New Perspectives on Public Goods Production: Policy Implications of Open Source Software

Jyh-An Lee*

Globally, the rapid rise of Open Source Software ("OSS") development has drawn the intense attention of the public sector as well as the private sector. For a variety of policy reasons, governments throughout the world are now adopting various legislative and administrative strategies that support the development of OSS.[1] For example, Singapore offers tax credits for companies that develop Linux, the principal OSS computer system platform.[2] Peru has a pending bill favoring OSS in the public sector.[3] Brazil's parliament and Germany's Bundestag are both migrating from proprietary software to OSS.[4] Even in the United States, consumer rights activists have called upon the federal government to use its procurement power to favor OSS in order to promote market competition.[5]

However, these government actions have prompted a strong response from Microsoft and its allies on the proprietary software front. The CEO of Microsoft, Steve Ballmer, cautions that government should avoid Linux at all costs.[6] To further their position against OSS, Microsoft officials have lent financial and moral support to the Initiative for Software Choice, a project of the Computing Technology Industry Association whose central goal is to preclude governments from expressing software preferences.[7] Furthermore, through lobbying and software donations abroad, Microsoft is trying to prevent OSS adoption in various countries' governments and schools.[8] Some OSS advocates believe that public support for OSS has a political

---

    1.   *See infra* notes 66, 113 and accompanying text.

    2.   *See* Drew Clark, *Counterculture's Gift to Government*, Nat'l J., Jan. 4, 2003, at 40, 41.

    3.   *See infra* note 66.

    4.   Clark*, supra* note 2, at 41.

    5.   *See* Letter from Ralph Nader & James Love, Consumer Project on Tech., to Mitchell E. Daniels, Jr., Dir., Office of Mgmt. and Budget (June 4, 2002), http://www.cptech.org/at/ms/omb4jun02ms.html (urging the government to consider using its purchasing power to favor the development of OSS).

    6.   Clark*, supra* note 2, at 41.

    7.   *Id.*

    8.   *See, e.g.*, Alan Clendenning, *Brazil Turns Away From Microsoft*, Info. Wk., Nov. 17, 2003, http://www.informationweek.com/story/showArticle.jhtml?articleID= 16100867.

aspect.[9]   For example, a pro-OSS group in Peru claims that OSS should be deployed as an instrument in the correcting of state and national "bugs" that encompass everything from the relentless, unflinching dominance of transnational corporations to a publicly unaccountable and non-transparent government.[10]   As a result, the issue of whether such pro-OSS policies are optimal for society as a whole remains intensely controversial and debated in many countries.

This article reveals some empirical data regarding the trend of evolving OSS policies globally.   Additionally, this article investigates why so many governments are considering support of OSS development, and weighs the pros and cons of such policies.   The ultimate conclusion is that when two systems are equally suitable, governments may reasonably choose OSS over proprietary software because software industry market failures may justify such support of OSS development.   While governments considering supporting OSS are primarily concerned with significant switching costs and incompatibility problems, OSS is actually superior to proprietary software because it increases compatibility and consequently decreases switching costs in the long term.   Further, OSS will not only help developing countries build their information technology capabilities, but will also promote competition in the software market.

I. INTRODUCTION TO OSS

The open source community is sizable and continues to expand as numerous programmers worldwide contribute to OSS.[11]   Below is a brief introduction to the general concepts, licensing terms, and incentives which make OSS unique in the software market.

---

9.   *See generally* Anita Chan, *Coding Free Software, Coding Free States: Free Software Legislation and the Politics of Code in Peru*, 77 ANTHROPOLOGICAL Q. 531, 531-35 (2004).

10.   *Id.*

11.   For example, SourceForge is a major website for OSS development that OSS developers visit regularly to see what kind of projects are evolving and who is doing what in specific areas. It currently hosts more than 100,000 projects and over 1,000,000 registered users. *See* SourceForge.net, What is SourceForge.net?, http://sourceforge.net/docs/about (last visited Oct. 1, 2006).   Moreover, according to Bonaccorsi and Rossi's estimate, there are 120,000 developers in the OSS community, contributing to 25 million lines of code. *See* Andrea Bonaccorsi & Cristina Rossi, *Why Open Source Software Can Succeed,* 32 RES. POL'Y 1243, 1246 (2003).

A. The Concept of OSS

Software developers write software in various programming languages, such as Fortran, C, C++, and Java.[12] The original format they write is called source code, which is easy for trained programmers to read and understand.[13] This source code has to be compiled or translated into an object code (alternatively referred to as machine code or binary code) before it can be processed by a computer.[14] Object code is very difficult to read and retranslate into a source code.[15] As a result, programmers write source code rather than object code.[16] Source code enables users to extend or modify the software for their own needs, while object code is understood only by computers.

"Open source software" is software, the source and object code of which are distributed and made available to the public allowing for free modification by other programmers.[17] In contrast, most commercial software is proprietary software, and is distributed only with the object code so that competitors are prevented from reusing the source code to develop the software.[18] Though the misappropriation of original source code for proprietary software may violate intellectual property (IP) laws, it is extremely costly to discover and prevent such behavior through litigation.[19] Distributing software without its source code is a less expensive way to preclude such misappropriation.[20]

---

12.   *See* JOHN C. MITCHELL, CONCEPTS IN PROGRAMMING LANGUAGES 3-7 (2003).

13.   *See* Christian H. Nadan, *Open Source Licensing: Virus or Virtue?*, 10 TEX. INTELL. PROP. L.J. 349, 350-51 (2002).

14.   *Id.*

15.   *See* Open Minds, Open Source, http://www.catb.org/~esr/writings/analog.html (last visited Oct. 1, 2006).

16.   *See* LAWRENCE LESSIG, THE FUTURE OF IDEAS: THE FATE OF THE COMMONS IN A CONNECTED WORLD 50 (2001).

17.   The term "open source software" is somewhat controversial. *Compare* Richard Stallman, *Why "Free Software" Is Better Than "Open Source," in* FREE SOFTWARE, FREE SOCIETY 55, 55-60 (Joshua Gay ed., 2002) (Richard Stallman, the founder of Free Software Foundation, believes that "free software" conveys an ethical value that "open source software" lacks; moreover, Stallman argues that though the name "free software" is ambiguous, the name "open source" leads to greater ambiguity) *with* Eric S. Raymond, Goodbye, "free software"; Hello, "open source", http://www.catb.org/~esr/open-source.html (last visited Oct. 1, 2006) (arguing that "free software" is not only a more ambiguous term, but also is likely to make profit-conscious businessmen in the corporate sector nervous).

18.   *See* Nadan, *supra* note 13, at 351.

19.   *Id.*

20.   *Id.* Software companies do not disclose source code for other practical reasons. Disclosure of source code may either prevent the original version of a piece of software from

In contrast to proprietary software, OSS has attracted a community of advocates, who believe that:

> [w]hen programmers can read, redistribute, and modify the source code for a piece of software, the software evolves. People improve it, people adapt it, people fix bugs. And this can happen at a speed that, if one is used to the slow pace of conventional software development, seems astonishing.[21]

B. OSS Licensing

People sometimes mistakenly believe that OSS, by its very nature, conflicts with the objectives of IP law.[22] Contrary to these beliefs, the entire OSS development system operates under the existing IP rights regime. Unlike property in proprietary software, "property in [OSS] is configured fundamentally around the right to distribute, not the right to exclude."[23] OSS is distributed under a license that requires source code authors, distributors, and users to comply with certain conditions.[24] These conditions include adherence to standard IP rules, and the licensing terms of OSS are "effective only if copyright law governs software."[25] The Open Source Initiative (OSI) has published a definition enumerating several criteria for an open-source license, which provides a mechanism for enforcing certain industry norms.[26] This licensing process is very important to the

---

becoming a standard or make it more difficult for the company to provide support to end-users if the original software is modified. *Id.*

21.   *See* Open Source Initiative, http://www.opensource.org (last visited to Oct. 1, 2006).

22.   Prior to the WIPO meeting on "Open Collaborative Models to Develop Public Goods," Lois Boland, Director of International Relations for the U.S. Patent and Trademark Office, stated that "[t]o hold a meeting which has as its purpose to disclaim or waive such rights seems to us to be contrary to the goals of WIPO." Jonathan Krim, *The Quiet War over Open-Source*, WASH. POST, Aug. 11, 2003, at E1, *available at* http://www.washingtonpost.com/ac2/wp-dyn?pagename=article&node=&contentId=A23422-2003ug20&notFound=true; *see also* Lawrence Lessig, Lessig Blog, The Extremist in Power, http://lessig.org/blog/archives/2003_08.shtml (Aug. 22, 2003, 05:58 PDT).

23.   *See* STEVEN WEBER, THE SUCCESS OF OPEN SOURCE 1 (2004).

24.   David McGowan, *Legal Implications of Open-Source Software*, 2001 U. ILL. L. REV. 241, 253-54.

25.   *See* LAWRENCE LESSIG, FREE CULTURE 265 (2004), *available at* http://www.free-culture.cc/freeculture.pdf; *see also* Yochai Benkler, *Coase's Penguin, or, Linux and the Nature of the Firm*, 112 YALE L.J. 369, 446 (2002) (arguing that the copyright-based licensing of OSS is used "only as a form of institutional jiujitsu to defend from intellectual property" and suggesting that "[a] complete absence of property in the software domain would be at least as congenial to free software development as the condition where property exists, but copyright permits free software projects to use licensing to defend themselves from defection").

26.   *See* Open   Source   Initiative,   The   Open   Source   Definition, http://www.opensource.org/docs/definition.php (last visited Oct. 1, 2006).

success of OSS because such a process can enforce OSS community norms and distinguish OSS from proprietary software.[27]

1. The Viral License

The GNU Public License (GPL),[28] adopted by the GNU/Linux operating system, is the most famous and dominant licensing mechanism among all the OSS license models.[29] The GPL, conceived and written by the Free Software Foundation, requires that anyone who redistributes modified versions of GPL software must license the software's source code to users according to the GPL terms.[30] In order to preserve both the freedom to publish source code versions and the freedom to distribute and modify corresponding programs, the GPL applies automatically to every new copy of the licensed software, every derivative work, and any other adaptation of the software.[31] Such licensing terms are referred to as "copyleft"[32] and are regarded as viral in nature.[33] The terms are viral because they preclude proprietary software companies from building software based on code falling under the GPL because any enhancement will be "infected" by the

---

27.   McGowan, *supra* note 24, at 245.

28.   GNU is a recursive acronym for "GNU's Not UNIX." YOCHAI BENKLER, THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM 64 (2006). Variants of the GNU open-rating system, which use the kernel Linux, are now widely used; though these systems are often referred to as "Linux", they are more accurately called GNU/Linux systems. *See* Free Software Foundation, The GNU Operating System, http://www.gnu.org/ (last visited Oct. 1, 2006).

29.   *See e.g.* BENKLER, *supra* note 28, at 64; ROD DIXON, OPEN SOURCE SOFTWARE LAW 19 (2004); 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, 322-23 (2003); Lawrence Lessig, *Open Source Baselines: Compared to What?*, *in* GOVERNMENT POLICY TOWARD OPEN SOURCE SOFTWARE 50, 54 (Robert H. Hahn ed., 2002).

30.   Section 2 of the GPL provides:

You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License. . . . [W]hen you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it. . . . [T]he intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

Free Software Foundation, GNU General Public License, Version 2 (June 1991), http://www.gnu.org/copyleft/gpl.html (last visited Oct. 1, 2006).

31.   *Id.*

32.   Richard Stallman, *What is Copyleft*, *in* FREE SOFTWARE, FREE SOCIETY, *supra* note 17, at 89, 89-90; Michael J. Madison, *Reconstructing the Software License*, 35 LOY. U. CHI. L.J. 275, 283-84 (2003).

33.   Klaus M. Schmidt & Monika Schnitzer, *Public Subsidies for Open Source? Some Economic Policy Issues of the Software Market*, 16 HARV. J.L. & TECH. 473, 477 (2003).

GPL requirements.[34] This viral nature has led some people to worry that these copyleft requirements "[are] too steep a price for developers to pay."[35]

2. The Non-viral License

Not all OSS is copylefted.[36] Some OSS allows users to modify the source code without requiring them to redistribute the modified software under the same licensing terms.[37] For instance, the Apache web server is the most widely used web server in the world, and it is not copylefted OSS.[38] Anyone can build the Apache source code into his or her proprietary software. Consequently, some people refer to the GPL as a "free software license" while referring to other OSS licenses without derivative work requirements as "open source licenses."[39] Alternatively, some label the former a "restrictive license" or "reciprocal license" and the latter a "permissive license" or "academic license."[40]

Another example of non-viral OSS is the Berkeley Software Distribution (BSD) license.[41] The BSD license is perhaps the oldest OSS license, and was created by Eric Raymond with various other OSS developers to represent "a quieter, less confrontational and more market-friendly strain in the hacker culture."[42] Contrary to the GPL, BSD is another OSS licensing model that does not prohibit users from turning source code into proprietary software.[43] Rather, the BSD only requires that users acknowledge the underlying source code's original copyright.[44] Notably this license does not preclude a user from keeping the BSD code private. As long as the proprietary software includes the required notice it can be distributed in object code form, and the source code can be maintained in secrecy. For example, both

---

34.   *See* Evans & Reddy, *supra* note 29, at 323.

35.   *See* Lessig, *supra* note 29, at 54.

36.   *See generally* LAWRENCE ROSEN, OPEN SOURCE LICENSING: SOFTWARE FREEDOM AND INTELLECTUAL PROPERTY LAW 69-70 (2005).

37.   *Id.*

38.   *See* Lessig, *supra* note 29, at 54-55.

39.   *See* LESSIG, *supra* note 16, at 60.

40.   *See* ROSEN, *supra* note 36, at 69-70, 179-80; Bradford L. Smith, *The Future of Software: Enabling the Marketplace to Decide*, *in* GOVERNMENT POLICY TOWARD OPEN SOURCE SOFTWARE, *supra* note 29, at 69, 73.

41.   *See* Open Source Initiative, The BSD License, http://www.opensource.org/licenses/bsd-license.php (last visited Oct. 1, 2007).

42.   *See* Eric S. Raymond, *Homesteading the Noosphere*, FIRST MONDAY, Oct. 5, 1998, http://www.firstmonday.dk/issues/issue3_10/raymond/.

43.   *See* Open Source Initiative, *supra* note 41.

44.   *Id.*

early versions of Sun's variant of the Unix operating system and Macintosh's latest operating system were based, either in whole or in part, on a BSD licensing model.[45] Microsoft also incorporates some BSD open source code into their Windows operating system.[46] However, this incorporation does not affect the proprietary nature of the Windows operating system.[47]

C. Incentives to Participate in OSS Development

In proprietary software development, profit provides an effective incentive to innovate that does not exist in the open source community. However, collaborative OSS projects such as Linux and Apache demonstrate that a large and complex system of software codes can be built, maintained, developed, and extended in a non-proprietary setting where developers work in a highly parallel and relatively unstructured way. Additionally, the robust development of OSS and a growing body of literature both demonstrate that software developers have sufficient incentives to participate in OSS development, even though they will not be able to capture the full profit value of what they produce.[48]

---

45.   Evans & Reddy, *supra* note 29, at 322.

46.   Hal R. Varian & Carl Shapiro, *Linux Adoption in the Public Sector: An Economic Analysis*, 18 (Dec. 1, 2003), http://www.sims.berkeley.edu/~hal/Papers/2004/linux-adoption-in-the-public-sector.pdf.

47.   *See* Nadan, *supra* note 13, at 361; Wikipedia, *BSD and GPL Licensing*, http://en.wikipedia.org/wiki/BSD_and_GPL_licensing (last visited Oct. 10, 2006).

48.   *See* Benkler, *supra* note 25, at 436-44; *see also generally* Alexander Hars & Shaosong Ou, *Working for Free? Motivations for Participating in Open-Source Projects*, 6 INT'L J. ELECTRONIC COMM. 25 (2002) (using survey research to categorize internal and external OSS development motivations); Guido Hertel et al., *Motivation of Software Developers in Open Source Projects: An Internet-Based Survey of Contributors to the Linux Kernel*, 32 RES. POL'Y 1159 (2003) (using an Internet-based questionnaire to explore the motives of 141 contributors to the Linux Kernel); Justin Pappas Johnson, *Open Source Software: Private Provision of a Public Good*, 11 J. ECON. & MGMT. STRATEGY 637 (2002) (using economic models to illustrate the effects that user programmers who are devoted to OSS development and to accompanying welfare have on society); Karim R. Lakhani & Eric von Hippel, *How Open Source Software Works: "Free" User-to-User Assistance*, 32 RES. POL'Y 923 (2003) (exploring how the mundane but necessary task of field support is organized in the case of Apache web server software, and why some project participants are motivated to provide free service to others); Josh Lerner & Jean Tirole, *Some Simple Economics of Open Source*, 50 J. INDUS. ECON. 197, 213-24 (2002) (highlighting the extent to which labor economics, especially the literature on career concerns, can explain the motives behind OSS development); Matthew A. Liao-Troth & Terri L. Griffith, *Software, Shareware and Freeware: Multiplex Commitment to an Electronic Social Exchange System*, 23 J. ORG. BEHAV. 635 (2002) (observing the behavior of 37 authors of shared software for the Apple Newton in terms of multiplex commitment and finding the corresponding relationships to two helping behaviors: the number of shared software programs produced and the degree of sacrifice expected with that shared software).

1. Altruism and Reciprocity

Eric Raymond, a prominent hacker, sees the open source community as being "most effectively understood not in conventional exchange-economy terms but as what anthropologists call a 'gift culture' in which members compete for status by giving things away."[49] This "gift culture" is primarily motivated by altruism and reciprocity.[50] As Steven Weber observes, "[t]o act selflessly in this setting would [mean] . . . writ[ing] and contribut[ing] [software] code for no apparent compensation other than the personal gratification that comes from doing something that helps someone else."[51]

This viewpoint has been criticized on the grounds that altruism and reciprocity are not likely to provide sufficient incentives for activities that take place on a scale as large as that characterizing the open source movement.[52] Critics like Weber argue that, "[i]f altruism were the primary driving force behind [OSS], no one would care very much about who was credited for particular contributions. And it wouldn't matter who was able to license what code under what conditions."[53] This article presents a different viewpoint from this critique without arguing that the development of OSS is merely motivated by altruism. As Steven Shavell explains,

> [t]here are[, actually,] a variety of reasons for gift-giving apart from altruism. One [reason] is that the act of giving itself may supply utility to the donor, independently of the degree of satisfaction it renders the donee. Another is that a gift may produce expressions of appreciation or affection from the donee, or respect from those who learn of the gift. . . .[54]

These incentives, earning utility for the donor herself and earning respect from others, also exist in the production of OSS.

2. Signaling Incentives

A survey by the Boston Consulting Group found a wide variety of motives for OSS development: "[s]ome developers get involved with

---

49.   McGowan, *supra* note 24, at 262 (quoting Eric S. Raymond, *The Magic Cauldron*, § 2, June 1999, http://www.tuxedo.org).

