual statements lacking sufficient originality to qualify for copyright protection.¹⁷⁵ This aspect of U.S. copyright law has facilitated a significant industry in “data mining,” whereby data is taken from publicly-accessible databases and used for other purposes, such as marketing and academic research.¹⁷⁶

Commercial database providers in Europe, such as Reed Elsevier, and some of their competitors and counterparts in the United States, have pressed for a *sui generis* right in databases.¹⁷⁷ The European Union has responded to this pressure by passing a directive that prevents extraction from, and unauthorized copying of, a substantial part of the data in a database.¹⁷⁸ The directive applies only to databases created by European nationals.¹⁷⁹ In the United States, however, separate protection for databases remains a hotly debated issue.¹⁸⁰ Moreover, an effort to harmonize international database protection law through the WIPO Copyright Treaty has not been successful, largely because of resistance from developing countries. Why is this so?

One lobby group opposing database protections in the United States is comprised of library associations, such as the American Library Association.¹⁸¹ These groups represent a sort of open source ethic, in that they argue individual pieces of data should be freely available for future innovation. However, their influence was blunted somewhat when database publishers positioned the database right as a corrective for the loose photocopying practices of some

174. For a discussion of LINUX, see Opderbeck, *The Penguin's Genome*, *supra* note 10, at 194.

175. See *Feist Publ'ns, Inc. v. Rural Tel. Service Co.*, 499 U.S. 340 (1991).

176. See generally Anita Ramasastry, *Lost in Translation? Data Mining, National Security, and the Adverse Inference Problem*, 22 SANTA CLARA COMPUTER & HIGH TECH. L.J. 757 (2006); Gregory Piatetsky-Shapiro, *The Data Mining Industry: Coming of Age*, IEEE INTELLIGENT SYSTEMS, Dec. 1999, at 32.

177. RYAN, *supra* note 8, at 183.

178. Council Directive 1996/9, 1996 O.J. (L 77) 20 (EC), available at <http://europa.eu.int/ISPO/infosoc/legreg/docs/969ec.html>.

179. *Id.*

180. See generally Samuel E. Trosow, *Sui Generis Database Legislation: A Critical Analysis*, 7 YALE J. L. & TECH. 94 (2004-2005).

181. RYAN, *supra* note 8, at 183-84.

libraries with respect to journal articles.¹⁸²

A more powerful lobby group opposing U.S. database protections was comprised of the Biotechnology Industry Organization (BIO), the On-Line Banking Association, and financial database provider Dun & Bradstreet.¹⁸³ One of Dun & Bradstreet's primary businesses is credit reporting. The information included in credit reports often is culled from other databases. Similarly, many of BIO's members use data available in public databases, such as the Human Genome Project, as source material for research. Thus, these groups viewed database protection as means by which the cost of inputs would be increased.¹⁸⁴

Anecdotal evidence suggests that the price elasticity for access to materials contained in commercial databases is low.¹⁸⁵ Database consumers are willing to pay a premium to avoid the high search costs associated with locating and aggregating isolated pieces of data.

Databases fit well into an open source model. The collection of individual pieces of data often can be easily disaggregated, and the Internet has provided the structure in which communities of data-gatherers and data-sharers can develop. Indeed, any materials made freely available on the Web can be considered part of a nearly global open source database. Some open source Web-based publishing efforts, such as the online encyclopedia Wikipedia, are essentially database projects.¹⁸⁶ Private open source efforts, such as the HapMap Project, provide basic scientific research data on an open source basis.¹⁸⁷

Some publicly-funded database projects, such as the National Center for Biotechnology Information GenBank, exist in a netherworld between proprietary and open source models.¹⁸⁸ The GenBank data is available to the public without governmental restrictions, but researchers who post data to GenBank may continue to claim intellectual property rights in their contributions.¹⁸⁹

This mixture of proprietary, open source, and public quasi-open source databases suggests that open source has played a role in the political economy

182. *Id.* at 184.

183. *Id.*

184. *Id.*

185. Mark Glaser, *Pay or Free? Newspaper Archives Not Ready for Open Web ... Yet*, U.S. CAL. ANNENBERG ONLINE JOURNALISM REV., Feb. 1, 2005, <http://www.ojr.org/ojr/stories/050201/>.

186. *See* Wikipedia: Five Pillars, http://en.wikipedia.org/wiki/Wikipedia:Five_pillars (last visited Aug. 10, 2006).

187. *See* International HapMap Project, About the International HapMap Project, <http://www.hapmap.org/abouthapmap.html> (last visited Nov. 15, 2006).

188. *See* National Center for Biotechnology, GenBank Overview, <http://www.ncbi.nlm.nih.gov/Genbank/index.html> (last visited Nov. 17, 2006).

189. *See id.*

of database protection. Where the search costs relating to the construction of a meaningful data set are high, a database provider can earn rents by keeping the data proprietary. Where a community effort or public funding make a meaningful data set available on an open basis, private researchers may contribute on an open source basis, and private users will want to be assured of continuing open access to the data.