50.   *See* Schmidt & Schnitzer, *supra* note 33, at 481.

51.   WEBER, *supra* note 23, at 131.

52.   *See* Schmidt & Schnitzer, *supra* note 33, at 481.

53.   WEBER, *supra* note 23, at 131.

54.   STEVEN SHAVELL, FOUNDATIONS OF ECONOMIC ANALYSIS OF LAW 58 (2004). Based on Eric Raymond's work, David Zeitlyn argues that within some subgroups of the OSS movement, "gift giving is not necessarily or directly reciprocated, instead members work according to the 'axiom of kinship amity'—direct economic calculation is not appropriate within the group." *See* David Zeitlyn, *Gift Economies in the Development of Open Source Software: Anthropological Reflections*, 32 RES. POL'Y 1287 (2003).

OSS projects to learn cutting edge technology. . . . Others seek a sense of community in participating in OSS projects," and still others "hope to build their reputation through involvement that advances their careers."[55]

Josh Lerner and Jean Tirole argue that strong signaling incentives exist for OSS developers.[56] As Weber notes, "[f]or many programmers, code is a core means of expression, an essential way of interacting with the world."[57] The widely distributed model of information production provided by the OSS community also better identifies who is the best person to produce a specific component of a project.[58] By solving complex problems or contributing significant new pieces of software to the computer world, programmers signal their abilities to others.[59] It has consistently been observed that "the challenge of programming in the open source environment" serves as "a source of satisfaction" to software developers.[60] A "code that represents an elegant solution to a complex problem is a thing of beauty that . . . can be shared with others" in the open source setting.[61] The recognition of this ability by one's peers creates an "ego gratification incentive."[62] The self-fulfillment incentive is, to some extent, analogous to that of "a tenured academic who is free to write a book on whatever she wants[;] the result is then presumed to be that person's best effort."[63]

This article holds that OSS developers are motivated in many ways and for many reasons. OSS developers consider a broad set of possible benefits, including peer recognition and the excitement of participating in a meaningful social project. The OSS model "allows multiple motivational systems to co-exist and to be aligned. . . ."[64]

II. GOVERNMENT PROJECTS SUPPORTING OSS

In recent years, governments around the world have begun to think about both fostering the use of OSS in the private sector and

---

55.   *See* James Bessen, *What Good is Free Software?*, *in* GOVERNMENT POLICY TOWARD OPEN SOURCE SOFTWARE, *supra* note 29, at 12, 18.

56.   *See* Lerner & Tirole, *supra* note 48, at 213-24.

57.   WEBER, *supra* note 23, at 136.

58.   See Benkler, *supra* note 25, at 414.

59.   *See* Lerner & Tirole, *supra* note 48, at 214.

60.   WEBER, *supra* note 23, at 140.

61.   *Id.* at 136.

62.   *See* Lerner & Tirole, *supra* note 48, at 214.

63.   *See* WEBER, *supra* note 23, at 136-37.

64.   *See* Ilkka Tuomi, *The Future of Open Source*, *in* HOW OPEN IS THE FUTURE? 429, 445 (Marleen Wynants & Jan Cornelis eds., 2005).

migrating to OSS in the public sector.[65] Some governments have also subsidized specific OSS development projects. From the local level to the national level, various policies have been adopted to support OSS. These policies have given rise to controversy regarding the appropriate role of government in the fields of software development and technology innovation.

A. Global Overview of Government Support for OSS

As of September 4, 2006, at least 99 governments in 44 countries had undertaken administrative or legislative action in support of OSS development.[66] As Table 1 shows, these countries and governments are geographically dispersed on different continents.[67] Although different countries' OSS policies may have varying implications, as discussed in Part II.B, Table 1 illustrates that governments' support of OSS development has become an international phenomenon.[68] This trend deserves more academic attention for further policy analysis.

---

65.   *See infra* Part II.A.

66.   *See* CTR. FOR STRATEGIC & INT'L STUDIES (CSIS), GOVERNMENT OPEN SOURCE POLICIES 2-18 (Dec. 13, 2004), *available at* http://www.csis.org/media/csis/pubs/ 040801_ospolicies.pdf. This estimate does not include government agency' procurement decisions of migrating to OSS, since it is not easy to tell whether such decisions indicate OSS policy implications or are made merely on the basis of price or quality. The data used in this Section is primarily based on the author's collection and a report released by the Technology and Public Policy Program, under Center for Strategic and International Studies (CSIS) on December 13, 2004.

67.   *See* tbl.1, p. 57.

68.   *See infra* Part II.B and tbl.1, p.57.

Table 1: Number of Governments and Countries that Have Pro-OSS Policies (By Geographical Areas)[69]

	Countries	Governments
Africa	2	2
Asia	14	19
Europe	17	31
Latin America	8	26
North America	2	16
Oceania	1	5
Total	44	99

Professor Yochai Benkler has suggested that the United States government should establish a national foundation that "will fund software development projects on condition that the fruits be licensed as free software," and "a government procurement policy that would require that software written under government contract be released as free software."[70] Although Professor Benkler discussed public funding and government procurement of OSS in the United States federal government context, a variety of regulatory alternatives are readily available to governments in other countries that choose to support OSS.[71] Governments may choose to promote OSS through legislation, administrative rules, guidelines, procurements, subsidies, or other public measures.

---

69.   Center for Strategic & International Studies (CSIS) data was updated by the author using data from the following sources: PAUL DRAVIS, OPEN SOURCE SOFTWARE: PERSPECTIVES FOR DEVELOPMENT 8-11 (2003), *available at* http://www.infodev.org/en/ Publication.21.html; Evans & Reddy, *supra* note 29, at 375-77, 390-91; Schmidt & Schnitzer, *supra* note 33, at 499; Damir Amirov, *Uzbekistan Is Becoming Acquainted with FOSS Experience of Asia-Pacific Countries*, Aug. 12, 2006, http://www.iosn.net/Members/damiramirov/uzbfoss; Colin Charles, *Free and Open Software in Malaysia*, REDHAT, Jan. 2006, http://www.redhat.com/magazine/015jan06/ features/malaysia/; Paul Festa, *Governments Push Open-Source Software*, CNET NEWS.COM, Aug. 29, 2001, http://news.com.com/2100-1001-272299.html?legacy=cnet; HispaLinux, Principal, http://www.hispalinux.es/node/439 (Mar. 24, 2003, 22:21); Michael Kanellos, *Peru's President Approves Open-Source Bill*, CNET News.com, Oct. 21, 2005, http://news.com.com/Perus+president+approves+open-source+bill/2110-7344_3-5907226.html; Openia, Governments: Open Source Activities and News From Governments Around the World, http://www.openia.com/resources/open-source/governments#argentina (last visited Oct. 1, 2006); Brian Proffitt, *Venezuela's Government Shifts to Open Source Software*, LINUXTODAY, Aug. 30, 2002, http://linuxtoday.com/news_story.php3?ltsn=2002-08-30-011-26-NW-LL-PB; Darryl K. Taft, *Mass. Softens Stance on Proprietary Software*, EWEEK, Jan. 14, 2004, http://www.eweek.com/article2/0,4149,1436253,00.asp; Andy Tai, *Taiwan to Start National Plan to Push Free Software*, KURO5HIN, Jun. 3, 2002, http://www.kuro5hin.org/story/2002/6/3/55433/41738.

70.   *See* Yochai Benkler, *Freedom In The Commons: Towards a Political Economy of Information*, 52 DUKE L.J. 1245, 1275 (2003).

71.   *See* tbl. 2, p. 58.

As Table 2 illustrates, in the forty-four countries that have pro-OSS government policies, thirty-three countries have had OSS-friendly policy announcements made by one or more administrative agencies, eighteen countries have taken OSS legislative action, and twenty countries have allocated public subsidies for OSS development.[72] Thus, promoting OSS by administrative efforts (rather than by legislative action or subsidies) appears to be the most common practice among countries that have OSS policies.[73]

However, comparing the number of governments that have announced support for OSS changes these results. Among governments promoting OSS, fifty-seven have undertaken legislative action while thirty-nine have made administrative policy announcements.[74] Nevertheless, there are two reasons why it would be incorrect to assume that this makes legislation the preferred means by which governments support OSS. First, as this article will show, most OSS legislation either is still pending or has failed to achieve passage.[75] Second, thirty-two pieces of legislation regarding OSS (almost half the total number) come from just three countries.[76] Therefore, it would be inaccurate to conclude that legislation is the most common practice for governmental promotion of OSS.

Table 2: Number of Governments and Countries that have Policies Promoting OSS (by type of Policy)[77]

	Countries	Governments
Legislative Actions	18	57*
Administrative Policies	33	39
Public Subsidies	20	30
Total	44	99

*   These fifty-seven governments do not include the E.U. parliament.

Individual countries may have different OSS policy preferences due to differing domestic industrial needs as well as varying cultural and socio-economic conditions. Table 3 shows that most of the current OSS legislation emerged from Latin America and Europe.[78] Beyond legislation, European countries also promote OSS vigorously through

---

72.   *Id.*
73.   *Id.*
74.   *Id.*
75.   *See* tbl.5 *infra* p.66.
76.   Eighteen pieces of legislation are proposed in Brazil; seven legislative proposals are in the United States and Argentina, respectively.
77.   *See* sources cited *supra* note 69.
78.   *See* tbl.3, p. 59.

government policy announcements.[79]   In contrast, Latin American countries have few policy announcements or public subsidies promoting OSS.[80] Compared to Latin America and Europe, governments in Asia and the United States more actively subsidize OSS projects.[81] It seems that Asian countries tend to promote OSS development without using legislative efforts.[82] African countries, on the other hand, have developed the comparatively fewest OSS policies in any form.[83]

Table 3: Number Of Governments And Countries that have Pro-OSS Policies (By Geographical Areas and Supporting Types)[84]

	Legislative Actions		Policy Announcements		Public Subsidies	
	Countries	Governments	Countries	Governments	Countries	Governments
Africa	0	0	2	2	0	0
Asia	0	0	13	16	10	10
Europe	9	21	12	13	7	8
Latin America	7	25	3	3	1	1
North America	1	7	2	3	1	9
Oceania	1	4	1	1	1	1
Total	18	57	33	39	20	30

B. Categorizing Government Policy Toward OSS

Government support for OSS can be alternatively categorized into policies that adopt OSS in the public sector and those that subsidize OSS projects in the private sector. This part will analyze both of these categories, laying out the policy implications of each.

1. Adopting OSS in the Public Sector

Using OSS in the public sector has, thus far, been the most widely adopted policy with regard to government support of OSS.[85] The market for government software procurement is crucial to

---

79.   *Id.*
80.   *Id.*
81.   *Id.*
82.   *Id.*
83.   *Id.*
84.   *See* sources cited *supra* note 69.
85.   *See* CSIS, *supra* note 66.

software companies, both because the government is usually the largest consumer of software products in a country and because a government's use of specific software may encourage individuals and businesses dealing with the government to follow suit. [86]

In terms of software procurement, the government can express its preference for OSS through legislation, legislative proposals, policy announcements, government reports, or procurement decisions.[87] Such government action may represent numerous interdependent factors such as a government's willingness to adopt OSS, the pressure exerted by the OSS community or proprietary software companies, or a government's perception of its role in technological development. This subsection will analyze these legislative efforts, executive policy announcements, and public OSS subsidies.

a. Legislative Efforts

As Table 2 shows, at least fifty-seven governments in eighteen countries have attempted to promote OSS through legislative efforts.[88] Brazil has led the way in the global regulatory movement toward requiring government agency OSS use.[89] There, four major cities (Amparo, Solonopole, Ribeirao Pires and Recife) have all passed laws advocating or requiring public sector OSS use.[90] The national legislatures of Belgium, Brazil, Bulgaria, Chile, Colombia, Costa Rica, France, Italy, Peru, Spain, and Ukraine also have bills mandating the use of OSS in all government offices and government-owned companies.[91]

Legislation may stipulate either that a government "consider" or "prefer" procuring OSS for its agencies.[92] The difference between

---

86.   *See, e.g.*, Sharifah Kasim, *Gov't Seeks Software Vendors' Commitment*, COMPUTIMES (Malay.), Sept. 18, 2000, at 1 (stating that "the [g]overnment . . . is one of [Malaysia's] biggest users of information technology"); Anh-Thu Phan, *Panda Eyes Government Deals with New Software Venture*, S. CHINA MORNING POST, Apr. 9, 2002, at 24 (observing that "[g]overnment offices are among the biggest buyers of software [in China]"). According to IDC, a market-research firm, government procurement of software amounted to almost US$17 billion globally in 2002, and this number is expected to grow by about 9% per year for the next five years. *See Microsoft at the Power Point*, THE ECONOMIST, Sept. 11, 2003, *available at* http://www.economist.com/displaystory.cfm?story_id=2054746 .

87.   *See* CSIS, *supra* note 66.

88.   *See* tbl.2 *supra* p. 58.

89.   *See* Festa,*supra* note 69.

90.   *Id.*

91.   *See* CSIS, *supra* note 66, at 2-4, 6, 8, 10-12.

92.   *See* Rodney Gedda, *ACT Passes Open Source Law*, ARNNET, Dec. 11, 2003, http://www.arnnet.com.au/index.php?id=792934018&fp=2&fpid=1.

"consideration" and "preference" is well illustrated in the Government Procurement Guideline Amendment of the Australian Capital Territory (ACT).[93] The original bill, proposed in July, 2003, provides that "[each government] entity should, as far as practicable, prefer open source software [to proprietary software]."[94] However, the bill was later amended by an independent member, Helen Cross, to substitute "consider" for "prefer."[95] The bill's final usage of "consider" may indicate the government's effort to remain neutral on the issue, as well as willingness to compromise political power to encourage the use of OSS over proprietary software.

Additionally, legislative bodies might pass non-binding resolutions to "prefer" OSS.[96] For example, the Bundestag of Germany passed a resolution regarding "Germany's Economy in the Information Society" on November 9, 2001, promoting the use of OSS in the federal administration.[97] In Spain, the Parliament of the Canary Islands likewise approved a multi-partisan, non-binding resolution in 2001 urging the government to use OSS.[98] In addition, the Netherlands parliament passed non-binding resolutions promoting the use of OSS in the public sector as well.[99]

b. Executive Policy Announcements

Some governments have encouraged their agencies to adopt OSS via administrative policy pronouncements.[100] As Table 2 shows,

---

93.   *Id.*
94.   *Id.*
95.   *Id.*
96.   *See* Evans & Reddy, *supra* note 29, at 374-75; Festa, *supra* note 69.
97.   *See* Evans & Reddy, *supra* note 29, at 374-75.
98.   *See* Festa, *supra* note 69.
99.   *See* CSIS, *supra* note 66, at 9.

100.   For example, the President of Brazil finalized a policy recommending that federal ministries, agencies, and state enterprises install OSS. *See* DRAVIS, *supra* note 69, at 7. As a result, the Brazilian government says that "it will switch 300,000 government computers from Microsoft's Windows operating system to open source software like Linux." *See* Alex Goldmark, *Brazil Makes Move to Open Source Software*, NPR NEWS, Jan. 31, 2005, *available at* http://www.npr.org/templates/story/story.php?storyId=4471963.   In August 2002, the Venezuelan government also announced an official policy that exclusively calls for the use of OSS in government agencies. *See* Proffitt, *supra* note 69. The announcement required all software developed for the government be licensed under the GPL with the general objective of acquiring "open source whenever possible, proprietary software only when necessary." *See id.* The national governments of other countries, including Belgium, Canada, China, Costa Rica, France, Indonesia, Italy, Malaysia, Netherlands, Philippines, South Korea, South Africa, Tanzania, Thailand, the United Kingdom, Venezuela, and Vietnam, have all issued similar policy announcements supporting OSS adoption in the public sector. *See* CSIS, *supra* note 66, at 2-4, 6, 8-13; *see also* DRAVIS, *supra* note 69, at 9-12; Festa, *supra* note 69.

at least thirty-nine governments in thirty-three countries have announced policies favoring OSS.[101] Furthermore, some governments choose to release research reports on OSS as a theoretical basis or rationale for future adoption of OSS in the public sector.[102]

c. Procurement Decisions

For governments that prefer OSS to proprietary software, the most common practice to support OSS is to expand the incorporation of OSS into its software procurement decisions.[103] Specifically, governments in many countries have partially migrated from Microsoft Windows systems to Linux systems via new software procurement.[104] For example, since 1999, the French government largely has moved to OSS.[105] Additionally, governments in China,[106] Germany,[107] and many other countries are adopting OSS in their government agencies.[108]

---

101.   *See* tbl.2 *supra* p. 58.

102.   For example, in 2002, the Danish Board of Technology released a report stating that "[OSS] represents a serious alternative to proprietary products, and should be used as a tool to open up [the software market] to more competition." *See* Matthew Broersma, *Denmark Urges Govt Support for Open Source,* ZDNET UK, Oct. 23, 2003, http://news.zdnet.co.uk/software/linuxunix/0,39020390,39117341,00.htm. In Norway, the "Statskonsult (the Norwegian directorate on public management) . . . prepared a report on the usability of Linux in the public sector" and concluded both that the government should support the development of OSS to promote alternatives to current software and that schools should also be encouraged to adopt Linux. *See* Endre Grøtnes, *Norwegian Statskonsult Endorses Linux/Open Source Software for the Public Sector*, LINUX TODAY, Sept. 15, 2001, http://nofud.linuxtoday.com/developer/2001091500720NW. In addition, the U.S. President's Information Technology Advisory Committee (PITAC) published reports in 2000 in support of OSS adoption, "recommend[ing] that a 'level playing field' must be created with the government procurement process to facilitate Open Source development." *See* DRAVIS, *supra* note 69, at 10.

103.   *See* CSIS, *supra* note 66.

104.   *Id.*

105.   Evans & Reddy, *supra* note 29, at 375.

106.   *See* Matt Berger, *Microsoft vs. Open Source, Battle Gets Political*, INFOWORLD, June 10, 2002, http://www.infoworld.com/articles/hn/xml/02/06/10/020610hnopen source.html (stating that "[t]he Chin[ese] Post Office . . . has struck a deal with IBM to run Linux at 1,200 branch offices. . . . [T]he Chin[ese] government [is working] with Red Flag Software, based in Beijing, to install Red Flag Linux on some government computers").

107.   *See* Schmidt & Schnitzer, *supra* note 33, at 497 (noting that the Bundestag decided that 150 servers of the Bundestag would be Linux-based in 2002). In May 2003, the city of Munich decided to migrate its 14,000 computers to Linux and other open source office applications. *See* John Blau, *Over 500 German Government Agencies Using Open Source*, INFOWORLD, June 25, 2003, http://www.infoworld.com/article/03/06/25/HN germanos_1.html [hereinafter Blau, *Over 500 German Government Agencies Using Open Source*]. The city did this even though Microsoft dropped its prices to match those of Linux. *See* John Blau, *High Growth Rates for Open Source in Germany*, INFOWORLD, July 2, 2003,

2. Subsidies for OSS Projects

Another way for governments to support OSS is to subsidize specific OSS projects.[109] As Table 2 shows, at least thirty governments in twenty countries have subsidized OSS projects.[110] However, the target of these public subsidies may differ from government to government.