In constructing payoffs, then, the model resembles that offered for software protection, but the payoffs for weaker protection are higher and the payoffs for stronger protection are somewhat lower to reflect the relationship between closed and open data sources, as follows:

TABLE 7: The International IPR Game and Computer Databases

		Developing Countries		
		W	M	S
Developed Countries	W	50, 50	25, 0	25, 0
	M	25, 75	50, 50	50, 50
	S	50, 50	25, 50	75, 25

The pure strategy equilibria are $\{W, W\}$ and $\{S, W\}$. Weakly dominated strategies are $\{W\}$ for developed countries and $\{M\}$ and $\{S\}$ for developing countries. It is interesting that developed countries might choose either strategy $\{W\}$ or strategy $\{S\}$, with $\{W\}$ being weakly dominated, as this perhaps reflects the current tensions within and between the United States and European Union about whether and to what extent databases should be protected based only on a “sweat of the brow” theory.

E. THE INTERNATIONAL IPR GAME AND TRADITIONAL PHARMACEUTICALS

The next set of games is played out in the context of traditional pharmaceuticals. For the purpose of this analysis, traditional pharmaceuticals include drugs other than biotechnology drugs that are typically created by large multinational pharmaceutical companies.¹⁹⁰ The overwhelming majority of

190. A similar distinction is made in the United States for the purpose of approving generic drugs under an Abbreviated New Drug Application (ANDA). Under an ANDA, the generic manufacturer need only demonstrate that the generic version is bioequivalent to the innovator drug. Presently, an ANDA cannot be filed with respect to drugs designated as “biologics” because of questions about whether bioequivalence can ever be established

these companies are located in developed countries, particularly the United States and countries in Europe.¹⁹¹ The human, physical, and financial capital and other infrastructure required to sustain a research-based pharmaceutical industry is simply beyond the means of most developing countries.¹⁹² One notable exception is India, where a strong generic pharmaceutical industry, birthed as a result of historically lax patent rules, is beginning to develop into an industry capable of producing original drugs.¹⁹³

The history of the international IPR framework relating to traditional pharmaceuticals is interesting. Patents play the central IPR role relating to such products. Although branding, marketing, and trademark protection are increasingly important, the ubiquity of generic competition after drugs go off patent demonstrates how much patents matter in this industry.¹⁹⁴

The modern pharmaceutical industry did not begin to take shape until after World War II.¹⁹⁵ Before that time, pharmaceutical companies typically supplied bulk chemicals to pharmacists who produced finished products.¹⁹⁶ After World War II, pharmaceutical manufacturers more commonly produced finished products.¹⁹⁷ In the United States, the Federal Food, Drug, and Cosmetic Act of 1962 regulated the ethical (prescription) drug industry by requiring extensive clinical testing to demonstrate safety and effectiveness.¹⁹⁸

This emphasis on regulatory testing reduced the effective patent term for ethical drugs significantly, as a formulation covered by a patent is not available for market during the lengthy testing period.¹⁹⁹ In the 1970s and 1980s, the pharmaceutical industry successfully lobbied for an extension of the effective patent term for pharmaceuticals in the Drug Price Competition and Patent Term

concerning such "large molecule" compounds. *See* 21 U.S.C. § 355(j) (2000); 21 C.F.R. § 320 (2006) (bioequivalence requirements). This distinction is also reflected in the different industry organizations for traditional pharmaceuticals—the Pharmaceutical Research and Manufacturers of America (PhRMA) and the Biotechnology Industry Organization (BIO). *See* Pharmaceutical Research and Manufacturers of America (PhRMA), PhRMA Homepage, <http://www.phrma.org> (last visited Jan. 11, 2006); Biotechnology Industry Organization, Biotechnology Industry Organization Homepage, <http://www.bio.org> (last visited Jan. 11, 2006).

191. *See* Opderbeck, *supra* note 116, at 518-521.

192. *See id.*

193. *Id.* at 520-21.

194. *See, e.g.*, FED. TRADE COMM'N, GENERIC DRUG ENTRY PRIOR TO PATENT EXPIRATION: AN FTC STUDY (2002); CONG. BUDGET OFFICE, HOW INCREASED COMPETITION FROM GENERIC DRUGS HAS AFFECTED PRICES AND RETURNS IN THE PHARMACEUTICAL INDUSTRY (1998); David Reiffen & Michael R. Ward, *Generic Drug Industry Dynamics* (Fed. Trade Comm'n Bureau of Econ., Working Paper No. 248, 2002).

195. RYAN, *supra* note 8, at 28.

196. *Id.*

197. *Id.*

198. *Id.* at 28-29.

199. *Id.* at 29.

Restoration Act of 1984.²⁰⁰

The price elasticity of prescription drugs is relatively low in developed countries.²⁰¹ Pricing of prescription pharmaceuticals is further complicated by the industry's "blockbuster" business model and the high costs of research and development.²⁰²

Open source production of large-molecule pharmaceuticals is infeasible for regulatory and practical reasons, with a few possible exceptions. In the United States, approval of a new drug requires multiple phases of safety and efficacy testing.²⁰³ The regulatory controls over such testing preclude distributed peer production. Likewise, the regulatory requirements for "current good manufacturing practice" relating to prescription drugs probably preclude distributed peer production of finished products.²⁰⁴

As a practical matter, it would be difficult to disaggregate and distribute many of the components of drug development because of the highly specialized knowledge and equipment required to create and test new therapeutic compounds. Anyone with a computer and a knack for problem solving can learn some programming skills and make some discrete contribution to an open source software project. In contrast, identifying and testing therapeutic compounds often requires advanced training and skills in biochemistry that are possessed by relatively few people, along with laboratory equipment that is

200. *Id.*

201. See Opderbeck, *supra* note 116, at 502-04, 525-30; see also RINGEL ET AL., THE ELASTICITY OF DEMAND FOR HEALTH CARE, A REVIEW OF THE LITERATURE AND ITS APPLICATION TO THE MILITARY HEALTH SYSTEM 35-56 (2002).

202. See Opderbeck, *supra* note 116, at 525-29.

203. Federal Food, Drug & Cosmetic Act § 505, 21 U.S.C. § 355 (2000); 21 C.F.R. § 312.21 (2005).

204. See Federal Food, Drug & Cosmetic Act § 501, 21 U.S.C. § 351; 21 C.F.R. § 210, 211. The statute and regulations establish a detailed quality control regimen for the manufacture of prescription drugs that almost certainly could not be met in a highly distributed peer production environment. For example, 21 C.F.R. § 211.22 requires a manufacturer to establish a "quality control unit"

that shall have the responsibility and authority to approve or reject all components, drug product containers, closures, in-process materials, packaging material, labeling, and drug products, and the authority to review production records to assure that no errors have occurred or, if errors have occurred, that they have been fully investigated.

The requirement of an identifiable "unit" likely precludes quality control via distributed peer production of the sort that occurs in open source software communities. Moreover, 21 C.F.R. § 211.25 requires persons "engaged in the manufacture, processing, packing, or holding of a drug product" to have specialized education and training, including continuing education in current good manufacturing process regulations. This requirement is fundamentally incompatible with the open source emphasis on results over credentials. The obstacles to peer production that these personnel-related regulations impose pale in comparison to the detailed facilities, equipment, process and laboratory control, and record-keeping requirements imposed by the regulations. See 21 C.F.R. § 211.42-198.

available to even fewer.

A possible exception might be the increasingly prevalent use of automation and computers that perform initial screening tasks quickly on a large number of compounds, a practice called "high throughput screening."²⁰⁵ To the extent this process involves computer modeling, it is possible that some processing tasks could be distributed, similar to the way in which the SETI@Home initiative uses spare computing cycles on home computers.²⁰⁶ Even high throughput screening, however, currently involves specialized laboratory equipment and biological assay materials that cannot feasibly be disaggregated.²⁰⁷

Given these factors, developed countries in which the world's multinational pharmaceutical companies are headquartered will choose strong international intellectual property protection. The choice is less clear for developing countries. In some developing countries, notably India, a strong generic drug industry has arisen as a result of historically lax patent laws.²⁰⁸ These developing countries resisted the pro-patent minimum standards of TRIPS. They acceded only because of the threat of high tariff barriers for exports of other products, and only after winning concessions on the timetable for implementing the TRIPS standards.²⁰⁹ Even after TRIPS was in place, developing countries pressed for exceptions concerning "essential medicines," such as AIDS drugs.²¹⁰

With this understanding of the players' interests, the payoffs to developed countries for "strong" protection will be higher because of the low price elasticity of prescription drugs in developed countries and the "blockbuster" dynamics of the market. The payoffs for "strong" protection in developing countries, in contrast, will be lower because the high price elasticity of drugs in those countries vitiates the benefits of a strong patent policy.²¹¹ The matrix is as

205. For a discussion of high-throughput screening, see Sandra Fox et al., *High-Throughput Screening: Update on Practices and Successes*, 11 J. BIOMOL. SCREENING 864 (2006); Robert P. Hertzberg & Andrew J. Pope, *High-Throughput Screening: New Technology for the 21st Century*, 4 CURRENT OPIN. CHEM. BIOL. 445 (2000); Wikipedia, High Throughput Screening, http://en.wikipedia.org/wiki/High-throughput_screening (last visited Jan. 11, 2007).

206. For information on SETI@home, see SETI@home, <http://setiathome.berkeley.edu> (last visited Aug. 1, 2006).

207. See Hertzberg & Pope, *High Throughput Screening*, *supra* note 205.

208. See Opderbeck, *supra* note 116, at 520-21.

209. See *id.* at 511-518; Robert J. Pechman, *Seeking Multilateral Protection for Intellectual Property: The United States "TRIPS" Over Special 301*, 7 MINN. J. GLOBAL TRADE 179, 180-85 (1998).

210. Opderbeck, *supra* note 116, at 511-518. For additional discussion about ongoing conflicts between developing and developed countries over the implementation of TRIPS, see, e.g., Jerome Reichman, *The TRIPS Agreement Comes of Age: Conflict or Cooperation With the Developing Countries*, 32 CASE W. RES. J. INT'L L. 441 (2000).

211. See Opderbeck, *supra* note 116, at 529.

follows:

TABLE 8: The International IPR Game and Traditional Pharmaceuticals

		Developing Countries		
		W	M	S
Developed Countries	W	0, 100	0, 0	0, 0
	M	50, 75	75, 50	50, 25
	S	75, 75	85, 50	100, 25

The pure strategy equilibrium of this game is $\{S, W\}$. Not surprisingly, $\{W\}$ and $\{M\}$ are strictly-dominated strategies for developed countries. More surprisingly, $\{M\}$ is a strictly-dominated strategy for developing countries, while $\{S\}$ is only weakly-dominated. This is an odd result given the nascent pharmaceutical industry in countries like India. As discussed in the historical survey in Subpart IV.A, *supra*, a country that is transitioning from developing to developed status should often prefer strategy $\{M\}$. This is because “pirate” industries can continue to operate while domestic producers of original IPR-rich products benefit from stronger IPRs in other countries under the minimum standards requirement.²¹²

One difference between the dynamics of the game in pharmaceuticals and the historical game played by the United States and Europe in traditional publishing is the wide disparity of price elasticity for drugs in developed and developing countries, and the “blockbuster” business model of the pharmaceutical industry. These dynamics drive up the payoffs for “strong” protection in developed countries and at the same time increase the payoffs for “weak” protection in developing countries.