Software developers are among the most important components of a nation's OSS industry. Therefore, governments may consider subsidizing projects that train OSS developers.[111] Governments may also subsidize institutions or projects that coordinate OSS development or improve OSS adoption in order to obtain compatible and stable OSS products.[112]

Governments may provide tax deductions or other grants to indirectly subsidize OSS projects.[113] Yet outright funding of specific OSS projects has also been an increasingly common approach.[114]

---

http://www.infoworld.com/article/03/07/02/HNgermanopen_1.html [hereinafter Blau, *High Growth Rates for Open Source in Germany*].

108.   It is important to note that, while a purchase of OSS could indicate a policy decision that has not been publicly articulated, it could also be a decision made on the basis of price or quality.

109.   *See* tbl.2 *supra* p. 58.

110.   *Id.*

111.   For instance, Sao Paulo's former mayor, Marta Suplicy, championed a project to teach the basics of Linux to slum children. *See* Lester Haines, *Brazil Loves Linux*, THE REGISTER, May 5, 2004, http://www.theregister.co.uk/2004/03/05/brazil_loves_linux_true/. The Taiwanese government is also planning to establish "six educational centers around Taiwan to train open-source developers." *See* Frederick Noronha & Lee Schlesinger, *Open Asia: Open Source in Tajikistan, Taiwan, and Thailand*, NEWSFORGE, Oct. 20, 2003, http://www.newsforge.com/os/03/10/10/1814248.shtml?tid=132&tid=2. In 2000, the South Korean government also set up GNU/Linux training programs for computer system administrators. *See* Festa, *supra* note 69.

112.   For example, BerliOS, a mediator for OSS developers and customers, is "co-funded by the German federal government and private companies such as Hewlett-Packard and Linux Information Systems." *See* Schmidt & Schnitzer, *supra* note 33, at 499. In the U.S., Massachusetts, Rhode Island, and several other states launched "a software repository designed" to allow "government agencies [to] make more efficient use of [OSS]." *See* Larry Greenemeier, *States Seek Common Ground on Open Source*, INFO. WK., Mar. 22, 2004, at 28, http://www.informationweek.com/story/showArticle.jhtml?articleID= 18401044#. In Brazil, the Ministry of Science and Technology has started the first Free Software Workshop, which recommends the use of OSS in the Federal Government. *See* CSIS, *supra* note 66, at 2. In China, the Ministry of Information Industry established the Open Source Software Promotion Alliance to encourage the development of China's OSS industry. *Id.* at 4.

113.   For instance, the Singapore government has offered economic incentives, such as tax breaks and grants, for Linux-related economic development. *See* Evans & Reddy, *supra* note 29, at 378.

114.   "In Thailand and the Philippines, for instance, government-funded computer research centers have created their own [OSS] applications that are [distributed] to

Additionally, some governments have chosen direct involvement in specific OSS projects.[115] This approach can be viewed as the public production of public goods.

C. Analysis Regarding OSS Legislation

The emergence of OSS legislation is a provocative issue for both the software industry and legal scholarship. This part will first discuss two types of OSS legislation: bills mandating a "preference" or "consideration" of OSS. It will then analyze the difficulties facing governments in their attempts to legislate OSS policies.

1. Preference and Consideration in OSS Adoption

Legislation may stipulate either that a government "consider" or "prefer" procuring OSS for its agencies.[116] The "preference" type of legislation will more likely be criticized as "procurement

---

government users and small businesses." Berger, *supra* note 106. In China, the Chinese government has backed CS&S, a state-owned OSS company, and the Institute of Software in the Chinese Academy of Sciences to develop a Chinese Linux operating system. *See* Xiaobai Shen, *Developing Country Perspectives on Software: Intellectual Property and Open Source—A Case Study of Microsoft and Linux in China*, 3 INT'L J. IT STANDARDS & STANDARDIZATION RES. 21, 30 (2005). The U.S. government has also provided substantial support for research and development efforts to create OSS that must be released under the GPL. As a result of this program, the advanced clustering software developed at Sandia National Laboratories was also released under the GPL. "The next version of the Reiser File System is sponsored primarily by the Defense Advanced Research Projects Agency (DARPA) … and will be licensed under the GPL." *See* Evans & Reddy, *supra* note 29, at 391.

115.   For example, the Taiwanese government had planned to pour US$3.4 million into the promotion of OSS development in 2003 and 2004. The Industrial Development Bureau (under the Ministry of Economic Affairs), the government's IT think tank, the Institute for the Information Industry (III), and the Taipei Computer Association were all charged to work together to implement the project. *See* Sharon Chuang, *Taiwan to Plug Open-Source Software*, CMPNETASIA.COM, Oct. 27, 2003, http://www.cmpnetasia.com/oct3_ nw_ViewArt.cfm?Artid=21899&catid=8&subcat=79&section=. The Filipino government has also initiated an effort to develop a package of OSS products as well as a support mechanism for government agencies, schools, and small business. The Advanced Science and Technology Institute (ASTI), which falls under the Philippines' Department of Science and Technology (DOST) has released a simplified version of Linux called Bayanihan. ASTI is also developing thin client and embedded solutions using OSS. "The DOST has also funded an OSS-based information system that is being implemented by the National Computer Center for use by more than 3,000 local governments." DRAVIS, *supra* note 69, at 9. The governments of India, the United States, and other countries are also all actively engaged in OSS development. For example, NASA built the Beowulf cluster for Linux. *See* Evans & Reddy, *supra* note 29, at 391.

116.   *See supra* text accompanying note 92.

discrimination" by proprietary software developers.[117]   On the other hand, merely requiring that its agencies "consider" adopting OSS may signify governmental desire to establish a level playing field within the public sector's IT procurement.   However, such legislation is not actually pro-OSS legislation because it neither constitutes a government preference for OSS nor means that the government will necessarily choose OSS in its final procurement decision.

Although the "consideration" type of OSS legislation is much less controversial than the "preference" type, most proposed legislation is of the latter type.[118] As Table 4 illustrates, only five out of sixty-five pieces of OSS legislation are the "consideration" type, while the remaining sixty pieces are the "preference" type.[119] Table 4 also reveals that the "preference" type is a more common practice for both national and local OSS legislation.[120]

Table 4: Types of OSS Legislation[121]

	Preference	Consideration	Total
National Legislation	27	1	28
Local Legislation	33	4	37
Total	60	5	65*
Number of countries	16		

* This number does not include non-binding legislative resolutions supporting OSS development.[122]

---

117.   For example, a letter from the General Manager of Microsoft Peru to a Peruvian Congressman expressed such concerns. *See* Microsoft's "Fear, Uncertainty and Doubt" (F.U.D.) Letter to Peru Concerning Free and Open Source Software (Mar. 21, 2002)*,* http://opensource2.usrbinruby.net/docs/msFUD_to_peru.php.

118.   *See* tbl.4, p.65.

119.   *Id*.

120.   *Id*.

121.   *See* sources cited *supra* note 69.

122.   The numbers of countries and governments in Table 4 are slightly different from the numbers shown in Table 2 and Table 3, wherein sixty governments in twenty countries have legislative actions supporting OSS. The reason for this discrepancy is that the basis for Table 4's estimate is different from that of Table 2 and Table 3. In Table 2 and Table 3, legislative actions include non-binding resolutions passed by legislative bodies. Therefore, the total number of countries is eighteen, rather than twenty. Furthermore, the unit of measurement for Table 2 and Table 3 is "government." Table 4, on the other hand, only includes actual pieces of legislation. Some single governments, such as Peru, may have more than one bill regarding OSS. For such cases, Table 2 and Table 3 only count one government, whereas Table 4 counts the actual pieces of legislation. This is why the number of pieces of legislation in Table 4 is sixty-two, rather than sixty.

One possible reason for this disparity is that the "consideration" type of legislation is advisory in nature. Governments can always consider adopting OSS without such advisory legislation, so it makes less sense for governments to pass a "consideration" type law. Rather, the "preference" type of OSS legislation can truly signify a government's willingness to promote OSS as a public policy. This stronger position may be the reason that the "preference" type of OSS legislation is the more popular alternative.

2. The Difficulties of Legislating Pro-OSS Policies

As stated above, governments that prefer OSS to proprietary software most commonly support OSS through software procurement decisions rather than through legislation.[123] Table 5 illustrates that as of September 4, 2006, most of the proposed OSS "preference" type legislation either had failed or was still pending.[124] In fact, only fourteen out of fifty-nine pieces of OSS preference legislation successfully passed.[125] Moreover, it was local legislatures that passed these successful bills.[126] Thus, no effective national OSS legislation had passed as of September 4, 2006.

Table 5: Status of OSS Preference Legislation (as of September 4, 2006)[127]

	Passed	Failed	Pending	Total	Number of countries
National Legislation	0	9	18	27	14
Local Legislation	14	6	12	32	8
Total	14	15	30	59	16

One possible explanation for this phenomenon is that a government rarely can maintain its nominally neutral role with an OSS-preferred law, whereas it can always claim its OSS procurement

---

123.   *See supra* Part II.C.1.
124.   *See, e.g.*, Julia Scheeres, *Peru Discovers Machu Penguin*, WIRED NEWS, Apr. 22, 2002, http://www.wired.com/news/business/0,1367,51902,00.html (stating that the Peruvian government has a pending bill that will make it compulsory for all public bodies to use only OSS). *See also* Festa, *supra* note 69 (indicating that Argentina proposed a bill that would mandate the use of OSS).
125.   *See* tbl.5 *infra* p. 66.
126.   *Id*.
127.   *See* sources cited *supra* note 69.

decision is based on neutral criteria such as costs or quality. Therefore, in terms of nominal neutrality, OSS-preferred legislation is certainly much more controversial than *de facto* OSS-preferred procurement.

Another plausible reason is that the enactment of a statute often requires the agreement of a majority of legislators, and the transaction costs are quite high due to the large number of parties involved.[128]   Economists point out that, even if government was perfectly informed about the consequences of all possible actions, the political process through which decisions are made would raise additional difficulties.[129]   In the context of government OSS policies, the transaction costs stemming from statutory production of rules and the political process of legislation should be much higher than the costs resulting merely from procurement decisions. Consequently, it is much easier for a government to institute purely OSS-preferred procurement, rather than passing OSS-preferred laws.

Similarly, transaction costs can be used to explain why, among legislation favoring OSS, local legislation is more common to pass than national legislation.[130]   This is perhaps because the process of enacting national legislation is complicated by interest groups and lobbies, thereby raising costs as compared to local legislation.

III. POLICY ANALYSIS OF GOVERNMENT SUPPORT OF OSS PROJECTS

The policy considerations behind government decisions regarding OSS are extremely complex and sometimes interdependent. This section analyzes these policy considerations and considers whether the policy goal of replacing proprietary software with OSS can be achieved through government support of OSS.

---

128.   *See* RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW 555 (6th ed. 2003).

129.   *See* JOSEPH E. STIGLITZ, ECONOMICS OF THE PUBLIC SECTOR 10 (3d ed. 2000).

130.   As of April 15, 2006, most OSS-preferred pieces of legislation had been passed at the local level. For example, in Brazil, four cities—Amparo, Solonopole, Ribeirao Pires and Recife—had passed laws giving preference to or requiring the use of OSS. In Italy, the legislators of the city government of Florence, Pavia, and a handful of smaller Italian municipalities passed a motion to mandate the use of OSS when feasible. *See* Festa, *supra* note 69. In May 2002, the Council of Pescara also approved a motion, introduced by the Italian Communist Party and the Left Democrats, requesting the introduction of OSS in the public administration of the Province of Pescara. *See* Evans & Reddy, *supra* note 29, at 376-77.

A. Economic Concerns

Government policy regarding OSS should have an economic rationale. This subsection attempts to identify the real economic concerns behind public policies favoring OSS, and evaluates whether these concerns are as important as governments typically deem them to be.

1. Cost Savings

Governments all over the world have realized that they have been spending enormous amounts for licensing fees on Microsoft software.[131] OSS presents an ideal means by which governments can attempt to substantially lower costs of software acquisition.[132] Some commentators believe that governments worldwide (for years some of Microsoft's most dependable customers) already are leveraging OSS to drastically reduce technology spending.[133] This cost concern is especially pronounced in the debt-laden governments of developing countries.[134]

---

131.   *See supra* text accompanying note 128.

132.   For example, South Korea's Ministry of Information and Communication established GNU-Linux training programs for systems administration because public universities suffering from the 1997 Asia financial crisis could hardly afford the software licensing fees. Festa, *supra* note 69. Moreover, interviews with people from 150 different organizations in Germany show that about thirty-eight percent of the polled companies and organizations identified savings as the main reason for choosing OSS. Blau, *High Growth Rates for Open Source in Germany, supra* note 107. The Bundestag of Germany passed a resolution on "Germany's Economy in the Information Society" on November 9, 2001, calling on the government to introduce OSS in the federal administration and stating that OSS should be used wherever it would lead to cost savings. German experts anticipated that the use of OSS in public administration would save the federal government US$130 million and US$2.6 billion countrywide. *See* Evans & Reddy, *supra* note 29, at 379. In Norway, government representatives also have looked into OSS as a way to cut costs. And in France, the government reduced its spending on software because 300 of its servers had migrated from Windows NT and Unix to OSS alternatives. Berger, *supra* note 106.

133.   For example, the UK's National Health Service (NHS) signed a deal with Sun Microsystems to use OSS on 5,000 of the agency's computers. It then sought a nine-year agreement with Microsoft on at most "900,000 computers and a customized user interface." Cassell Bryan-Low, *Governments Prod Microsoft to Slash Prices*, WALL ST. J., Jan. 27, 2005, at B1.

134.   *See* Clendenning, *supra* note 8; *see, e.g.*, *Activists Urge Open-Source*, WIRED NEWS, Jan. 29, 2005, http://www.wired.com/news/technology/0,1282,66444,00.html. Besides, as the British Commission on Intellectual Property Rights stated: "[Given] the considerable needs which developing countries have for information and communication technologies and the limited funds which are available, it would seem sensible that governments and donors should certainly consider supporting programmes to raise awareness about low cost options, including open source software in developing countries." COMMISSION ON INTELLECTUAL PROPERTY RIGHTS, INTEGRATING INTELLECTUAL PROPERTY

a. Production Costs and Marginal Pricing

OSS typically does not involve license fees and is downloadable directly from the Internet.[135] By making source code openly available, OSS not only facilitates low-cost and large-scale innovation of software but also eliminates the marginal cost of use.[136]

Economists have indicated that, in order to cover significant fixed costs, proprietary software developers cannot price their products at marginal cost.[137]   Therefore, OSS can be priced at marginal cost, and seems obviously more efficient.[138] In addition, the significant consumer cost to switch between software systems provides strong incentives for proprietary software companies to charge locked-in consumers more than cost.[139] On the other hand, the ability of OSS community members to copy and distribute code related to their products constrains pricing for the code itself. [140]

Schmidt and Schnitzer argue, however, that OSS marginal cost pricing is inefficient because it provides software developers with insufficient incentives to engage in research and development.[141] In other words, the limited monetary rewards available to OSS developers limit their efforts toward developing OSS.[142] David S. Evans and Bernard J. Reddy also contend that the lack of property rights associated with OSS results in firms charging hardly more than their distribution cost, resulting in "little or no incentive to devote substantial resources to the development" of new OSS products.[143] Evans further argues that while consumers can benefit from the associated efficiencies, the dominant proprietary software company is

---

RIGHTS AND DEVELOPMENT POLICY 105 (2002), *available at* http://www.iprcommission.org/papers/text/final_report/chapter5htmfinal.htm.

135.   *See* discussion *supra* Parts I.A-B.

136.   *See generally* Evans & Reddy, *supra* note 29, at 356.

137.   *See* Schmidt & Schnitzer, *supra* note 33, at 478; *see also* Evans & Reddy, *supra* note 29, at 329-30 (claiming that "[i]n order to stay in business, a successful [software] firm must charge substantially more than marginal cost in order to cover its fixed costs").

138.   *See* Schmidt & Schnitzer, *supra* note 33, at 477-79.

139.   *Id.* at 492. Some believe that the goal of Microsoft's pricing strategy is to achieve maximum market penetration and consumer dependence. *See* Alan Story, *Don't Ignore Copyright, the 'Sleeping Giant' on the TRIPs and International Education Agenda*, *in* GLOBAL INTELLECTUAL PROPERTY RIGHTS 125, 135 (Peter Drahos & Ruth Mayne eds., 2002).

140.   *See* McGowan, *supra* note 24, at 244.

141.   *See* Schmidt & Schnitzer, *supra* note 33, at 499-500.

142.   *See generally id*. at 484. Smith also indicates that "the basic economics of the software industry still require open source firms to generate sufficient revenue to recoup their costs and earn at least some profit." Smith, *supra* note 40, at 74.

143.   *See* Evans & Reddy, *supra* note 29, at 355.

justified in having a monopoly power allowing higher charges than a competitive firm.[144]

It is understandable that proprietary software would charge prices above the marginal cost for their products. Pricing at marginal cost may not provide enough financial incentives for proprietary software development, thereby resulting in software produced at an inefficient level.[145] Nonetheless, this article holds that OSS must be analyzed within a different context. The incentives for programmers to engage in OSS development are entirely different from those for proprietary software developers, as previously described in Part I.C.[146] Past development of OSS demonstrates that OSS programmers are not driven by direct monetary incentives.[147] Therefore, the viewpoint arguing that there are insufficient incentives for OSS developers may not prevail in this analysis. At the very least, the analysis should not come to an arbitrary conclusion on this point without providing empirical evidence that pricing at marginal cost provides insufficient incentives for OSS development.

b. Costs of Maintenance

Though OSS has some obvious acquisition cost advantages, governments must examine the long-term total costs of ownership (TCO), which include training, technical support, and customizing new or specialized software. In addition to acquisition or licensing costs, the costs of maintenance are also a part of such ownership costs. Additional outlays for customizing, training, upgrades, maintenance and support may negate acquisition or licensing cost savings.

Some scholars believe that the cost of debugging especially complex software problems is so high that OSS can often bear those costs better than proprietary software.[148] Because proprietary

---

144.   *See* Evans, *Politics and Programming, in* GOVERNMENT POLICY TOWARD OPEN SOURCE SOFTWARE, *supra* note 29, at 34, 36-37. Evans's argument is similar to the rationale for a natural monopoly. Economists contend that a natural monopoly is efficient because some industries have increasing returns that are so significant that only one firm should operate in the market. Therefore, the problem caused by a natural monopoly should also be taken into account for Evans's argument. The problem mainly lies in that natural monopolists usually charge too high a price, and accordingly produce too little. *See* STIGLITZ, *supra* note 129, at 191-96. The related issue regarding how users are charged too high a cost by proprietary developers will be analyzed in Part III.A.3.