Another key difference is the technical, infrastructure, and capital requirements of the pharmaceutical manufacturing industry compared to the requirements of the publishing industry, even in the eighteenth century. The handful of pharmaceutical producers in India that are capable of original research and development are essentially the same companies that make generic drugs.²¹³ Barriers to new entrants mean that domestic generic competition is not a major problem and, as a result, strong IPRs are less important to the domestic industry.

212. See *supra* Part IV.A.

213. Opderbeck, *supra* note 116, at 520-21.

F. THE INTERNATIONAL IPR GAME AND BIOTECHNOLOGY

The biotechnology industry is actually a collection of related industries, including medical, industrial and agricultural biotechnology.²¹⁴ This analysis will focus on medical biotechnology, which is at the heart of debates concerning the scope of IPRs. Medical biotechnology concerns drugs, vaccines, and other treatments for diseases and other health problems that are developed through biological or essentially biological processes.²¹⁵

Medical biotechnology involves many of the costs and risks faced by the traditional pharmaceutical industry. The end-of-pipeline products that biotechnology companies hope to produce require expensive and time-consuming regulatory approvals, as do traditional pharmaceuticals.²¹⁶ Although biotechnology has as yet yielded only a few blockbuster drugs in its relatively brief history, the pricing history of such drugs suggests that they are price-inelastic in similar fashion to traditional pharmaceuticals. For example, pioneering biotechnology company Genentech sells RITUXAN, the first therapeutic antibody approved by the U.S. Food and Drug Administration to treat cancer, as well as AVASTIN for colon cancer, and HERCEPTIN for breast cancer.²¹⁷ Genentech reports that RITUXAN is priced at \$13,041 per course of treatment, while HERCEPTIN costs \$22,521, and AVASTIN costs \$46,640.²¹⁸ This is likely substantially higher than the marginal cost to

214. ERNST & YOUNG, BEYOND BORDERS: GLOBAL BIOTECHNOLOGY REPORT 2006 1-2, 20 (20th Anniversary ed., 2006), available at http://www.ey.com/global/content.nsf/International/Biotechnology_Report_2006_Beyond_Borders.

215. Other key areas of biotechnology include industrial and agricultural biotechnology. Industrial biotechnology involves products such as biofuels that replace traditional industrial products. Agricultural biotechnology focuses on genetically-modified crops and other means of improving food crop yield and quality. For a general discussion of medical, industrial and agricultural biotechnology. *See id.* at 1-4.

216. *Id.*

217. *See* Genentech, Rituxan, <http://www.gene.com/gene/products/information/oncology/rituxan/index.jsp> (last visited Aug. 1, 2006); *see also* Genentech, Avastin <http://www.gene.com/gene/products/information/oncology/avastin/index.jsp> (last visited Nov. 15, 2006); Genentech, Herceptin <http://www.gene.com/gene/products/information/oncology/herceptin/index.jsp> (last visited Nov. 15, 2006).

218. Information concerning the pricing of these drugs was available on Genentech's website as of May 2006, but the website appears to have been modified since then to remove pricing information. The pages in question, however, are available through the "wayback" machine at the Internet Archive, <http://www.webarchive.org>. *See* Genentech, Media Statement on Avastin Pricing (Mar. 29, 2006), <http://web.archive.org/web/20060526074616/http://www.gene.com/gene/about/views/pricing/media-statement.jsp> (copy of archive file also on file with author).

manufacture such drugs.²¹⁹ Consumers in developed countries are willing to pay a price premium for such potentially life-saving drugs.

Medical biotechnology differs from traditional pharmaceuticals, however, because the industry's early growth was based on speculative investment in smaller start-up companies that possessed few end-of-pipeline products.²²⁰ In some instances, a company's most valuable asset was an upstream research tool, rather than an end-of-pipeline product. For example, during its early existence, Genentech held patent rights in recombinant DNA technology but had no commercial products.²²¹ Although some companies like Genentech went on to develop commercially successful end products, others attracted significant venture capital during the biotech "boom" based only on promising upstream research.²²² Many small-to-medium-sized enterprises in biotechnology base their business models on proprietary research tools or methods rather than on finished products.²²³

Moreover, some aspects of medical biotechnology might be susceptible to open source development. In particular, large-scale bioinformatics databases, such as the HapMap project, can be constructed through open source methods.²²⁴ However, some significant cultural and technological barriers to more extensive open source biotechnology development remain.²²⁵

Given these factors, the baseline matrix for medical biotechnology will be the one employed for traditional pharmaceuticals, but the payoffs for "strong" protection will be reduced and the payoffs for "weak" protection increased.

219. For a discussion of price elasticity of demand in relation to marginal cost and competitive pricing, see Opderbeck, *supra* note 116, at 525-29. See also John E. Calfee, Mario Villarreal & Elizabeth DuPre, *An Exploratory Analysis of Pharmaceutical Price Disparities and Their Implications Among Six Developed Nations*, (AEI-Brookings Joint Center for Regulatory Studies, Working Paper No. 06-07, Apr. 2006), available at <http://www.aei-brookings.org/admin/authorpdfs/page.php?id=1265&PHPSESSID=237d36bb203fb3d2059ca5be44cc5839>. Calfee et al. note that manufacturing costs for biotechnology drugs are higher than for traditional pharmaceuticals, but that the uniqueness of a drug (for example, if the drug is a "last hope" treatment for an aggressive cancer) also affects price. *Id.* at 16-25.

220. See ERNST & YOUNG, *supra* note 2148, at 12-13.

221. See Genentech, Corporate Chronology, <http://www.gene.com/gene/about/corporate/history/timeline/index.jsp> (last visited Aug. 1, 2006).

222. See ERNST & YOUNG, *supra* note 208, at 13.

223. See, e.g., Cormac Sheridan, *Out to Break Biotech's IP Stranglehold*, SCI. BUS., June 7, 2006, <http://www.bios.net/daisy/bios/1860/version/live/part/4/data> (noting that "[m]any life sciences SMEs have developed business models based on proprietary tools or methods" and that venture investors require patent protection to support their funding efforts).

224. For information on the HapMap project, see International HapMap Project, *supra* note 187.

225. See generally Opderbeck, *The Penguin's Genome*, *supra* note 10.

Assuming my analysis of the barriers to open source production in biotechnology is correct, the baseline matrix can be adjusted by relatively modest ten-point adjustments to the “strong” and “weak” payoffs, as follows (except where the “weak” payoff is already set at the maximum of 100):

TABLE 9: The International IPR Game and Biotechnology: Baseline

		Developing Countries		
		W	M	S
Developed Countries	W	10, 100	10, 0	10, -10
	M	50, 85	75, 50	50, 5
	S	65, 85	75, 50	90, 50

The pure strategy equilibrium remains {S, W}. Price elasticity and other market dynamics drive the game to the same solution, even if the prospect of open source development affects the payoffs. Interestingly, however, while {W} remains strictly dominated for developed countries, {M} is now only weakly dominated for those countries. Strategy {M} remains strictly dominated, and {S} weakly dominated for developing countries. Could it be that the potential influence of open source production begins to tip developed countries towards a less “strong” solution?

We can test this possibility by further increasing the payoffs for open source production. Perhaps my earlier analysis of open source biotechnology is too pessimistic and limited.²²⁶ Following is the matrix if the baseline payoffs are adjusted another ten points:

TABLE 10: The International IPR Game and Biotechnology: Increasing Payoffs

226. *See id.*

		Developing Countries		
		W	M	S
Developed Countries	W	20, 100	20, 0	20, -20
	M	50, 95	75, 50	50, -5
	S	55, 95	65, 50	80, 40

The pure equilibrium solution, yet again, is {S, W}. Strategy {W} for developed countries remains strictly dominated, but {M} is now also strictly dominated for developed countries instead of weakly dominated. Strategy {S} is strictly dominated for developing countries rather than weakly dominated.

This appears to be another illustration of the “penguin’s paradox”: increasing the value of open source development in the biotechnology sector seems to intensify the divide between developed and developing countries, rather than to move the game towards a common solution. The problem is that the price elasticity factor, combined with the “blockbuster” market model and high barriers to entry, make this an industry in which a “medium” strategy does not yield a good mix of payoffs, regardless of the influence of open source.

This problem remains even if the assumptions are adjusted to increase the payoffs for strategy {M} in response to a greater prospect of open source development. For example, the payoffs in the previous game could be adjusted to increase the payoffs for strategy {M} by twenty points (the same absolute quantity adjustment as was made from the baseline payoffs for strategies {W} and {S}) for each player, with the following result:

TABLE 11: The International IPR Game and Biotechnology: Further Increasing Payoffs

		Developing Countries		
		W	M	S
Developed Countries	W	20, 100	20, 20	20, -20
	M	50, 95	95, 70	70, -5
	S	55, 95	85, 70	80, 40

The solution is identical to the previous game. It seems that open source, for better or worse, is unlikely to influence the outcome of the international IPR game concerning biotechnology.

G. THE INTERNATIONAL IPR GAME AND SCIENCE, TECHNOLOGY, AND MEDICAL (STM) PUBLISHING

Although prescription drugs cannot be produced through open source methods, and the viability of open source biotechnology on a large scale is questionable, research relating to medicines can be published using an open access model. Indeed, one of the principal motivations of the open access publishing movement is to make medical research, including drug research, openly available.

The price elasticity of traditional science, technology, and medicine (STM) journals is a complex question. The question is complicated because the market includes both for-profit and not-for-profit publishers, and pricing varies both across disciplines and with the quality (or prestige) of the journal.²²⁷ The European Commission's recent study of the STM publishing market concluded that price elasticity with respect to journal quality, measured by number of citations to the journal, is positive (price is elastic) for both for-profit and not-for-profit journals.²²⁸ For-profit journals, according to the EC Report, charge on average three times more than not-for-profit journals.²²⁹ The EC Report concludes that these facts suggest that there are few opportunities for substitution across journals, and that journal publishers maintain supercompetitive prices on popular journals in order to recoup development costs and fund the launch of risky new journals.²³⁰ In other words, the STM publishing market displays characteristics similar to the pharmaceutical and biotechnology markets, in which IPRs facilitate a "blockbuster" business model.²³¹

227. See EC Report, *supra* note 29, at 40.

228. *Id.* at 40. This is not precisely a measure of price elasticity of demand, since the numerator relates to citation count and not quantity demanded.