145.   Economists have also indicated that even if there is some private provision of public goods there will be an undersupply. *See* STIGLITZ, *supra* note 129, at 131.

146.   *See* discussion *supra* Part I.C.

147.   *See supra* text accompanying note 48-64.

148.   *See* Lessig, *supra* note 29, at 63-64. A study at Berkeley found superior debugging among OSS projects. *See* Bessen, *supra* note 55, at 17.

software companies only distribute object code, users (including governments) are entirely dependent on these companies to provide debugging and upgrades.[149]   However, scholars argue that the fully modifiable code accompanying OSS is better in terms of maintainability and extensibility.[150]   Furthermore, OSS "permits an extremely large labor force (potentially the entire Internet community of programmers) to bring its skill and insight to bear on a problem."[151] The benefits presented by OSS, therefore, may legitimately result in legislation or regulation favoring OSS in government procurement. To put it differently, a policy of acquiring OSS may be implemented to maintain a competitive software debugging market, thus leading to high software maintainability.[152]

While adept users are able to create bug fixes for OSS quicker than for proprietary software, it is still unclear whether such bug fixes can easily be placed into the hands of general users and governments.[153]   Further, although OSS source code is readily available, it is not certain that programmers will volunteer to fix all kinds of OSS bugs.[154] Solving these problems partially depends on the benevolent nature of the volunteer testers,[155] and on the willingness of government users to hire someone to repair ad hoc code issues. Therefore, before adopting OSS, a government would need to evaluate whether there would be enough technicians to back up the whole OSS system. A government would also need to ensure that the services and prices offered by firms maintaining or debugging OSS were more attractive than those offered by proprietary software companies.

Proprietary software companies argue that OSS's solutions tend to be more customized than their proprietary counterparts, and consequently will require more sophisticated and expensive support and maintenance.[156]   As a result, when total lifetime costs for

---

149.   *See* Ahmad Basha, *Open-Source Systems Versus Close-Source Systems*, ENDERUNIX, Sept. 13, 2001, http://www.enderunix.org/docs/opensource_vs_ closedsource.html; Open Minds, Open Source, *supra* note 15.

150.   *See* Eben Moglen, *Free Software Matters: Free Government, II,* LINUXUSER, Oct. 30, 2002, at 1, 2, *available at* http://emoglen.law.columbia.edu/publications/lu-24.pdf.

151.   *See* Johnson, *supra* note 48, at 647.

152.   *See* Moglen, *supra* note 150, at 2.

153.   *See* Evans & Reddy, *supra* note 29, at 356-57.

154.   Jonathan Zittrain, *Normative Principles for Evaluating Free and Proprietary Software*, 71 U. CHI. L. REV. 265, 282 (2004).

155.   *Id.*

156.   *See* Smith, *supra* note 40, at 83-84. From the perspective of software development, there is always a trade-off between product standardization and feature richness. The more standardized software products tend to be less flexible to meet customized needs, but with lower debugging costs and higher reliability. Bessen, *supra* note 55, at 20.

installing, operating and maintaining software are taken into consideration, the low cost of OSS becomes questionable.[157] According to this argument, license costs are only a minor part of TCO.[158]

While both arguments are ultimately inconclusive, it is fair to say that the adoption of OSS has the potential to prevent software vendors from monopolizing the software debugging market, thereby allowing government users to avoid being locked-in.

2. Switching Costs and Network Effects

Users (including governments) are advised to pay careful attention to costs of switching to a new system when making decisions regarding software adoption.[159] Switching costs and the costs of subsequently moving away from that system are both important concerns for users.[160] When evaluating migration to an OSS system, therefore, a government must seriously consider these costs.

The expressions "network effects" and "network externalities" refer to an economic theory in which "the utility that a user derives from consumption of a good increases with the number of other agents consuming the good."[161] In other words, the value of a network to a single user depends on how many additional users join the network. Any additional adoption makes current users better off. Farrell and Saloner define network effects as situations in which "one consumer's value for a good increases when another consumer has a compatible good."[162] According to this definition, network effects lie in the adoption of not only identical goods, but also compatible ones.

Network effects are very important in the software market because they may cause the market to favor one software standard over another. A government's adoption of specific software may result in strong software market network effects due not only to the government's large market share, but also to the impact of government on the software choices of individuals and businesses dealing with the government.[163] Therefore, governments should

---

157.   Smith, *supra* note 40, at 83-84.

158.   *Id.*

159.   *See* Schmidt & Schnitzer, *supra* note 33, at 492.

160.   Varian & Shapiro, *supra* note 46, at 13.

161.   *See* Michael L. Katz & Carl Shapiro, *Network Externalities, Competition, and Compatibility*, 75 AM. ECON. REV. 424, 424 (1985).

162.   *See* Joseph Farrell & Garth Saloner, *Standardization, Compatibility, and Innovation*, 16 RAND J. ECON. 70, 70 (1985).

163.   Theoretically, a government could make the market tip toward OSS if it decided to adopt OSS extensively, but so far we have no empirical evidence to show that governments adopting OSS may actually lead to market tipping. Nevertheless, the public

assess these effects carefully before intervening in the software market or attempting to promote certain policy goals through software procurement.

a. Switching Costs: From Proprietary Software to OSS

Substantial switching costs may deter governments from adopting OSS. Such costs may be high because the investment in proprietary software has to be duplicated.[164] Switching to a new form of software may also implicate investments in equipment, staff training, and relationships with vendors.[165] It may simply be inefficient to switch to superior software if there is already a large installed base with high switching costs.[166] If switching to a new system affects the terms of trade for software products and consequently reduces long-run user costs, however, it might be worthwhile for organizations to make the switch.

Recently, governments have begun to worry about being locked-in by Microsoft, and some believe that OSS might be a desirable way to seek greater technology independence.[167] This desire for independence may make switching to OSS an ideal strategy regardless of OSS's high functionality or the related switching costs.[168]

sector's role in technological development cannot be overemphasized. Take the adoption of smart cards, for example: they are "plastic cards containing a small computer chip that can store 500 times the data of a magnetic strip card." CARL SHAPIRO & HAL R. VARIAN, INFORMATION RULES: A STRATEGIC GUIDE TO THE NETWORK ECONOMY 236 (1999). They have not had much success in the United States but have done well in Europe. One of the most important reasons for the latter outcome is that European telephone companies leveraged their monopoly power to mandate that users pay for phones with the smart cards. This mandate built a "critical mass" for that technology. *Id.* at 244. Accordingly, as long as smart cards have support from the government, other vendors are less doubtful with regard to use of such new technology. *Id.*

164.   *See* Schmidt & Schnitzer, *supra* note 33, at 490.

165.   *Id.*

166.   *Id.* at 492.

167.   For example, Munich Mayor Christian Ude said that the city "was seeking greater IT independence" when Munich decided to migrate 14,000 computers in its public administration to Linux and other OSS. DRAVIS, *supra* note 69, at 8. The State Secretary in the Federal Ministry of Interior Affairs stated in July 2001 that "dependence on a single software provider makes systems more vulnerable, and that the federal government would try to reduce its dependence on a single software provider" by adopting OSS. Evans & Reddy, *supra* note 29, at 380. In Saxony's regional parliament, Green Party members also contended that the Linux operating system with OSS and proprietary applications on it can reduce government's technology dependence on only one vendor. *Id.*

168.   According to a report released by the Danish Board of Technology in October 2002, OSS enables governments to have a better position when renegotiating agreements with Microsoft. Broersma, *supra* note 102. *See also* DANISH BD. TECH, OPEN SOURCE SOFTWARE IN E-GOVERNMENT 79 (2002), *available at* http://www.tekno.dk/pdf/projekter/p03_opensource_paper_english.pdf.

In addition to software independence, governments have other unique software procurement concerns (such as national security and industrial policy), which alone may outweigh the enormous cost of switching.[169] These concerns are discussed in further detail in Parts III.C and III.D.[170]

b. Switching Costs: From OSS to Proprietary Software

In addition to the initial switching costs of moving from proprietary software to OSS, governments are expected to measure the cost of moving back to proprietary software after comprehensive OSS adoption.[171] If the switching cost of moving from OSS to proprietary software is too high, OSS may capture the entire market, even if it is eventually proven to be inferior to proprietary software.[172] In the worst-case scenario, if OSS were to capture the whole market through strong network effects, current software companies would have few incentives to innovate and potential proprietary software market entrants would be discouraged by having to compete with government-favored OSS.[173] Thus, innovation in the proprietary software market would be impeded, while incentives for innovation in the OSS community would remain the same. Such a result would not benefit the government, consumers, or proprietary software developers.

c. Compatibility as One Key to Eliminating Switching Costs

The above discussion of switching costs and network effects shows that software incompatibility is a major obstacle to software system switching.[174] Network effects lie not only in the adoption of identical goods, but also in the adoption of compatible ones.[175] If OSS and proprietary software were compatible, the network effects could be enjoyed by all consumers instead of only those users of software produced by the dominant market players. Moreover, switching costs would be manifestly lower, and governments would not have to worry that their adoption of OSS might negatively affect software innovation. Such compatibility could also increase social welfare by

---

169.   *See* discussion *infra* Parts III.C-D.

170.   *Id.*

171.   *See* Schmidt & Schnitzer, *supra* note 33, at 497.

172.   *Id.*

173.   *Id.*

174.   *See* Parts III.A.1, III.A.2.a, III.A.2.b.

175.   *See* Farrell & Saloner, *supra* note 162, at 70.

allowing consumers to choose the most appropriate software products for their needs without worrying about significant switching costs. This compatibility could place OSS and proprietary software on a level playing field and allow genuine competition, which could help to attain the goal of efficiency.[176]

3. Subsidies for Research and the Underproduction of Public Goods

Schmidt and Schnitzer argue that public subsidies for research and development (R&D) should be limited to basic research rather than applied research, because the former is a public good with strong positive external effects that will not be provided by the market.[177] The authors point out that there are few incentives for conducting basic research, as private firms are unable to capture the spillover value of that research.[178] It is much easier for private firms to internalize the positive effects of applied research through IP laws and the market.[179] They conclude that, because most software products directly result from applied R&D, governments should ensure either that the products of subsidized research enter the public domain or that liberal licenses such as the BSD protect software.[180] The authors further argue that the viral nature of the GPL will preclude proprietary software companies from using it.[181] Some Microsoft officers argue that public funding for GPL software is incompatible with the United States government's IP policies of the past two decades, which "promote commercialization of public research."[182]

a. Basic Research and Applied Research

Schmidt and Schnitzer have not clearly defined "basic research."[183] If the difference between basic research and applied

---

176.   Such concerns of compatibility and lock-in effects are well illustrated in the "Open Source Software Trials in Government Final Report" released by the British Office of Government Commerce (OGC) in 2004. In this report, the OGC claims its priority is to "avoid lock-in to proprietary IT products and services," and maintain "interoperability that support open standards." OFFICE OF GOVERNMENT COMMERCE, OPEN SOURCE SOFTWARE TRIALS IN GOVERNMENT FINAL REPORT, *available at* http://www.arb.ca.gov/oss/ articles/report-v8d.pdf#search=%22Open%20Source%20Software%20Trials%20in%20 Government%20Final%20Report%22.

177.   *See* Schmidt & Schnitzer, *supra* note 33, at 494.

178.   *Id.*

179.   *Id.* at 495.

180.   *Id.* at 496.

181.   *Id.*

182.   *See* Clark, *supra* note 2, at 41.

183.   *See* Schmidt & Schnitzer, *supra* note 33, at 494.

research is whether the researcher or the developer can internalize the positive effects of the research, then the development of OSS is obviously basic research while proprietary software is an aspect of applied research. OSS developers have never attempted to capture the value of OSS through IP laws or market price.[184] Rather OSS is disseminated as widely as possible.[185]

Furthermore, the incentives for OSS development are more similar to those for basic research than for applied research. Incentives for basic research usually consist of celebrated reputations and prestigious awards, whereas IP rights are the most significant incentive for applied research.[186] The incentives associated with the former are more similar to the incentives associated with OSS development (as discussed in detail in Part I.C), which encompass recognition from others and intellectual satisfaction rather than direct pecuniary compensation.[187] Therefore, it is not reasonable to consider all software development to be applied research and to arbitrarily disregard the possibility of public subsidies for OSS.

Finally, with regard to Schmidt and Schnitzer's argument against the GPL, the viral nature of the GPL and the concerns of proprietary software companies do not at all affect the underlying "public goods nature" of OSS.[188] One may argue that the primary goal of research subsidies is to increase education and the greater body of knowledge, whereas the secondary goal is to allow commercialization of the research.[189] By keeping the source code open, OSS can achieve this primary goal far better than its proprietary counterpart.[190]

---

184.   According to the Open Source Definition published by the Open Source Initiative (OSI), all open source software must be freely distributed with its source code. *See* Open Source Initiative, *supra* note 26. Therefore, OSS developers can never capture the value of OSS through IP or market prices.

185.   See discussion *supra* Part I.A.

186.   WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 306-07 (2003).

187.   Pecuniary profit usually is ill-perceived in academia. Scholars place more importance on professional recognition. ROBERT P. MERGES ET AL., INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE 474 (3d ed. 2003). Moreover, academic authors often pay journals to have their work published because their reputations and incomes are expected to increase when their articles are published. To some extent, this is very similar to the signaling incentives for OSS programmer, described in Part I.C.2 of this article. *See also supra* Part I.C.

188.   Schmidt & Schnitzer, *supra* note 33, at 496.

189.   *See* Clark, *supra* note 2, at 41.

190.   *Id*.

b. The Underproduction Problem of Public Goods

The main reason that governments harness their budgets to provide incentives for basic research is a desire to avoid the underproduction of public goods.[191] One successful example of government sponsorship of non-proprietary inventions is the basic architecture of the Internet, including the TCP/IP standard.[192] During the Internet's early years, the United States government encouraged and promoted a culture of non-proprietary development that protected the open architecture of the Internet.[193] This development path was justified by the fact that the TCP/IP and other basic Internet protocols constituted classic public goods that would not necessarily be provided by the market.[194]

However, in light of the burgeoning development of the software industry, it is difficult to provide empirical evidence that software products are under-produced. The monopoly power conferred by the current IP regime has already provided important incentives for software production.[195] Perhaps the more fundamental problem rests not on whether software development is a type of basic research, but on whether the current IP regime, as a set of incentives for software production, has created costs that are too high for individual consumers and society as a whole to bear.

---

191.   Private provision of public goods is usually inadequate, either because private parties do not have incentives to provide enough public goods for society or because private parties charge too steep a price, which depresses consumption for the products. *See* SHAVELL, *supra* note 54, at 110-11.

192.   *See* Philip J. Weiser, *The Internet, Innovation, and Intellectual Property Policy*, 103 COLUM. L. REV. 534, 536-38 (2003). TCP/IP (Transmission Control Protocol/Internet Protocol) standard actually refers to a suite of protocols designed to provide internetworking. These protocols have been set as open standards by the IETF (Internet Engineering Task Force) to facilitate communications between computers. It is these protocols that define the current Internet architecture. *See* LAWRENCE LESSIG, CODE AND OTHER LAWS OF CYBERSPACE 101-02 (1999).

193.   Weiser, *supra* note 192, at 537.

194.   *See* Brett Frischmann, *Privatization and Commercialization of the Internet Infrastructure: Rethinking Market Intervention into Government and Government Intervention into the Market*, 2 COLUM. SCI. & TECH. L. REV. 1, 30-46 (2001). Some scholars also argue that the media conglomerate would not create an architecture that delegates users so much autonomy. Therefore, academia, rather than the business world, is the only venue that could give birth to the Internet. *See* Jay P. Kesan & Rajiv C. Shah, *Deconstructing Code*, 6 YALE J. L. & TECH. 279, 285-87 (2003).

195.   *See* George B. Richardson, *Economic Analysis, Public Policy, and the Software Industry* 14-16 (Danish Research Unit for Indus. Dynamics (DRUID), Working Paper No. 97-4, 1997), *available at* http://webdoc.sub.gwdg.de/ebook/lm/1999/druid/druid-attach/pdf_files/97-4.pdf (arguing that a viable software industry depends on effective IP protection).

Governments have different approaches to solving the problem of the underproduction of public goods.[196] Public subsidies and IP rights are just two such approaches.[197] Because IP legislation presents "no direct, immediate cost to the government" it seems to be a relatively cheap solution to the public goods problem.[198] With regard to software products, governments have utilized IP rights to solve the public goods problem.[199] Professor Lawrence Lessig nonetheless argues that by combining the overlap protection of the law and software code, proprietary companies create too large a gap between the software's price and its marginal cost, a gap that may not be justified by the need to solve the product provision problem.[200]

A software developer can invoke IP rights to charge a price for its product, which is a non-rivalrous good, and thus restrict use even though additional consumption of the good would have no additional cost.[201] Accordingly, using IP to provide incentives for public good production may be inefficient because this approach results in under-consumption.[202] Nevertheless, without IP rights, there may not be enough incentive for software developers to supply the good. In this

---

196.   *See* WILLIAM W. FISHER III, PROMISES TO KEEP 199-202 (2004); Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When Is the Best Incentive System?*, 2 INNOVATION POL'Y & ECON. 51, 53-56 (comparing IP, prize, and procurement contract as different mechanisms for awarding innovation).

197.   *Id.*

198.   MERGES, *supra* note 187, at 111.

199.   With regard to IP protection over software, see generally MARK A. LEMLEY ET AL., SOFTWARE AND INTERNET LAW 99-212, 259-364 (2000).

200.   *See* Lessig, *supra* note 29, at 58-59. Rahnasto also holds that proprietary software developers exercising copyright may have an external effect on the software market. *See* ILKKA RAHNASTO, INTELLECTUAL PROPERTY RIGHTS, EXTERNAL EFFECTS AND ANTI-TRUST LAW 1 (2003). Professor Benkler contends that "the current heavy focus on strengthening intellectual property rights is exactly the wrong approach to increasing growth through innovation and information production, if having a robust peer production sector is important to an economy's capacity to tap its human capital efficiently." Benkler, *supra* note 25, at 445. On the contrary, some commentators believe that intellectual property protection for software is essential if proprietary software developers are to recover their significant fixed costs. *See* Evans & Reddy, *supra* note 29, at 331. Actually, it is economists' general belief that without IP protection, creators can only capture the information production cost. Nonetheless, the production cost cannot truly reflect the true social value associated with the information and underlying creativity. *See* SHAVELL, *supra* note 54, at 139-40.

201.   *See supra* note 191 and accompanying text.