229. *Id.*

230. *Id.* at 40-41.

231. Of course, the STM publishing market displays these characteristics on a much smaller scale than the pharmaceutical and biotechnology market. Success in STM publishing would be measured in thousands or millions of dollars, rather than billions. Moreover, the STM publishing industry disputes this characterization of the market. See STM Response, *supra* note 113. The STM publishing industry argues, among other things, that the EC Report glosses over the fact that circulation costs increase as the popularity of a journal increases. *Id.* at 13-15. In addition, according to the EC Report, these monopolistic characteristics allow STM publishers to engage in "bundling" and "big deal" strategies, whereby a library is encouraged to purchase a publisher's entire collection of journals instead of paying higher individual prices for only the popular journals. EC Report, *supra*

As discussed in Subpart II.C, *supra*, STM publishing is not amenable to open source production in the traditional sense because the task of researching and writing a typical journal article cannot be distributed across a large, disparate group of workers. However, STM publishing is the focus of the open access movement, which borrows open source concepts and norms. The game, then, includes “strong” factors both for price elasticity and open source. The model could be the same as that offered for commercial databases:

TABLE 12: The International IPR Game and STM Publishing: Baseline

		Developing Countries		
		W	M	S
Developed Countries	W	50, 50	25, 0	25, 0
	M	25, 75	50, 50	50, 50
	S	50, 50	25, 50	75, 25

The pure strategy equilibria are {W, W} and {S, W}. As with commercial databases, the best strategy for developing countries is to press for “weak” protection. The different equilibrium strategies available to developed countries may reflect some ambivalence—present in the current debates over open access requirements for publicly-funded research in the United States, European Union, and United Kingdom, and in the U.S. open access legislative proposals—about whether to promote open access models.

The data concerning price elasticity of STM journals in the EC Report seems more robust than similar data concerning commercial databases, so it is useful to try this game with a stronger price elasticity factor. The game is as follows if the payoffs for “strong” protection in developed countries are increased by only approximately ten percent:

TABLE 13: The International IPR Game and STM Publishing: Increasing

note 29, at 47-50. STM publishers argue that bundled subscriptions offer price and choice efficiencies to purchasers, while the EC Report concludes that bundling leads to high switching costs and barriers to entry. STM Response, *supra* note 113, at 11-12; EC Report, *supra* note 29, at 49-50.

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		Payoffs		
		Developing Countries		
		W	M	S
Developed Countries	W	50, 50	25, 0	25, 0
	M	25, 75	50, 50	50, 50
	S	55, 50	28, 50	85, 25

The pure strategy equilibrium is then $\{S, W\}$. The driving factor in whether developed countries seek only a “strong” solution seems to be price elasticity, rather than the desirability or feasibility of an open source or open access model.

V. SOME POLICY IMPLICATIONS OF THE INTERNATIONAL IPR GAME FOR OPEN IPR MOVEMENTS

The game theoretic study of the political economy of international intellectual property suggests some important principles when price elasticity and the potential for open source or open access production are taken into account. These principles are as follows:

Price elasticity of demand is more important than the practical potential for open source or opens access development. Open source will not be a preferred policy in markets where, because price is relatively inelastic, producers can capture significant rents when IPRs permit monopoly pricing. In markets where price is relatively elastic, network effects are more important than the practical potential for open source or open access development. Open source also will not be a preferred policy in markets where producers can capture rents due to network effects. Paradoxically, this is the case even though open source development can represent a strong, spontaneous, market-based effort to reduce network effects.

If open source is not a preferred policy in a developed country market because of low price elasticity or network effects, international IPR negotiating games will tend towards “strong” solutions, even though such “strong” solutions might not support the interests of developing countries and/or the scientific community.

These principles suggest that efforts such as the “Treaty on Access to

Knowledge”²³² are likely to fail. In fields that matter—access to medicines, access to scientific knowledge, and access to standard computer software—price inelasticity or network effects will drive international IPR rules to a “strong” solution.

Is the situation then hopeless? Not necessarily. First, open source and open access advocates can focus on organic, “bottom-up” changes rather than “top-down” changes imposed by law. Indeed, the open source movement is rooted in the free software movement, which is a bottom-up reaction to the propertization of software.²³³ As the analysis in Part IV, *supra*, suggests, “strong” IPR regimes might even provide a dialectical framework that supports the early growth of open movements.

In addition, open source and open access advocates should emphasize the ethical and “soft law” aspects of IPRs and development. For example, the United Nations’ draft statement of norms for transnational corporations under the Universal Declaration of Human Rights states that transnational companies should use their intellectual property rights in a manner that will promote local development objectives in the countries in which they do business.²³⁴ Such “soft law” obligations may provide a framework for binding claims against corporate actors, may continue to shift public opinion and norms away from a perhaps overly static view of IPRs, and may be more achievable in the short run than major reforms to TRIPS or the WIPO treaties.²³⁵

Finally, the lobbying strategies of open source and open access advocates should focus on providing *incentives* to use open models, rather than mandating their use. This would involve using the prospect of rents in price inelastic markets or markets subject to high network effects as a lever to encourage the adoption of open models in those same markets or in other markets.