202.   *See* BENKLER, *supra* note 28, at 36 (indicating "if these [IP] laws are…necessary to create the incentives for publication, the market that develops based on them will, from the technical economic perspective, systematically be inefficient."); *cf.* STIGLITZ, *supra* note 129, at 129 (indicating that, "[c]harging a price for a non-rival good prevent some people from enjoying the good, even though their consumption of the good would have no marginal cost. Thus charging for non-rival good is inefficient because it results in underconsumption . . . The underconsumption is a form of inefficiency").

case, inefficiency may result from under-supply.[203]   Therefore, IP rights cannot always properly balance the two basic market failures associated with information production: under-consumption and under-supply. Some scholars also contend that IP rights are bad for innovation in many cases.[204] If the costs exceed the benefits that IP rights bring, governments certainly should consider developing and implementing alternative incentives such as public funding of software production.[205] Hence, the inefficiency associated with IP's exclusion may currently be the most challenging problem for IP policymakers.

c. Public Subsidies for Gift-Giving

In Part I.C.1, this article mentioned that Eric Raymond contends that there is a "gift culture" in the OSS community that provides incentives for OSS production.[206] This article argued that in the OSS community there are a variety of reasons for gift-giving apart from the altruism identified by Raymond.[207] Broadly interpreting the concept of gift-giving, the efforts that programmers make for the development of OSS can be considered to be a sort of gift, even if those efforts do not flow from purely altruistic motives.[208] Consequently, we may find some specific reasons for the state to support such gift-giving.

With regard to the relations between gift-giving and public subsidies, Professor Steven Shavell has indicated that if an organization such as a university "is furnishing a public good . . . , providing a benefit to society generally that cannot be provided by the private sector, then one way to finance it is by encouraging those who

---

203.   *Cf.* STIGLITZ, *supra* note 129, at 129 (pointing out that, without a "charge for a non-rival good, there will be no incentive for supplying the good. In this case, insufficiency takes the form of undersupply").

204.   *See* ERIC VON HIPPEL, DEMOCRATIZING INNOVATION 112-17 (2005).

205.   Nonetheless, public subsidies for basic research may also contribute to the problem of the under-consumption of public goods. Before 1980, many government-subsidized inventions were languishing because of inadequate incentives for commercialization. *See generally* Rebecca Eisenberg, *Public Research and Private Development: Patents and Technology Transfer in Government-Sponsored Research*, 82 VA. L. REV. 1663, 1663 (1996). Therefore, the U.S. Congress enacted the Bayh-Dole Act to give universities the power to license and profit from their intellectual property. *Id.* at 1683. In this regard, intellectual property can supplement public subsidies in creating public goods. *See id.* at 1667 (analyzing how the allocation of IP rights over government-sponsored research affects the dissemination and use of knowledge).

206.   *See* discussion *supra* Part I.C.1.

207.   *Id.*

208.   *Id.*

would give for whatever reason to give more, by subsidizing giving."[209] OSS programmers usually do not take the value of their contribution to users into full account, and thus they may give too little.[210] Subsidizing OSS therefore may be a desirable way of promoting social welfare.[211]

Consider the following illustration: OSS developer A gives a gift to B such that A would obtain an altruistic benefit of 35 and B would obtain a gift benefit of 70. However, the gift would also cost A 40 due to the consumption she would forgo. Therefore, OSS developer A would not give the gift because the altruistic benefit to her of 35 is outweighed by the cost to her of 40 (35-40 = -5). But it is socially desirable for the gift to be given, because if the gift is given, the net change in welfare will be positive (35+70-40 = 65). A subsidy for OSS could induce A to give the gift which would result in the desired net social benefit.[212]

This proposal for government support of OSS seems plausible, but the above example also suggests that through market mechanisms B, a private party, could pay A no less than 5 to produce the gift. Thus, public subsidy is not necessary to produce such software products. Nevertheless, in the real world B represents the huge number of dispersed software users. Given the significant transaction costs of collective action between those users, governments acting to represent the wide interests of their citizens may legitimately subsidize OSS developer A. A fundamental question here is whether there is an under-production or under-consumption problem for public goods. If such problems do not exist, government subsidies for gift giving by OSS developers are superfluous unless OSS is proven to be superior to proprietary software and the benefits of subsidies outweigh their costs.

4. Market Competition and Technology Neutrality

It is true that the rapid growth of the open source movement has exerted competitive pressure on proprietary software companies such as Microsoft by constraining their pricing.[213] The goal of

---

209.   SHAVELL, *supra* note 54, at 59.

210.   *See id.* at 58.

211.   *See id.* at 58-59.

212.   This study has adapted Professor Shavell's argument on the desirability of state encouragement of gifts for use in this paragraph. *Id.* at 59.

213.   For example, in May 2003, the city of Munich, Germany, decided to migrate its 14,000 computers to Linux and other open source office applications even though Microsoft dropped its prices to match those of Linux. *See* DRAVIS, *supra* note 69, at 8. When Paris's socialist mayor looked into switching that city's roughly 18,000 computers to an OSS

efficiency could be realized through the positive effects of competition between OSS and proprietary software.[214] However, the competitive effects resulting from government intervention in the software market through favoring OSS are still fiercely debated.[215]

a. Government Support of OSS Will Promote Competition

Some researchers suggest that the playing field is not level for proprietary software and OSS; therefore, "the public policy problem is to keep the two sub-systems in proper balance by public funding" of OSS and by "checking excessive incursions" of proprietary software developers' IP claims.[216] Shen argues that the government should support OSS in order to exert additional pressure on proprietary software companies, a strategy that might force them to continue lowering their prices.[217] Antitrust cases in the software industry have raised the profile of Microsoft and, identified it as the industry's most dominant vendor.[218] Researchers in the antitrust field assert that

alternative, Microsoft offered a huge discount as well. Bryan-Low, *supra* note 133. Moreover, the Thai government initially subsidized an OSS project consisting of both a Thai version of Linux and OpenOffice application suite. Microsoft's multi-fold reaction to such subsidies is (1) to sell its Windows operating system and office suite for only about US$300, (2) to translate the program into Thai, and (3) to offer a new licensing agreement. DRAVIS, *supra* note 69, at 9. Microsoft's price-cutting reaction may raise antitrust concerns about predatory pricing in the United States and Europe. *See* Amanda Cohen, *Surveying the Microsoft Antitrust Universe*, 19 BERKELEY TECH. L.J. 333, 356 (2004).

214.   Professor Zittrain urges the coexistence of different software for the sake of reliability. He argues that "[h]omogeneity in deployed software scores well for interoperability among machines, but it places everyone's eggs in one basket. A diversity of computer platforms running a diversity of software distributes those eggs—perhaps resulting in the same number of potential infections but avoiding catastrophic simultaneous infection." Zittrain, *supra* note 154, at 283.

215.   *See infra* notes 216-225 and accompanying text.

216.   *Cf.* 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 19, 19 (Julie M. Esanu & Paul F. Uhlir eds., 2003) (arguing that "open science and commercially oriented research and development based on proprietary information constitute complementary sub-systems").

217.   *See* Shen, *supra* note 114, at 35-38. In addition, on November 9, 2001, the Bundestag of Germany passed a resolution on "Germany's Economy in the Information Society." Evans & Reddy, *supra* note 29, at 374. The resolution describes OSS as a means by which to secure competition against dominant players in the software market. *Id.* The State Secretary in the Federal Ministry of Economics and Technology indicated that OSS could facilitate competition in the German software market. Moreover, an audit study delivered to the Budget Committee of the regional parliament of Schleswig Holstein and the Commission's 2001 IDA study also express similar views about OSS's role in fostering competition in the software market. *Id.* at 385.

.   218.   *See generally* Benjamin Klein, *The Microsoft Case: What Can a Dominant Firm Do to Defend Its Market Position?*, 15 J. ECON. PERSP. 45 (2001).

without government intervention in the software market and government support of OSS, a very small number of proprietary software companies would monopolize the software market.[219] They believe that proprietary systems entail strong ties to a single supplier, which in reality precludes competition.[220]

b. Government Support of OSS Will Impede Competition

Free market advocates oppose public subsidies for OSS projects and any other governmental intervention in the software market.[221] They argue that technology should compete on its merits in a free market and that governments should not pick winners and losers.[222] IT specialists in business and government, rather than legislators, can decide to adopt OSS if OSS is indeed superior.[223] Alternatively, some researchers argue that if a product cannot make it without government mandates, then it will not make it with government mandates either.[224] They claim that governments are incapable of determining the efficiency of OSS and proprietary software.[225] Even some proponents of the open source movement come to similar conclusions about government support of OSS software under the belief that OSS will succeed on its own merits.[226] They contend that purity of OSS should be protected from politics, and that the free market can be relied upon to recognize the legitimate technical merits of OSS and to secure its steady advancement.[227]

Compared to the government, the market can be far superior at determining which products are best for consumers. Therefore, we should not be so quick to abandon the current market unless there is a

---

219.   In October 2002, the Danish Board of Technology released the report "Open Source Software in e-Government" in which it is stated that "[t]he ordinary market conditions for standard software will tend towards a very small number of suppliers or a monopoly . . . . It will only be possible to achieve competition in such a situation by taking political decisions that assist new market participants in entering the market." Broersma, *supra* note 102; *see also* DRAVIS, *supra* note 69, at 8 (describing the same Danish report about OSS and e-government).

220.   Broersma, *supra* note 102.

221.   *See* Schmidt & Schnitzer, *supra* note 33, at 494.

222.   *See* Schmidt & Schnitzer, *supra* note 33, at 494.

223.   *See* Evans, *supra* note 144, at 44.

224.   *See* Tony Stanco, *Opinion on Brazil Making Open Source Mandatory in Government*, LINUX TODAY, Jun. 13, 2003, http://linuxtoday.com/news_story.php3?ltsn=2003-06-13-009-26-OS-LL-PB&tbovrmode=0.

225.   *See* Schmidt & Schnitzer, *supra* note 33, at 496.

226.   For example, Bessen contends that OSS "corrects imperfections in the markets for proprietary software, and it does so without requiring government intervention through subsidies or procurement preferences." Bessen, *supra* note 55, at 33.

227.   *See* Chan, *supra* note 9, at 534-35.

market failure. When a market failure does occur, there is a rationale for government intervention.[228] Nevertheless, most economists believe that government failure resulting from its intervention in a "failed market" may cost the public more than the original market failure.[229]

c. The Role of Government in Market Competition

From the above discussion, we see that the issue of whether government support for OSS will promote or impede market competition remains unsettled.[230] If we inquire thoroughly into the controversy of government support of OSS and its relation with market competition, we will find that the essential question lies in what the governments' role should be in market competition. The most common arguments with regard to this debate rest on the government's neutral role in technological development and its role in promoting competition.[231] Therefore, analysis of these two functions will aid in finding a solution.

i. Technology Neutrality

The principle of technology neutrality—which has been globally adopted in legislation regarding electronic signatures[232] and more recently applied by scholars to broadband access[233]—implies that government should not stifle the development of certain technologies or unfairly favor one technology over another. According to this principle, the choice between different technologies or implementation schemes must belong to parties and users, instead of the government

---

228.   *See* JOSEPH E. STIGLITZ, PRINCIPLES OF MICROECONOMICS 163 (2d ed. 1997).

229.   *Id.*

230.   *See* discussion *supra* Parts III.A.4.a-b.

231.   *See supra* note 216-225, and accompanying text.

232.   *See* Andrew Barofsky, *The European Commission's Directive on Electronic Signatures: Technological "Favoritism" Towards Digital Signatures*, 24 B.C. INT'L & COMP. L. REV. 145, 156 (2000); Adam White Scoville, *Clear Signatures, Obscure Signs*, 17 CARDOZO ARTS & ENT L.J. 345, 373-74 (1999); Thomas J. Smedinghoff & Ruth Hill Bro, *Moving with Change: Electronic Signature Legislation as a Vehicle for Advancing E-Commerce*, 17 J. MARSHALL J. COMPUTER & INFO. L. 723, 728 (1999).

233.   Recently, legal scholars have also adopted the concept of neutrality in the discussion of broadband open access issues. They believe that the process of technological innovation proceeds most rapidly through a survival-of-the-fittest competition between new technologies, and this fact encourages policymakers to ensure a fair fight among competing innovations. *See* Jim Chen, *Webs of Life: Biodiversity Conservation as a Species of Information Policy*, 89 IOWA L. REV. 495, 525-27 (2004). *See generally* Tim Wu, *Network Neutrality, Broadband Discrimination*, 2 J. TELECOMM. & HIGH TECH. 141, 172 (2003) (making "an initial case for a broadband discrimination regime as an alternative to structural remedy of open access to achieve the goal of network neutrality").

and policymakers.[234] This approach exhibits a degree of confidence in the marketplace's capacity to make suitable options available to consumers, thereby enabling consumers to make intelligent choices.[235]

From the perspective of technology neutrality, market competition will decide whether OSS or proprietary software ultimately prevails.[236] Governments should exclude picking the winner, but maintain a level playing field in the software market.[237] That is, the government should not intervene in the market unless there is a market failure. Nonetheless, two questions should be answered before we come to the conclusion that government support of OSS will be detrimental to a particular variety of technology. First, is there a market failure in the current software market that can justify governmental intervention? Second, can a government supported by free market advocates always avoid any kind of intervention into market activities?

In response to the first question, there are numerous types of failures that may exist in the software market. First, OSS is demonstrably superior to proprietary software has not been adopted widely in the market due to significant switching costs.[238] The under-consumption of software products is another market failure. Due to strong IP protection, some individuals that need the product will not purchase it.[239] Furthermore, software incompatibility can be viewed as a market failure, because it may prevent users from adopting software products that meet their needs. Researchers also suggest that market failures due to inefficient competition in the current software market have led to fewer jobs and services.[240] In developing countries, the lack of skilled programmers and programming education may itself be deemed a market failure. As a whole, these

---

234.   *See* Amelia H. Boss, *The Internet and the Law: Searching for Security in the Law of Electronic Commerce*, 23 NOVA L. REV. 585, 601 (1999).

235.   *Id.*

236.   Nevertheless, Professor Lessig holds a different view, arguing that—even from the perspective of government neutrality—as long as the interests the government assumes are sufficiently broad, the government will often arrive at the conclusion that OSS is preferable to proprietary software. *See* Lessig, *supra* note 29, at 67-68.

237.   *Cf.* Stephen Martin & John T. Scott, *The Nature of Innovation Market Failure and the Design of Public Support for Private Innovation,* 29 RES. POL'Y 437, 440 (2000) (indicating that, "[b]ecause governments typically have a poor record of identifying ultimately successful lines of technological development in advance, public support for innovating SMEs should not take the form of direct grants … Rather, government should limit its role to setting up market infrastructure and creating an environment conducive to entrepreneurship").

238.   *See* discussion *supra* Part III.A.4.c(i).

239.   *See* discussion *infra* Part III.B.1.a.

240.   *See* Tuomi, *supra* note 64, at 450.

market failures may justify government intervention into the software market through support of OSS.

The second question is somewhat more contentious. Scholars such as Ilkka Tuomi claim that successful public policy can never be neutral because it must effectively change society.[241] If we consider the IP system itself as a form of government intervention, it is too idealistic to argue that government should avoid intervening in the software market altogether. Therefore, from a pragmatic perspective, policymakers should focus on designing the optimal government intervention rather than adopting a totally hands-off approach to the market.

ii. Supporting OSS as a Competition Policy

The government can facilitate technological transition in its role as a regulator.[242] One may argue that, if market competition is impeded by several of the dominant proprietary software companies, such a problem should be resolved by antitrust laws rather than by government support of OSS. However, antitrust laws have their own limits since there are still some anti-competitive behaviors that evade antitrust regulation. For example, according to researchers, the fact that software market entry-points are only in the hands of incumbents may lead to sub-optimal industry structure.[243] From this perspective, OSS is said to provide another limit to anticompetitive behavior in the digitally networked economy.[244] If a government can use its procurement or subsidy policy to correct market failure and retrieve the limit of antitrust laws, there is no reason to deny the potential benefits brought by such government intervention. Accordingly, the government can play the positive role of subsidizing, affirming, and using specific technologies to expedite their diffusion. In this sense, the government can function as a crucial user of certain technologies to achieve its policy goals.[245]

---

241.   *Id.* at 449.

242.   For a discussion of such an effort with regard to the transition from analog to digital television, see Albert N. Lung, *Must-Carry Rules in the Transition to Digital Television: A Delicate Constitutional Balance*, 22 CARDOZO L. REV. 151, 158-95 (2000).

243.   Tuomi, *supra* note 64, at 450.

244.   *See* Shruti Ahuja-Cogny, *Interrogations on a Passion-Filled Debate on Open-Source Software and the Digital Divide*, 1 INFO. TECH. & INT'L DEV. 60, 60-61 (2004). Moreover, it is reported that the Taiwanese government planned to promote OSS development as "part of an effort to curb Microsoft's dominance in [the] software" market. *See* Berger, *supra* note 106.

245.   SHAPIRO & VARIAN, *supra* note 163, at 313-15.

B. Technical Concerns

In addition to economic concerns, one of the most important considerations in adopting OSS is the potential technical problems. This part analyzes these technical issues from the viewpoint of compatibility, security, usability, and availability.

1. Compatibility

Compatibility (or interoperability) is a concern in adopting any software, including OSS and proprietary software.[246] There are two primary compatibility issues in regard to governmental adoption of OSS. The first is incompatibility between proprietary software and OSS, which may prevent users (including governments) from adopting OSS in the first place.[247] The second issue is whether OSS, as opposed to proprietary software, can promote software compatibility better in the long run.[248]

a. Incompatibility of Proprietary Software and OSS

The incompatibility of OSS and proprietary software is a problem that plagues any government's adoption of OSS.[249] Even the OSS itself may have manifold incompatible editions of the same software.[250] Incompatibility hinders consumers in replacing their proprietary software with OSS because network effects and switching costs already exist for proprietary software.[251] If such incompatibility is not warranted for technological reasons but is posed by proprietary software companies to deter OSS or other potential competitors, it may result in an anti-competitive effect that decreases efficiency in the software market.

---

246.   *See* discussion *supra* Part III.A.2.c.
247.   *See* discussion *infra* Part III.B.1.a.
248.   *See* discussion *infra* Part III.B.1.b.
249.   For instance, in Finland, where the government has been testing StarOffice and OpenOffice, early results reveal some incompatibilities for users trying to open Microsoft Office documents using the OSS alternative. A counselor in Finland's Ministry of Finance said, "We recommended open source only for people who don't exchange documents with other people." Berger, *supra* note 106. In the "Open Source Software Trials in Government Final Report" released in 2004, the British Office of Government Commerce (OGC) also recognized that one of the main obstacles to widespread use of OSS desktop applications is "the current lack of complex functionality which can affect ease of migration and interoperability for some organisations." OFFICE OF GOVERNMENT COMMERCE, *supra* note 176, at 2.
250.   Evans & Reddy, *supra* note 29, at 357-58.
251.   *See* discussion *supra* Part III.A.2.

Many OSS applications do not require an OSS operating system because the set of application-programming interfaces (APIs) that define compatibility with the Microsoft Windows operating system are an industry standard. [252] As long as the adoption of the interfaces complies with the standard, applications are easily compatible with the Windows operating system.[253] Therefore, many OSS applications can be deployed with Microsoft Windows and other proprietary operating platforms. For example, the open source database MySQL and PostgreSQL can run on proprietary systems.[254] Open source applications such as the office suite OpenOffice and web browser Firefox are also available for Windows.[255]

On the other hand, proprietary applications can always be designed to be interoperable with OSS operating systems because the source code and interfaces of such systems are always open.[256] For example, proprietary databases from Oracle and IBM can operate on a Linux operating system.[257] Therefore, it is still possible for government agencies adopting the Linux operating system to have proprietary applications running on it.[258]

Overall, the compatibility of proprietary and OSS applications has improved. One empirical study shows that there are minimal problems in exchanging data between proprietary (Microsoft Word and Excel) and OSS (OpenOffice) applications.[259] Some software developers have started producing hybrid software, parts of which are open while other parts are closed.[260] Hybrid software can also help facilitate the compatibility between OSS and proprietary software.[261]

---

252.   Functioning as interfaces between operating systems and applications, APIs facilitate smooth communications between them. Bruce Abramson, *Promoting Innovation in the Software Industry: A First Principles Approach to Intellectual Property Reform*, 8 B.U. J. SCI. & TECH. L. 75, 116 (2002). APIs also allow other programmers to exploit functionalities of the program in question by writing their code to utilize, or call, the program. These "calls" are synapses at which an application can connect to invoke pre-fabricated blocks of code in the operating system. These blocks of code, in turn, perform crucial tasks, such as displaying text on the computer screen. BARRY B. SOOKMAN, COMPUTER, INTERNET AND ELECTRONIC COMMERCE TERMS: JUDICIAL, LEGISLATIVE AND TECHNICAL DEFINITIONS 7 (2001).

253.   Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 CAL. L. REV. 1889, 1896 (2002).

254.   DRAVIS, *supra* note 69, at 23.

255.   *Id.*

256.   *See* discussion *supra* Parts I.A-B.

257.   DRAVIS, *supra* note 69, at 23.

258.   Varian & Shapiro, *supra* note 46, at 5.

259.   *See* DRAVIS, *supra* note 69, at 17.

260.   For example, the new Macintosh system is a proprietary fork of BSD. Moreover, the LindowsOS, an OSS operating system, comes with interfaces enabling interability with Microsoft proprietary applications. Elad Harison & Robin Cowan, *On*

However, incompatibility between proprietary and OSS operating systems has yet to be solved completely. For example, in order to exchange documents with other institutions or individuals, many government agencies in China adopting the Linux operating system also install Microsoft Windows on the same computers.[262] Consequently, the Chinese government "has found the lock-in effect [to be] much greater than anticipated."[263]

b. Regulatory Approaches to Promoting Software Compatibility

Scholars and governments have tried to provide regulatory solutions to promote software compatibility. However, none of these attempts has completely solved current incompatibility problems.[264] This part will discuss OSS and open standards as policy strategies to promote software compatibility.

i. Open Software Interfaces

Vendor control over software interfaces is critically associated with network effects and user switching costs.[265] Therefore, when users (including governments) consider switching to different software, they should carefully assess whether software interfaces exhibit network effects. Many scholars claim that "IP rights should be interpreted narrowly in settings with network effects," because with such effects IP protection may not be socially desirable if it grants

---

Substitution of Intellectual Property and Free Disclosure: An Analysis of R&D Strategies in Software Technologies, 13 ECON. INNOVATION & NEW TECH. 477, 480 (2004).

261.   *Id.*

262.   Shen, *supra* note 114, at 33.

263.   *Id.*

264.   For example, to achieve software compatibility, it is legal in many jurisdictions (including the U.S. and the E.U.) for software developers to access their competitors' software interfaces through decompilation of software products or reverse engineering. Nonetheless, both U.S. and European laws provide a very circumscribed right to look for interface information through reverse analysis. Under the U.S. regime, contractual use provisions can easily prevent a third-party developer from reverse engineering software. *See* Sony Computer Entm't, Inc. v. Connectix Corp., 203 F.3d 596, 602 (9th Cir. 2000); DSC Commc'ns Corp. v. DGI Techs., Inc., 81 F.3d 597, 601 (5th Cir. 1996); Bateman v. Mnemonics, Inc., 79 F.3d 1532, 1540 n.18 (11th Cir. 1996); Sega Enter. Ltd. v. Accolade, Inc., 977 F.2d 1510, 1520 (9th Cir. 1992). The E.C. Software Directive also permits lawful users of a software program to decompile the program solely for the purpose of achieving interoperability with other programs. For instance, Article 6 of the Directive permits lawful users of a software program to decompile the program solely for the purpose of achieving interoperability with the subject program and other programs.

265.   Mark A. Lemley & David McGowan, *Legal Implications of Network Economics Effects*, 86 CAL. L. REV. 479, 532 (1998).

monopoly power without promoting innovation.[266] Some scholars thus believe that, by allowing competitors to use software interfaces, users of different programs could benefit both from the network effects of different networks and by avoiding switching costs.[267] Accordingly, many legal scholars believe that it is a desirable policy to eliminate IP protection over software interfaces.[268]

However, one might allege that an expansive open interface regulation directly expropriates the incumbent's *ex ante* investment. Some scholars believe that owners of large amounts of IP under the present system are often politically powerful, as is evidenced by their rent-seeking activities to support and reinforce the current IP regime.[269] Therefore, it will be difficult to change IP laws.[270] Moreover, it is believed by some scholars that IP law is essential to competition and innovation at the application layer of our communications system.[271] Thus, there is a fear that, without full IP rights protection, the incentive to create software will weaken.[272]

Nonetheless, the "IP as incentive" argument only applies to proprietary software, the production of which is largely motivated by IP rules.[273] The incentives for OSS development, as mentioned in Part I.C, are obviously different from those for proprietary software.[274] If the law decreases IP protection for software interfaces, it would not affect the incentives for programmers to participate in OSS development. After all, interfaces associated with OSS are already open because they are described in the source code.[275] Thus, some scholars claim that one of the benefits of supporting OSS is the resulting pressure on proprietary software developers to open their

---

266.   Neil Gandal, *Compatibility, Standardization, and Network Effects: Some Policy Implications*, 18 OXFORD REV. ECON. POL'Y 80, 88 (2002).

267.   Lemley & McGowan, *supra* note 265, at 532.

268.   *See id.* at 533 (suggesting that to deny all forms of intellectual property protection to software interfaces would truly permit competition within *de facto* standards); Mark A. Lemley & David W. O'Brien, *Encouraging Software Reuse*, 49 STAN. L. REV. 255, 295 (1997) (suggesting that the patentability for programming interfaces should be raised to promote interoperability); Pamela Samuelson, *Software Compatibility and the Law*, 38 COMM. OF THE ACM 15, 16, 21 (1995) (noting that copyright law does not protect internal program interface, and such protection may impede innovation of competing and complementary products).

269.   Terrel Gallaway & Douglas Kinnear, *Open Source Software, the Wrongs of Copyright, and the Rise of Technology*, 38 J. ECON. ISSUES 467, 471 (2004).

270.   *See* VON HIPPEL, *supra* note 204, at 115.

271.   Weiser, *supra* note 192, at 600.

272.   *See* LANDES & POSNER, *supra* note 186, at 11.

273.   *See* discussion *supra* Part I.

274.   *See* discussion *supra* Part I.C.

275.   *See* discussion *supra* Part I.

own interfaces, which in turn would benefit users.[276]   From this perspective, OSS is better than proprietary software when it comes to increasing compatibility and network effects.

ii. Government Procurement Favoring Open Standard Software

An open standard is generally defined by the following characteristics: first, the standard is publicly available at a minimal cost.[277] Second, no entity controls the standard, or the standard is licensed on reasonable and nondiscriminatory terms.[278]   Many commentators argue that, in the absence of technological differences between standards, consumers generally prefer an open standard.[279] From a network effects perspective, an open standard has positive consequences for compatibility or interoperability between different software, which generates greater value for users by enlarging the network.[280]

Compared to the mandatory adoption of OSS via overt legislation, an open standard requirement in government procurement rules seems less partial to OSS. [281]   If the policy goal of government

276.   Varian & Shapiro, *supra* note 46, at 13. Besides, The eEurope 2005 Action Plan, which is operated by the E.U., also recommends OSS for an E.U. "interoperability framework." CSIS, *supra* note 66, at 5.

277.   Kesan & Shah, *supra* note 194, at 354. However, the E.U.'s definition of open standard requires the royalty-free licensing of any applicable patents and prohibits any restrictions on the reuse of open standards. *See* Robert Jaques, *EU Governments Gather Together to Promote Open Source*, VNUNET.COM, Nov. 19, 2004, http://www.vnunet.com/ news/1159547.

278.   Kesan & Shah, supra note 194, at 354. In addition to these two characteristics, some contend that the development process for creating the standard should involve public participation.

279.   Peter S. Menell, *An Epitaph for Traditional Copyright Protection of Network Features of Computer Software*, 43 ANTITRUST BULL. 651, 673 (1998); *see also* Daniel A. Farber & Brett H. McDonnell, *Why (and How) Fairness Matters at the IP/Antitrust Interface*, 87 MINN. L. REV. 1817, 1819 (2003) (arguing that "there should be a legal presumption in favor of open standards, except where efficiency concerns clearly dictate otherwise"); Douglas D. Leeds, *Raising the Standard: Antitrust Scrutiny of Standard-Setting Consortia in High Technology Industries*, 7 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 641, 648 (1997) (stating that "[i]f a single accepted and open standard exists, consumers can adopt compatible technological improvements without surrendering network externalities").

280.   SHAPIRO & VARIAN, *supra* note 163, at 229.

281.   For example, Massachusetts announced its IT acquisition policy (Enterprise Open Standards Policy) on January 12, 2004, moving from what originally appeared to be a shift from specifying OSS to a greater focus on open standards. The new open standards for IT acquisitions base the criteria for government IT procurements on "best value" and set guidelines to help reduce the total cost of ownership of systems. *See* Taft, *supra* note 69. In 2005, the Massachusetts state government further amplified the open standard policy to an *open format* policy. *See* W. David Gardner, *Massachusetts Senator Hails Compromise on Open-Source Effort*, TECHWEB, Jan. 21, 2005, http://www.techweb.com/

software procurement is only to promote compatibility or interoperability between different software products, an open standard requirement may be more legitimate than a strict OSS requirement in governmental software procurement rules. Nonetheless, sometimes interoperability is not the only policy goal in governmental software procurement.[282] Governments may still face some practical problems when they implement open standard requirements in software procurement.[283]

The most significant problem results from the fact that open standards are not the norm in the computer and software industry.[284] The primary reason for this is that open standards take time to develop.[285] This process can slow down code development and implementation, and as a result, firms may not be able to quickly meet the demands of their customers.[286] Moreover, since open standards do not allow any one party to control the standard, software companies do not always develop their products based on open standards.[287] Consequently, if governments prescribe that all software procurement be based on open standards, they may not

---

wire/57702867. Moreover, the Government Procurement Guideline Amendment 2003 of the Australian Capital Territory (ACT) also requires a preference for open standard in the government's procurement of software. Gedda, *supra* note 95. Other government actions supporting open standard in software include a pending bill in South Australia and a policy announcement made by France's Committee for e-Government. *See* Adam Turner, *SA Democrats to Tone Down Open Source Bill*, THE AGE (AUSTL), Aug. 20, 2003, *available at* http://www.theage.com.au/articles/2003/08/20/1061261205187.html; Press Release, EuroLinux Alliance, France Towards Open e-Government (Nov. 21, 2001), *available at* http://petition.eurolinux.org/pr/pr15.html?LANG=en.

282.   It is noteworthy that even if the government is taking interoperability concerns seriously in its software procurement, OSS is still better than proprietary software in promoting compatibility. *See* K. D. Simon, *The Value of Open Standards and Open-Source Software in Government Environments*, 44 IBM SYS J. 227, 234-36 (2005) (indicating that "OSS has proven to provide a superior development philosophy and development technique in the sense that it embraces the open standards valued by governments … OSS has provided interoperable … solutions for governments").

283.   *See generally* Kesan & Shah, *supra* note 194, at 362.

284.   *Id.*

285.   *Id.* at 354-55.

286.   *Id.* at 355. Whether an open standard will slow down or accelerate innovation and technological development depends on many dynamic factors. Sometimes open standards can also accelerate acceptance of a new technology because a standard with many backers can go far to bolster the credibility of the technology, which then become self-fulfilling. *See* SHAPIRO & VARIAN, *supra* note 163, at 230.

287.   Kesan & Shah, *supra* note 194, at 355. A firm's decision on whether to choose open standards is usually based on its control of the market. Some scholars believe that a firm will accept and use open standards only if it predicts that it cannot control the market directly and that standards can be dominant in the market. Thus an open standard is favored when no firm is strong enough to dictate a technology standard. *See id.,* at 354-56.

always find appropriate software products for their particular government uses.

c. GPL Licenses and Compatibility

Schmidt and Schnitzer believe that if the OSS favored by government is licensed by the GPL or other viral licenses, proprietary software developers would find it legally difficult to make their software compatible with OSS.[288]   Then, there would be two incompatible networks existing in the market.[289]   Evans and Reddy have also ascertained that it is the distribution restrictions of the GPL that obstruct the coexistence of proprietary software and the GPL.[290] Evans and Reddy argue that since government-sponsored GPL software can neither go into the public domain nor be spun off for commercial purposes, it is bad policy for the government to support software R&D that is licensed under the GPL.[291]   Because the GPL license is viral by nature, proprietary software developers are much more cautious about not being infected by OSS under the GPL license.[292]

Nonetheless, proprietary software's licensing terms may have the same effect on software compatibility as the GPL license does. Without a license, OSS programmers cannot legally appropriate the source code of proprietary software–just as proprietary software cannot appropriate the source code of GPL software without being infected.[293]   Hence, the influence of proprietary software on software compatibility does not differ substantially from that of GPL software. Government-sponsored GPL software might not benefit proprietary software, but this does not mean that such GPL software would not benefit consumers and society as a whole.   For example, users who do not distribute GPL software can copy it as many times as they wish

---

288.   Schmidt & Schnitzer, *supra* note 33, at 497-98.   *See* discussion *infra* Part III.B.1.

289.   Schmidt & Schnitzer, *supra* note 33, at 497-98.

290.   Evans & Reddy, *supra* note 29, at 324.

291.   *Id.* at 390-93.   Smith holds the same viewpoint. He argues that "the GPL forbids the commercial licensing of software that includes or is derived from GPL-covered code. . . . [U]se of the GPL in publicly funded research projects would drive an impenetrable wedge between the public and private sectors, thereby undermining the innovation and economic growth that has resulted from such public-private collaboration in the past." Smith, *supra* note 40, at 79.

292.   *See* discussion *supra* Part I.B.1.

293.   As Professor Lessig has argued, the GPL is, "no doubt, a restriction on the freedom of developers. They can't simply 'take' Linux and do with it as they wish. But neither can anyone simply 'take' the Windows operating system and do with it as they wish." LESSIG, *supra* note 16, at 329 n.9.

for internal use, as well as modify and customize it.   Arguments against governmental sponsorship of GPL say nothing about whether the government should subsidize non-viral OSS projects, such as projects licensed under the BSD.[294]   According to this line of reasoning, perhaps the only software projects that governments should subsidize are those that produce code in the public domain or under non-viral OSS licenses.[295] However, such arguments may be too simplistic because the policy concerns behind government support for software development are quite complicated and lay far beyond the goal of compatibility.

2. Security

Security is another important concern for government software procurement. Modern governments maintain a great number of digital files that must be retrievable in perpetuity.[296] Security flaws in the Microsoft operating system and its applications are often exploited by viruses.[297]   In fact, security concerns have prompted some governments to pause when considering the future use of proprietary software.[298]

Some commentators believe that systems built on software from a single vendor are more vulnerable to attack than systems integrating software from different sources.[299]   OSS provides

---

294.   *See* Lessig, *supra* note 29, at 65-66.

295.   *Id.* at 66.

296.   *Microsoft at the Power Point*, *supra* note 86.

297.   *Id.*

298.   *Id.* In the 1990s, the U.S. National Security Agency (NSA) faced challenges regarding software security. However, with obvious demand from the market, proprietary developers hesitated to spend money solving NSA's security concerns. NSA, therefore, turned to Linux system to enhance their software security. Clark, *supra* note 2, at 40.

299.   For example, the German Federal Ministry of the Interior in Berlin announced a government deal with IBM in 2002 to purchase hardware and software products that support Linux. The official in charge of the deal implied that OSS is less vulnerable to attack. Berger, *supra* note 106. The European Parliament also published a report in 2001 stating that:

> If security is to be taken seriously, only those operating systems should be used whose source code has been published and checked, since only then can it be determined with certainty what happens to the data. . . . The Commission and Member States are called upon to promote software projects whose source text is made public (open-source software), as this is the only way of guaranteeing that no backdoors are built into programmes.

Report on the Existence of A Global System for the Interception of Private and Commercial Communications, EUR. PARL. DOC. A5-0264/2001, 128-41 (2001), *available at* http://www2.europarl.eu.int/omk/sipade2?PUBREF=-//EP//NONSGML+REPORT+A5-2001-0264+0+DOC+PDF+V0//EN&L=EN&LEVEL=2&NAV=S&LSTDOC=Y.   Furthermore, a

transparency, which is lacking in e-government initiatives that build on proprietary software.[300] Transparency bolsters security because it exposes "backdoors" used by hackers, and allows programmers to root out bugs from the source code, provided that the code is clear and visible.[301] According to a report released by the British Office of Government Commerce, "[p]roperly configured OSS can be at least as secure as proprietary systems, and OSS is currently subject to fewer Internet attacks."[302] Certain United States government agencies that have salient security requirements, such as the Department of Defense and the National Security Agency (NSA), have adopted the Linux operating system.[303] The NSA even developed a "Security Enhanced Linux" for users with particular security concerns.[304]

Proprietary software companies such as Microsoft assert that the openness of OSS makes it insecure and, therefore, vulnerable to terrorism.[305] The argument for closed source code is that keeping source code unavailable makes it more difficult for hackers and computer criminals around the world to develop malicious code.[306] In fact, while the open nature of OSS makes it more vulnerable to such attacks, it also enables OSS programmers to fix the bugs more efficiently.[307] In 2001, Microsoft launched a Shared Source Initiative that allowed some approved government and business clients to gain access to most of the Windows software code, but not to modify it.[308] This initiative is aimed, in part, at the alleviation of foreign governments' fears that there may be secret security backdoors in Windows.[309] In 2003, Microsoft further announced the Government

---

study at the University of Wisconsin found open source UNIX operation systems were more reliable than mature commercial products. Bessen, *supra* note 55, at 17.

300.   Clark, *supra* note 2, at 40.

301.   Tuomi, *supra* note 64, at 440-41; *see also* Bryan-Low, *supra* note 133; Richenda Gillespie, *German Federal Government to Support Open Source Software*, INTERNET NEWS.COM, July 5, 2000, http://www.internetnews.com/bus-news/article.php/6_408271. According to the resolution on "Germany's Economy in the Information Society" by the Bundestag of Germany on November 9, 2001, high security is one advantage of OSS for users. Evans & Reddy, *supra* note 29, at 374-75.