The IPR system, of course, already involves such tradeoffs. In particular, patents require disclosure of the invention in order to acquire the patent right.

232. See A2K Draft Treaty, *supra* note 28.

233. For background on the Free Software movement, see the Free Software Foundation, Philosophy of the GNU Project, <http://www.gnu.org/philosophy/> (last visited Jan. 12, 2007). See also Wikipedia, Free Software Movement, http://en.wikipedia.org/wiki/Free_software_movement (last visited Aug. 2, 2006).

234. See U.N. Econ. & Soc. Council [ECOSOC], Sub-Comm. on Promotion & Prot. of Human Rights, *Economic, Social, and Cultural Rights: Norms on the Responsibilities of Transnational Corporations and Other Business Enterprises with Regard to Human Rights*, § C(4), U.N. Doc E/CN.4/Sub.2/2003/12/Rev.2 (Aug. 26, 2003), available at <http://www.globalpolicy.org/soecon/tncs/2003/08ecosocnorms.pdf>. For further discussion of the Norms, see Larry Catá Backer, *Multinational Corporations, Transnational Law: The Harbinger of Corporate Social Responsibility in International Law*, 37 COLUM. HUM. RTS. L. REV. 287 (2006).

235. See Backer, *supra* note 234, at 380-84; Steven R. Ratner, *Corporations and Human Rights: A Theory of Legal Responsibility*, 111 YALE L.J. 443, 486-89, 536-38 (2001).

Scholars such as Dan Burk, Mark Lemley, and others have suggested ways in which existing policy levers in the patent system relating to disclosure, such as the patent term and the stringency of disclosure requirements, could be tweaked for greater efficiency in different product markets.²³⁶

For example, Burk and Lemley argue that current biotechnology and pharmaceutical patent policy results in too many narrow patents in the United States.²³⁷ They suggest that the low obviousness requirement for biotechnology patents makes such patents relatively easy to obtain, but that the enablement and written description standards, which require specific disclosure of the structure or sequence of biological macromolecules, significantly narrow the scope of the resulting patent.²³⁸ They propose that the obviousness requirement for biotechnology be tightened so that patents are harder to obtain, but that the enablement and written requirement standards be loosened so that the resulting patents will be broader.²³⁹ This would result, they suggest, in strong incentives to innovate (broad patent rights), without a resulting anticommons problem (because the right is hard to obtain).²⁴⁰

This concept could be tied to the right holder's willingness to make the information covered by the right available for certain public uses. Under this scenario, the amount of disclosure required can be viewed like an aperture that is narrower or wider, depending on the amount of public use the patentee is willing to permit. If the patentee is willing to permit free public use of the invention for upstream research and development, the aperture would be wider and the disclosure could be more general, resulting in a broader patent right. If the patentee is not willing to permit free use of the invention for upstream research and development, the aperture would be narrower, resulting in a more precise disclosure requirement and a more narrow patent right.

An objection to such a mechanism is that licensing markets perform a similar function under the existing patent rules. If an upstream patent appears to be useful, the technology can be licensed at a price set by the market according to its perceived usefulness. Assuming transaction costs can be controlled, Coaseian bargaining should result in an efficient distribution of the resource.²⁴¹

This is a substantial objection. A patent system that hinders efficient licensing transactions is a bad system. The response to this objection is that, as Burk and Lemley have suggested, at least with respect to biotechnology, the

236. Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575 (2003).

237. *Id.* at 1676-79, 1685-87.

238. *Id.* at 1678-80, 1685-87.

239. *Id.* at 1681-82.

240. *Id.*

241. For a discussion of transaction costs and Coasian bargaining in the biotechnology patent context, see Opderbeck, *supra* note 10, at 218-26.

proliferation of narrow patents reduces the efficiency of the licensing market.²⁴² The large number of patents increases transaction costs in identifying and clearing rights.²⁴³ In addition, the ready availability of patent rights in price inelastic markets vitiates any public policy move in favor of open source or open access models, even if such models are good responses to public health problems and disparities between developed and developing countries.

Moreover, the “aperture” model of disclosure should not hinder efficient licensing transactions. In fact, it should increase efficiency because it should help reduce the proliferation of speculative “reach through” licenses. In a reach through license, the licensee obtains the right to use a research tool in return for a percentage of profits on any commercial product resulting from research using the tool.²⁴⁴ Such licenses can result in a windfall to the holders of marginally valuable upstream patent rights that are cleared simply to avoid possible litigation.

The “aperture” model could help limit speculative reach through licenses because the inventor will need to make a choice about the scope and value of the invention before a patent issues. Many inventors likely will choose the more relaxed disclosure requirements, which will result in broader patent rights but will preclude claims against anyone using the invention for basic upstream research. Such inventions are likely to be those that have no clear application in basic upstream research, but which may one day prove valuable in a downstream application. Those inventors that choose the more narrow disclosure aperture will be in possession of inventions that are likely to be particularly valuable in upstream research and therefore more clearly subject to a licensing valuation. Such inventions should be more susceptible to efficient Coasian bargaining.