302.   OFFICE OF GOVERNMENT COMMERCE, *supra* note 176, at 8.

303.   Varian & Shapiro, *supra* note 46, at 10.

304.   *Id.*

305.   *Microsoft at the Power Point*, *supra* note 86.

306.   *Id.*

307.   Varian & Shapiro, *supra* note 46, at 15.

308.   *Microsoft at the Power Point*, *supra* note 86.

309.   Microsoft has stated that it is "committed to helping governments develop strong, sustainable IT infrastructures that deliver ease of use, value through innovative technology, a clear road map for future development and access to source code to improve security and implementation." Berger, *supra* note 106. Some commentators suggest that, based on Microsoft's Shared Source Initiative and some OSS companies' adoption of aspects

Security Program (GSP) to provide its government clients with access to the source code of Windows 2000, Windows XP, Windows Server 2003, and Microsoft Office 2003.[310] Microsoft claims that "[t]he GSP provides national governments with information to help them evaluate the security of Microsoft products."[311]

So far, software developers and governments around the globe have different views regarding whether OSS or proprietary software provides better security for customers. Regardless, from Microsoft's shared source initiative and GSP, it is evident that security will be continuously enhanced in response to the strength of market competition.

3. Usability

Since the functionality as well as the user-friendliness of software may be related to both its market share and developers' profit margins, some scholars believe that there are strong incentives for proprietary software developers to meet the needs of all potential users of the software.[312] Proprietary software developers are undoubtedly willing to identify the needs of consumers through marketing research and to satisfy them in order to gain a competitive advantage.[313] For example, it is recognized by professionals that Microsoft has significantly improved the usability of Windows systems in recent years.[314]

However, these same usability incentives may not be shared by OSS developers. Typically, little analysis of consumer needs accompanies OSS development.[315] The open source movement has been fairly successful in the development of operating systems and server application systems that respond directly to the needs of sophisticated users, but they have been much less successful in developing end-user applications.[316] Casual observation suggests that OSS is now largely aimed at sophisticated users. This targeting may

---

of commercial models, elements of open source and proprietary models are beginning to overlap in important ways. Smith, *supra* note 40, at 70. However, Bessen argues that, in spite of Microsoft's Shared Source Initiative, it still appears difficult for Microsoft and other proprietary developers to duplicate OSS's dynamic community support for software. *See* Bessen, *supra* note 55, at 23.

310.   Microsoft,   Government   Security   Program   (Mar.   1,   2006), http://www.microsoft.com/resources/sharedsource/Licensing/GSP.mspx.

311.   *Id.*

312.   Schmidt & Schnitzer, *supra* note 33, at 485.

313.   Smith, *supra* note 40, at 71.

314.   Varian & Shapiro, *supra* note 46, at 15.

315.   Evans & Reddy, *supra* note 29, at 341.

316.   *See* Schmidt & Schnitzer, *supra* note 33, at 486.

be explained by the fact that OSS programmers are seeking recognition from their peers, who are sophisticated users.[317] Developing software for unsophisticated end-users may be intellectually unsatisfying and may result in little or no recognition from the OSS community.[318] Therefore, significant numbers of users and contributors tend to overlap with each other in successful OSS projects.[319] Moreover, OSS projects usually have very limited resources regarding market research to identify customer needs.[320] Since most OSS developers have not received training in either human-computer interaction or usability engineering,[321] They usually lack detailed knowledge of end-user preferences and practices.[322]

Thus, it seems that there are fewer incentives for OSS programmers to cater to mass consumer markets, and as a result OSS has not been very successful in developing user-friendly software aimed at these markets. Though some vendors have begun to provide OSS for desktop users, such OSS is still not as functional or as easy to use as Microsoft Office software.[323]

Nonetheless, OSS also has its own advantages in serving users' specific needs. The development model and the openness of OSS can be particularly attractive to users who want to "repackage, embed, . . . host specialized services, or create complementary products."[324] It is comparatively harder for users to adopt proprietary software products for local needs because the source code is protected by IP laws.[325] Thus, Xiaobai Shen argues that the functions and standard technical features of proprietary software products are designed primarily for the developed world.[326] "Proprietary software, the source code of which is kept secret, leaves little scope for technological participation by developing countries."[327] Conversely, OSS provides locals with

---

317.   Aaron Schiff, *The Economics of Open Source Software: A Survey of Early Literature*, 1 REV. NETWORK ECON. 66, 73 (2002).

318.   *See* Lerner & Tirole, *supra* note 48, at 217.

319.   Tuomi, *supra* note 64, at 435.

320.   *See* Smith, *supra* note 40, at 72. Test or beta version is usually the only means for OSS developers to investigate the market before OSS products are eventually released.

321.   Johnson, *supra* note 48, at 656.

322.   *See* Schmidt & Schnitzer, *supra* note 33, at 486.

323.   Nevertheless, Sun Microsystems has developed StarOffice, which is desktop productivity software that competes with Microsoft Office. The free open-source version of the product is called OpenOffice. Berge*r*, *supra* note 106. OpenOffice is also regarded as possibly the best existing open source office suite. Evans & Reddy, *supra* note 29, at 354.

324.   Varian & Shapiro, *supra* note 46*,* at 10.

325.   *See* COMMISSION ON INTELLECTUAL PROPERTY RIGHTS, *supra* note 134, at 105.

326.   *See* Shen, *supra* note 114, at 34.

327.   *Id.*

opportunities to develop products for domestic markets, thereby utilizing "their better understanding of local needs."[328]

4. Availability

The different production models employed by proprietary software companies and the OSS community may, to some extent, result in dissimilar products.[329] According to Bradford L. Smith, the General Counsel and Senior Vice president of Microsoft, proprietary software companies "normally own the result of the developers' efforts, define the scope and goals of the project, allocate work, and act as a single point of accountability for the programs vis-à-vis the outside world."[330] In this respect, proprietary software development is more structured than OSS development.[331] Therefore, when considering migration to OSS, government users have to contemplate whether there are OSS products available that can serve their various administrative needs.

Industry observers have complained that there is no appropriate open source product available for governmental use.[332] Sometimes, people have the impression that OSS is free, so companies are not readily attracted to the idea of developing OSS applications.[333] As Evans points out, "the fact that government 'demands' does not mean it will get 'supply'."[334] Application providers first have to find an economically viable business model for OSS. In addition, software developers may hesitate to participate in an OSS project unless it achieves a "critical mass,"[335] where demand-side economies of scale emerge as a result of network effects.[336] From this perspective, a government initially adopting OSS can help the platform to achieve a critical mass, which may promote the long term availability of future OSS products and subsequent competition in the software market.

---

328.   *Id.* at 35.

329.   *See* Smith, *supra* note 40, at 71, 72.

330.   *See id.* at 71.

331.   *Id.* at 71-72.

332.   *See* Turner, *supra* note 281.

333.   OSI founders aimed to eliminate business and investor misunderstanding regarding "free" software. *See* Brian W. Carver, *Shared and Share Alike: Understanding and Enforcing Open Source and Free Software Licenses*, 20 BERKELEY TECH. L.J. 443, 448-50 (2005). However, in the proprietary world, it is still a common perception that "free" means "no revenue" or "no support." *See* Frank Hecker, *Setting Up Shop: The Business of Open-Source Software*, 16 IEEE SOFTWARE 45, 46 (1999).

334.   Evans, *supra* note 144, at 46.

335.   *See* Bessen, *supra* note 55, at 24.

336.   *See* Shapiro & Varian, *supra* note 163, at 179-82.

For those who intend to procure OSS for governments and other public sector users, the availability of proper OSS products is still a problem to be solved.[337]   Nonetheless, with the rapid development of OSS and the maturity of its related business models,[338] more and more OSS applications are available for a mass consumer market.[339] For example, a great number of unsophisticated users have adopted the office suite OpenOffice and web browser Firefox.[340]   In the years to come, it is reasonable to expect that developers will continuously improve OSS's availability in order to compete with proprietary software in different operating and applications markets.   As a user, governments will find more and more OSS applications available to meet various administrative needs.

5. Summary

Both proprietary software and OSS have advantages in terms of quality.   Businesses and general users should make purchasing decisions based on their specific software needs, as well as on the features of different software products.[341]   More specifically, rather

---

337.   For example, the Taiwanese government is facing such a problem now that they are developing OSS with twenty domestic software companies. *See* Chuang, *supra* note 115.   Furthermore, in the "Open Source Software Trials in Government Final Report" released in 2004, the British Office of Government Commerce (OGC) stated that one of the main obstacles to widespread implementation of OSS business applications is "the lack of Open Source products to compete with large-scale proprietary enterprise-level products." OFFICE OF GOVERNMENT COMMERCE, *supra* note 176, at 2.

338.   Some OSS companies build their distribution and service businesses by assembling collections of OSS programs, bundling them, and selling them as "distributions"; payment is thus received not for the software *per se*, but rather for the selection and assembly skill needed to compile a workable distribution. For example, the company Red Hat, which has successfully developed its OSS business model, collects a premium for assembling customized versions of Linux and adds value to their product by testing components and using only those that are of the highest quality, thus saving users the cost of making such modifications on their own. This is a business model based on "aggregation" of freely available pieces into a valuable whole. *See* Sulin Ba et al., *Small Companies in the Digital Economy, in* UNDERSTANDING THE DIGITAL ECONOMY 185, 192-93 (Erik Brynjolfsson et al. eds., 2000).   Other OSS companies found that true business opportunities lie in follow-on documentation, support, service, and customization. In sum, OSS business models have demonstrated the service aspect, rather then the product aspect, of the software industry. *See* Varian & Shapiro, *supra* note 46, at 7.

339.   *See* Wikipedia, List of Open Source Software Packages, http://en.wikipedia.org/ wiki/List_of_open_source_software_packages (last visited Oct. 1, 2006).

340.   *See* Simon London, *Open Source Moves Into Microsoft's Office Block*, FIN. TIMES (LONDON), Apr. 21, 2005, at 20.

341.   According to research conducted by the Berlin-based company Infora, OSS is most appropriate not only for mail server and groupware tasks, but also for file and print serving. Microsoft Windows remains most appropriate for the desktop. *See* John Lettice,

than blindly supporting OSS procurement, business software consumers should adopt a two-fold strategy: first, rigorous comparisons of the functionalities of OSS with the functionalities of proprietary software; and second, precise targeting of specific needs in discrete areas of business administration.

However, as a software consumer, a government is likely to have more concerns than a business consumer does. The difference between a government user and a business user is that, in lending its support to OSS, the government should take into account the long-term interests of society and not merely its own interests as a consumer.[342] OSS is better than proprietary software when it comes to increasing compatibility and network effects; therefore, one benefit of supporting OSS is that it pressures proprietary software developers to open their own interfaces for the benefit of users. Governments can also legitimately provide a critical mass in order to promote the availability of OSS products and subsequent competition in the software market. When two systems are similarly suitable, therefore, it is reasonable for governments to choose OSS over proprietary software based on these technical policy considerations.

C. Political Concerns

Political factors, including both the form of government involved and the nature, variety, and power of special interest groups working within a country, exercise important influences on the way that government operates.[343] Sometimes the decision whether to adopt OSS is based not only on technical and economic considerations but also on political and ideological ones.[344] For instance, Danese Cooper, a manager of the Sun Microsystems open-source programs office, speculated that countries with strong socialist histories or political movements are more likely to embrace OSS.[345] However, such an inference lacks empirical support at this time.

Report Favours Open Source, Windows Mix for Bundestag, THE REGISTER, Feb. 13, 2002, http://www.theregister.co.uk/content/4/24048.html.

342.   *See* SHAPIRO & VARIAN, *supra* note 163, at 314-15.

343.   *See* John Henry Merryman, *On the Convergence (and Divergence) of the Civil Law and the Common Law*, 17 STAN. J. INT'L L. 357, 372 (1981).

344.   For example, legislators in the city government of Florence, Italy, passed a motion in June 2001 to warn the public that continued use of proprietary software was leading to "the computer science subjection of the Italian state to Microsoft." *See* Festa, *supra* note 69.

345.   *Id.*

1. Threatening or Strengthening Democracy

Attitudes toward democracy may affect a government's decision to support OSS. It is still unclear whether OSS benefits or impedes the development of democracy.[346] For example, it has been reported that China favors OSS for political reasons that are diametrically opposed to the tenets of democracy.[347] Dan Kusnetzsky, vice president of software systems at IDC, stated the following:

> [o]pen source gives a level of control that proprietary software from the likes of Microsoft and HP do not give. . . . It may be that the authorities want to keep a check on who is using computers and firms like HP might take a dim view of what the Chinese Government wants to do.[348]

In contrast, the European Working Group on Libre Software stated that one of the reasons for supporting OSS concerns its capacity to "[provide] a new forum for democratic action."[349] According to Professor Lessig, "[t]o the extent that code is open code, the power of government is constrained. Government can demand, government can threaten, but when the target of regulation is plastic, it cannot rely on its target remaining as it wants."[350] Professor Benkler also contends that "the way that OSS is produced, or the peer-production of information, enables new opportunities for citizens to pursue core political values of liberal societies, which include democracy, individual freedom, and social justice."[351]

So far, there is no empirical research on OSS's impact on political systems and institutions. One may argue that both the result of government promotion of OSS and the promotion's effects on democracy are theoretically diverse, owing to various attitudes toward democracy and to the ultimate objectives in promoting OSS. Nevertheless, because it is the idea of freedom, rather than control, which is at the heart of the OSS philosophy,[352] promotion of OSS may help to facilitate a decentralized environment for digital creativity. Such a decentralized environment, in turn, is consistent with values underlying a democratic system: limited government and free

---

346.   *See   Linux   takes   on   MS   in   China*,   BBC NEWS,   Jan.   8,   2002, http://news.bbc.co.uk/2/hi/science/nature/1749441.stm; *see also* LESSIG, *supra* note 192, at 107; Benkler, *supra* note 70, at 1247; Working Group on Libre Software, *Free Software/Open Source: Information Society Opportunities for Europe?* 13 (Working Paper Version 1.2, 2000), *available at* http://eu.conecta.it/paper.pdf.

347.   *See Linux takes on MS in China*, *supra* note 346.

348.   *See id.*

349.   *See* Working Group on Libre Software, *supra* note 346, at 13.

350.   *See* LESSIG, *supra* note 192, at 107.

351.   Benkler, *supra* note 70, at 1247.

352.   *See* ROSEN, *supra* note 36, at 1-2, 8-11.

speech.[353]   Also, some hackers contributing to OSS development contend that, if OSS were directed toward a political end, it would sully the "purity" of the technical decision-making process.[354] It seems that too much politics in the OSS sphere may discourage people from contributing their expertise.[355]   Therefore, public authorities attempting to use OSS as a tool of political control may encounter insurmountable conflicts between OSS and their governmental policy goals—conflicts that will ultimately render the marriage of OSS and government control unfeasible.

2. Anti-United States Complexity

The United States government has long made efforts through international lobbying activities to promote its software industry, which is one of the most important copyright-protected industries in the country.[356] Indeed, the United States is completely aware of the global trend favoring OSS and seeks to counter this trend through such efforts.[357]   Meanwhile, Microsoft has declared OSS to be "un-American."[358] In a review of government support for OSS, industry observers found that some governments seek to avoid dependence on software whose export is legally controlled by the United States and whose development and licensing is controlled by this country's

---

353.   Benkler, *supra* note 70, at 1247.

354.   *See* Gabriella Coleman, *The Political Agnosticism of Free and Open Source Software and the Inadvertent Politics of Contrast*, 77 ANTHROPOLOGICAL Q. 507, 512 (2004).

355.   *Id.*

356.   *See* PETER DRAHOS & JOHN BRAITHWAITE, INFORMATION FEUDALISM 91-99 (2003). The United States succeeded in linking intellectual property, which is vital to its software industry, with trade and thereby extending it to a supranational level. *See* Warren Newberry, *Copyright Reform in China: A "TRIPS" Much Shorter and Less Strange than Imagined?*, 35 CONN. L. REV. 1425, 1427-29 (2003).   The circumvention of technological protections provision in Article 11 of the WIPO Copyright Treaty (WCT) is another example of the United States' aggressive protection of its copyright industries through international legislation. *See* JULIE E. COHEN ET AL., COPYRIGHT IN A GLOBAL INFORMATION ECONOMY 577-79 (2002).

357.   For example, it has been reported that the U.S. Ambassador to Peru, John Hamilton, afraid that his host nation might adopt a bill decreeing the use of OSS in all government systems, wrote a letter to the president of the Peruvian Congress expressing his dismay at the proposed legislation. As reported in *Wired News*, Hamilton's letter noted that, "while the United States does not oppose the development of open-source software, it prefers to support a free market where the quality of the product can determine the issue." Peruvian Congressman Edgar Villanueva, the bill's chief sponsor, said that he considers Hamilton's letter to be "overt pressure" on Peru by the United States and Microsoft. Agustin d'Empaire, *Microsoft's Big Stick in Peru*, WIRED NEWS, Jul. 27, 2002, http://www.wired.com/news/business/0,1367,54141-2,00.html.

358.   *See* Story, *supra* note 139, at 136.

dominant software industry.[359] Thus, it is believed by some that there may be certain anti-United States sentiment behind other governments favoring OSS.[360] For example, the BBC News cited Brazil's xenophobia as one possible cause for the country's love affair with Linux.[361] Additionally, the Wall Street Journal assumed that there were ideological factors affecting the OSS policies of European governments based on the fact that some left-leaning government officials routinely rail against the dangers of being beholden to a United States software giant.[362]

It would be naïve to explain a government's preference for OSS merely on the basis of an anti-United States prejudice. Some United States companies, such as IBM, Intel, Hewlett Packard, and Sun, regard government attitudes toward OSS as a positive development for their own open-source efforts.[363] On a smaller scale, some states and other local governments in the United States are also considering adopting OSS.[364] A more practical concern for governments is the aim to increase sovereignty over software products. Some governments worry that Microsoft (a single vendor) exercises far too much power over their operations.[365] No government wants to submit to so much influence from a single supplier.

3. Software Industrial Policy

Many developing countries believe that software may be a more promising field than other technologies because it enables them to

---

359.   *See id.* Some people support OSS for political and technical reasons that have yet to be verified. These people believe that some versions of Windows contain backdoors designed to grant the U.S. National Security Agency access to user data. *See* Rick Perera, *German Parliament Considers Linux Switch*, ITWORLD.COM, Oct. 16, 2001, http://www.itworld.com/Comp/2384/IDG011016germanlinux/.

360.   *See infra* note 361 and accompanying text.

361.   *See* Mark Ashurst, *Brazil Falls in Love with Linux*, BBC NEWS, Feb. 1, 2004, http://news.bbc.co.uk/1/hi/business/3445805.stm.

362.   *See* Bryan-Low, *supra* note 133.

363.   It is reported that IBM has poured US$1 billion into various OSS projects, including the integration of both the Linux operating system and Apache server software into IBM's hardware. Evans & Reddy, *supra* note 29, at 348. Intel has also provided resources for OSS developers. *Id.* at 349. Hewlett Packard has developed Linux drivers for their hardware and sponsors a variety of open source organizations. *See id.* at 349.