At this point, open source or open access advocates might object that the aperture model keeps the most evidently valuable upstream inventions “closed” while “opening” only those of questionable value. In particular, some “research tools” will gain patent protection even under the stricter disclosure standards proposed by Burk and Lemley. That is true, and it is precisely the point. Licenses to upstream inventions that have readily-identifiable value can be supplied by the market with few transaction costs. Other inventions will add to the stock of basic knowledge and perhaps stimulate further research. And, because the policy still represents a “strong” IPR model, it might stand a greater chance of adoption.

242. See Burk & Lemley, *supra* note 236, at 1679-82.

243. See Opderbeck, *supra* note 10, at 221-22.

244. See generally Kimberlee A. Stafford, *Reach-through Royalties in Biomedical Research Tool Patenting: Some Implications of NIH Guidelines on Small Biotechnology Firms*, 9 LEWIS & CLARK L. REV. 699, 702 (2005).

Burk and Lemley propose the opposite for software patents.²⁴⁵ They note that the Federal Circuit has upheld software patents under a seemingly-relaxed enablement requirement but with a tight obviousness standard.²⁴⁶ They suggest that this will likely result in a smaller number of broad software patents.²⁴⁷ However, because the software industry is characterized by strong competition and cumulative innovation, they suggest that patent policy in this industry should foster a larger number of more narrow patents, by loosening the obviousness standard and tightening disclosure requirements.²⁴⁸

Burk and Lemley's proposal concerning software patents also makes sense from the perspective of policy choices that would foster the development of open source and open access methods. As the games in Part IV, *supra*, demonstrated, in the software and database industries, a "strong" IPR solution paradoxically produces incentives for parallel open source and open access development. If the "strong" solution includes minimum standards for software patents with a broad enablement requirement, the resulting patents could foreclose cumulative or competing open source products. If the patents are constrained by relatively tight enablement requirements, it is more likely that the proper balance of competition between closed and open products will result.

Burk and Lemley's analysis, however, is limited to software patents in general. It does not directly address the differences between software IPR dynamics in markets characterized by different levels of network effects, nor does it deal with other IPRs, including copyright or database rights.²⁴⁹ Copyright and adjuncts to copyright, such as database and Trade Promotion Authority anti-circumvention measures, are arguably more important to the software industry than patents.

The games presented in Subparts IV.C and D, *supra*, concerning software and databases tended towards a "medium" solution, which was defined as national treatment without minimum standards under the existing international IPR treaty paradigms. They suggest that little adjustment is needed to the system concerning traditional copyright or databases, except perhaps to ensure strong regulatory oversight in markets with strong network effects. In fact, in some ways, such a regulatory framework already exists concerning copyright for other types of works, such as performance rights for music (governed by blanket licenses issued by performing rights societies such as American Society

245. See Burk & Lemley, *supra* note 236, at 1687-95.

246. *Id.* at 1688.

247. *Id.*

248. *Id.* at 1688-89.

249. Burk and Lemley do suggest that a "reverse engineering" exception should be written into software patent law to foster the sort of experimentation that leads to cumulative innovation. *Id.* at 1689-93. However, they do not discuss whether anyone will have incentives to conduct such experimentation in closed development markets characterized by strong network effects.

of Composers, Authors and Publishers) and broadcast rights for cable and satellite television programs (governed by compulsory licensing provisions).

A similar “regulatory” framework might facilitate open access STM publishing models. For example, the right to control the copyright of an STM publication could be accompanied by a compulsory license that requires deposit of the work in public repositories with technological access restrictions. The ability to view the work on more than a temporary basis, or to print it, could be provided under a graded scale based on the user’s presumptive ability to pay. A library at a major university in a developed country might pay a certain fee, while a medical clinic in a developing country might enjoy free access. This sort of balanced approach would not be easy to enact into law, but the game theory model presented here suggests that it is an approach that is more likely to gain traction than current proposals.

VI. CONCLUSION

This is a critical time in the history of intellectual property policy. Intellectual capital matters now as never before, and it will only become more important as global communication networks continue to improve, and the life sciences continue to produce information and products that can combat hunger and disease. There is enormous support in the scientific community for open IPR models, which are seen as a solution to many of the imbalances in access to intellectual capital between the developed and developing world.

The political economy of international IPRs, however, suggests that the matter is not as simple as advocating a public policy move towards open source and open access models. A central tenet of game theory is that many negotiation games will tend towards solutions that are neither pareto-optimal nor ethically best. The game theory models presented in this paper suggest that this is in fact the case concerning international IPR treaties. The practical feasibility or moral desirability of open IPR models will not drive the game. Instead, the drivers are price elasticity, network effects, and other market factors.

This perhaps bleak conclusion should not sound the death knell for open IPR advocacy. Rather, it suggests that open IPR advocates should focus on “bottom-up” cultural, ethical, and soft-law changes that can continue to influence public norms towards openness, and that strategies for encoding such norms into public policy should emphasize flexible models rather than stark contrasts between open and closed paradigms. As a possible example of such a flexible approach, an aperture model of patent disclosure requirements, in which patent policy “levers” serve to broaden or tighten access to patents depending on the applicant’s willingness to permit open source production using the patented invention, might represent a more realistic open IPR

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approach to patents than other more stark proposals. Similarly, a “regulatory” model of copyright relating to scientific publications, with a sliding scale of royalties, might enable open access publishing models to gain more policy traction. In any event, the game is well underway, and open IPR advocates must play it with more savvy if they wish to achieve any meaningful policy gains.