364.   *See* DRAVIS, *supra* note 69, at 10-11; Larry Greenemeier, *States Seek Common Ground on Open Source*, INFO. WK., Mar. 22, 2004, http://www.informationweek.com/story/showArticle.jhtml?articleID=18401044#.

365.   For example, when considering converting to OSS, the Deputy Mayor of Paris Francois Dagnaud said: "Our objective is to not be dependent on a monopolistic vendor." *See* Bryan-Low, *supra* note 133.

catch up to the technological level of developed countries.[366] The software industry is labor-intensive, and neither needs heavy capital investment in factories and other manufacturing facilities, nor incurs substantial costs in transportation.[367]   Nevertheless, developing countries usually find it difficult to afford the licensing fees for proprietary operating systems, which constitute the core software for computing technologies and other software networks.[368] This is one of the legitimate reasons for developing countries to support OSS if they are to foster their own software industry.   Equally important, governments around the globe are now realizing that their technology expenditures have benefited not local players, but foreign vendors (mostly based in the United States). In order to ameliorate this harsh reality, OSS provides an alternative for developing countries to build up their own software industry.

By promoting OSS and decreasing the use of Microsoft software, some governments expect to make computer technology more accessible to their citizens and to aid their domestic economy.[369] Some countries, such as Peru, are proposing extreme preferential legislation for OSS, mandating its use wherever possible.[370] Behind this approach lies a long-term strategic objective, often expressed in terms of "national interest."[371] They deem OSS to be a policy tool with which to develop a domestic software industry and to increase local job opportunities.[372] Furthermore, some OSS supporters contend that by promoting OSS, governments can build a foundation for the export of

366.   Shen, *supra* note 114, at 26; *see also* Nir Kshetri, *Economics of Linux Adoption in Developing Countries*, 21 IEEE SOFTWARE 74, 80 (2004) (indicating that "the Chinese government sees Linux as a powerful opportunity to catch up and even pull ahead in the global technology race").

367.   Shen, *supra* note 114, at 26.

368.   *See* Kshetri*, supra* note 366, at 76-77.

369.   *See* Berger, *supra* note 106 (using the governments of Thailand and the Philippines as examples).

370.   *See* Alolita Sharma, *Tracking the Open Source Front,* TECHNETRA, July 2, 2003, http://www.technetra.com/writings/free_thinking/tracking_oss_front_html.

371.   DRAVIS, *supra* note 69, at 8; Evans & Reddy, *supra* note 29, at 381; *see* Proffitt, *supra* note 69.

372.   For instance, in China, a vice minister of the Chinese Ministry of Information said in November 2003 that "Linux is an opportunity for us to make a breakthrough in developing software." DRAVIS, *supra* note 69, at 8. The Bundestag of Germany also passed a resolution on November 9, 2001, that declared OSS to be a special opportunity for the European Software industry. Evans & Reddy, *supra* note 29, at 374-75. The Venezuelan government also announced a policy that exclusively calls for the use of OSS by that government. The main reason is that "the government and the people of Venezuela were increasingly concerned the fact that over 75 percent of the funds for software licenses went to foreign nations, 20 percent to foreign support agencies, and only 5 percent to Venezuelan programmers." *See* Proffitt, *supra* note 69.

future services and products.[373] This goal is more immediate whenever there is a strong need to conserve foreign currency reserves.[374]

The software industry requires skilled and trained labor, which is usually insufficient in developing countries.[375] However, programmers in developing countries can actually learn coding skills from their counterparts in developed countries through participation in the OSS community.[376] Government promotion of OSS can thus narrow the technological gap between the developing and the developed world.[377]

James Bessen believes that OSS provides a means of extending the market for software because it serves those consumers who cannot afford to license proprietary software products, and, in turn, can bridge the digital divide to some extent.[378] OSS serves to promote the widest access to computing and the Internet.[379] Therefore, it may be worthwhile for developing countries to make substantial investment in OSS, rather than in less affordable proprietary software.

Developed countries have their own software industrial policy concerns as well. Some of these countries believe that OSS is a desirable alternative for software development.[380] For example, the

---

373. *See* Clendenning, *supra* note 8.

374. Hancom Office in South Korea is an example of an organization that is not only serving local users, but also breaking out into new markets. Hancom is promoting its Arabic version of Linux (based on Red Hat Linux) as well as its office suite in the Middle East. *See* Robin Miller, *Asia Will Be the Center of Linux Development in 2003*, NEWS FORGE, Dec. 27, 2002, http://www.newsforge.com/software/02/12/27/0259244.shtml?tid=11.

375. *See* Ashish Arora & Alfonso Gambardella, *The Globalization of the Software Industry: Perspectives and Opportunities for Developed and Developing Countries*, 5 INNOVATION POL'Y & ECON. 1, 21 (2005).

376. *See* Shen, *supra* note 114, at 35.

377. As the General Counsel of the Free Software Foundation and a law professor at Columbia Law School, Eben Moglen has argued that government use of OSS "makes local software development opportunities, as technical students everywhere learn how to install, maintain, and improve it. This is just one aspect of the enormous human capital improvement that comes when free software—whose users can learn anything about how computers work by reading the code of the programs that they use themselves—is pervasively employed." *See* Moglen, *supra* note 150, at 2.

378. *See* Bessen, *supra* note 55, at 22. For example, to bridge the technology gap in Brazil, President Luiz Inacio Lula da Silva and his chief technology officer Sergio Amadeu are encouraging a move toward OSS computing. Amadeu plans to transform Brazil into a tech-savvy nation where everyone from schoolchildren to government bureaucrats use OSS instead of costly Windows products. There are eighty-six free Telecentros computers in Sao Paulo. All the computers use OSS, and these centers cater to working class Brazilians. They learn how to send e-mails, write resumes, and surf the Web. *See* Clendenning, *supra* note 8.

379. *Id.*

380. *See generally* DRAVIS, *supra* note 69, at 10-11; Benkler, *supra* note 25, at 371-72.

United States President's Information Technology Advisory Committee recommended that the federal government back OSS strategically in order to maintain the United States' lead in critical software development.[381] In April 2003, NASA released the report "Developing an Open Source Option for NASA Software," which stated that "for NASA, the adoption of the Open Source option would lead to three benefits: (1) improved software development; (2) enhanced collaboration in particular across organizational boundaries; and (3) more efficient and effective dissemination."[382]

Some economists criticize the industrial policy approach to governments favoring OSS as an unwarranted attempt to "interject political considerations into what should be a [technological and economic] decision."[383] They argue that, although possibly benefiting certain OSS projects (and even society more generally), most government sponsorship negatively distort market mechanisms and thus may be socially undesirable.[384]

Nevertheless, this argument for a hands-off approach may be too ideal for the real world. As previously mentioned, OSS provides some unique advantages for developing countries.[385] As a general proposition, it is within a government's capacity to enact the most appropriate industrial policy to promote social welfare. If OSS can serve as a tool to maximize social welfare, governments are legitimately taking advantage of it.[386] Furthermore, free market advocates should bear in mind that IP laws, which have provided incentives for proprietary software development in the past few decades, are also a type of industrial policy and governmental intervention.[387] Therefore, the real problem is discerning the optimal nature of government intervention, rather than figuring out how to avoid such intervention.

---

381.   *See* Benkler, *supra* note 25, at 371.
382.   DRAVIS, *supra* note 69, at 10-11.
383.   Evans & Reddy, *supra* note 29, at 375.
384.   *See* Bessen, *supra* note 55, at 26.
385.   *See* discussion *supra* Part III.C.
386.   Dr. Lemos works with the Brazilian Federal Government in the implementation of OSS, and he believes that, although in the short-term governmental implementation of OSS may be more expensive than using proprietary software, these costs in the long term will be recovered through the elimination of technological dependence and the dissemination of knowledge in the source code. Interview with Dr. Ronaldo Lemos, Director, Center for Technology & Society of Fundação Getulio Vargas´ Law School, Brazil (Mar. 14, 2005). This approach highlights that, as a software consumer, governmental perspective is quite different from business and individual users. *Id.*
387.   *See* discussion *supra* Part III.A.3.

D. Legal Concerns

Legal compliance is also an important concern for government OSS policies. Some governments promote widespread OSS adoption in order to solve domestic piracy problems.[388]   Nonetheless, governments are advised to carefully evaluate liability costs and potential international trade disputes resulting from their support of OSS.

1. An Alternative Approach to the Piracy Problem

IP protection has been a global issue for both developed and developing countries.[389]   In recent years, most developing countries have quickly built up their IP protection regimes to meet international standards and the demands of the United States in trade negotiations.[390]   However, many developing countries still have serious problems with IP enforcement.[391]   While in the early stage of economic development, piracy arguably helps developing countries to promote the uptake of computer and other digital technologies.[392] Strengthening IP enforcement will therefore result in the decline of indigenous industries based on imitation.[393]

International pressure to improve the enforcement of IP laws in these developing countries, however, has not lifted.[394]   Because its giant software industry makes it the biggest exporter of copyrighted works in the world, the United States has been pressuring most developing countries to take IP laws seriously.[395]   Thus, IP protection

---

388.   *See infra* notes 397-400 and accompanying text.

389.   *See* ROBERT L. OSTERGARD, JR., THE DEVELOPMENT DILEMMA: THE POLITICAL ECONOMY OF INTELLECTUAL PROPERTY RIGHTS IN THE INTERNATIONAL SYSTEM 5-7 (2003).

390.   DRAHOS & BRAITHWAITE*, supra* note 356, at 85-107; Peter Drahos, *Developing Countries and International Intellectual Property Standard-Setting*, 5 J. WORLD INTELL. PROP. 772, 772-73, 788-89 (2002); J. Michael Finger & Philip Schuler, *Implementation of Uruguay Round Commitments: The Development Challenge*, 23 WORLD ECON. 511, 511, 519-22 (2000).

391.   *See* KEITH E. MASKUS, INTELLECTUAL PROPERTY RIGHTS IN THE GLOBAL ECONOMY 58 (2000) (pointing out that "effective enforcement of copyrights in developing economies will be delayed because of administrative costs and economic interests in pirating that will be difficult to overcome").

392.   *See* Shen, *supra* note 114, at 34.

393.   COMMISSION ON INTELLECTUAL PROPERTY RIGHTS, *supra* note 134, at 23.

394.   *See* DRAHOS & BRAITHWAITE, *supra* note 356, at 33, 98 (2003); Gary   Lea, *Digital Millennium or Digital Dominion? The Effects of IPRs in Software on Developing Countries*, *in* GLOBAL INTELLECTUAL PROPERTY RIGHTS, *supra* note 139, at 144, 144-49.

395.   *See* DRAHOS & BRAITHWAITE, *supra* note 356, at 33, 98 (2003).

of software exports is a crucial part of the United States' trade war with developing countries.[396]

For developing countries, OSS can be used to absorb some of the shock resulting from an anti-piracy clampdown.[397] For example, it is perfectly acceptable under most recognized OSS licenses to simply download the software for free from the Internet.[398] This same act would be considered piracy when applied to proprietary software.[399] Widely adopting OSS might reduce software piracy and consequently lessen United States pressure to stamp out copyright infringement.[400]

Although it is possible that adopting OSS could alleviate the software piracy problem to some extent in developing countries, the strategy of supporting OSS may only effect a temporary solution. In addition to software, there are still many other information products that can be pirated.[401] Even in the context of software, as discussed in Part III.B.4, OSS is currently still unavailable for many application programs.[402] Therefore, even if a government were to support specific OSS projects or to procure OSS for public administration, piracy would still be problematic in those areas of the software market in which OSS is not available. It stands to reason that supporting OSS is, at best, a stopgap measure that only mitigates the piracy problem. In the long run, education and enforcement are probably the best methods of really getting at the root of the problem.

---

396.   *See* Lea, *supra* note 394, at 145-49.

397.   *See* COMMISSION ON INTELLECTUAL PROPERTY RIGHTS, *supra* note 134, at 105; *see also* Kshetri, *supra* note 366, at 79 (suggesting "[r]apid open source diffusion in developing countries will likely lower economic losses and reduce administrative costs for IP law enforcement").

398.   DAN WOODS & GAUTAM GULIANI, OPEN SOURCE FOR THE ENTERPRISE: MANAGING RISKS, REAPING REWARDS 91 (2005).

399.   *Id.*; *see* discussion *supra* Part I.A.

400.   For example, in Peru, some members of the Peruvian Congress have proposed a bill according to which the public sector must adopt OSS whenever possible. One of the legislative reasons therein centers on a hoped-for reduction in software piracy rates, which has reached sixty percent. Berger, *supra* note 106. OSS has also become a policy measure according to which the Pakistani government has attempted to cut down piracy rates. DRAVIS, *supra* note 69, at 9.

401.   *See* COMMISSION ON INTELLECTUAL PROPERTY RIGHTS, *supra* note 134, at 101-02; International Intellectual Property Alliance, *Copyright Industry Initiatives and Challenges in 2006*, http://www.iipa.com/pdf/2006%20Special%20301%20Seven%20Themes %20CLEAN%20DRAFT%20021306.pdf#search=%22copyright%20industries%20piracy%22 (last visited Oct. 10, 2006).

402.   *See* discussion *supra* Part III.B.4.

2. Risks of Indemnification

Recently, the SCO Group (SCO) sued some Linux vendors and users under IP claims in regards to their use of OSS systems.[403] SCO claimed that Linux systems had misappropriated the Unix code currently owned by SCO.[404] Although most of this litigation is still pending,[405] the liability issue resulting from use of OSS has become a main issue of concern for OSS users, including governments.[406]

In order to compete with OSS, Microsoft has announced that it will offer its customers full indemnification against lawsuits over patents and other IP disputes involving the current and older versions of its software (including the Windows operating system, Office desktop, and SQL Server database).[407] According to Steve Ballmer, Microsoft's CEO, by providing full IP indemnification, Microsoft "can stand behind [its] products in a way that open source can't because they have no one standing behind them."[408] Ballmer further warned governments that they could find themselves staring at the wrong end of some patent infringements suits if they adopt Linux.[409]

However, some major hardware and software vendors have begun to stand behind Linux and other OSS products in order to protect their customers.[410] For example, in order to compete with the Linux operating system, Sun Microsystems offered to protect users and developers of Solaris, another OSS operating system, from potential patent-infringement suits.[411] Hewlett-Packard has offered some limited protection to its Linux customers,[412] and Novell, the second largest Linux seller in the world, has pledged to use its own patent portfolio to defend against patent-infringement attacks against

---

403.   *See SCO Targets Government Open Source Users*, OUT-LAW NEWS, Mar. 23, 2004, http://out-law.com/page-4399.

404.   *See* John Foley, *Microsoft Extends Legal Protection to All Customers*, INFO. WK., Nov. 10, 2004, http://www.informationweek.com/showArticle.jhtml?articleID=52600316.

405.   *See* Wikipedia, SCO-Linux controversies, http://en.wikipedia.org/wiki/SCO-Linux_controversies (last visited Oct. 1, 2006).

406.   For example, Regal Entertainment and ADC Telecommunications have announced that "indemnity was key to their choice of Windows over Linux." Ina Fried, *Microsoft to Back Customers in Infringement Cases*, CNET NEWS, Nov. 10, 2004, http://news.com.com/2102-1014_3-5445868.html?tag=st.util.print.

407.   *Id.*

408.   *Id.*

409.   *See Ballmer Attacks Linux on Patent Front*, ZDNET NEWS, Nov. 18, 2004, http://news.zdnet.com/2100-3513_22-5457879.html.

410.   *See infra* notes 411-412 and accompanying text.

411.   *See* Stephen Shankland, *Sun Plans Patent Protection for Open-Source Solaris*, ZDNET NEWS, Nov. 18, 2004, http://news.zdnet.com/2100-3513_22-5456451.html?tag=nl.

412.   *See Ballmer Attacks Linux on Patent Front*, *supra* note 409.

customers using its OSS.[413]   Furthermore, the Open Source Development Lab (OSDL) provides a $10 million legal defense fund for Linux customers.[414]

The contention that OSS faces greater legal risks than proprietary software may result from its open nature. However, both proprietary software and OSS are developed under the current IP regime.[415]   Professor Jonathan Zittrain argues that, compared to proprietary software, OSS is much more vulnerable to claims of infringement by proprietary code authors, because the source code of OSS is freely available to would-be plaintiffs.[416]   That availability makes the costs of stealing OSS typically lower than the costs of stealing proprietary code because one can always obtain the OSS source code, whereas one can never easily obtain the proprietary software's code.[417]   Professor Zittrain's argument is based on the hypothesis that both proprietary software and OSS developers steal each other's code.[418]

If OSS turns out to be more vulnerable to IP claims as Professor Zittrain asserted,[419] OSS developers will be more cautious than proprietary developers about the legality of their programs. Accordingly, OSS users would face no more legal risk than proprietary users do. Given the fact that there are major IT companies standing behind both proprietary software and OSS to protect their customers, the legal risks facing customers have been reduced substantially.[420] This is simply another instance of how competition between proprietary software and OSS can promote consumer interests.

3. Compliance with the International Trade Regime

It is quite common for governments to achieve certain domestic policy goals through their purchasing decisions, including software procurement.[421] However, a government's support of OSS may trigger trade disputes from the perspective of the international trade regime.

---

413.   *See* Martin LaMonica & Stephen Shankland, *Novell Vows Patent Defense of Open Source*, ZDNET NEWS, Oct. 12, 2004, http://news.zdnet.com/2100-3513_22-5406571.html?tag=nl.

414.   *See Ballmer Attacks Linux on Patent Front*, *supra* note 409.

415.   *See* discussion *supra* Part I.B.

416.   *See* Zittrain, *supra* note 154, at 286.

417.   *Id.* at 286-87.

418.   *Id.*

419.   *Id.* at 285-87.

420.   *See Ballmer Attacks Linux on Patent Front*, *supra* note 409; LaMonnica & Shankland, *supra* note 413; Shankland, *supra* note 411.

421.   *See* discussion *supra* Parts III.C.3, III.D.1.

If government practices or domestic legislation restrict the access of foreign proprietary software to government markets for the purpose of giving domestic OSS industries an advantage in winning contracts, such practices or legislation would obviously violate the World Trade Organization (WTO) rule of national treatment, as well as the multilateral Agreement on Government Procurement (GPA).[422] Although there are complex industrial policy concerns behind government software procurement decisions, research for this article did not yield an example of a government that explicitly states in its legislation or procurement announcements that the purpose of purchasing OSS is to restrict foreign software products from the government market.

In addition, government procurement of OSS may be disputed under the WTO rules, which require government procurement to be non-discriminatory and based on commercial considerations.[423] Proprietary software companies or their home countries may argue that government procurement of OSS is not based on such commercial considerations, which include price, quality, availability, marketability and transportation.[424] Based on a recent WTO panel

---

422. The GPA national treatment rule is set out in GPA Article III:

> With respect to all laws, regulations, procedures and practices regarding government procurement covered by this Agreement, each Party shall provide immediately and unconditionally to the products, services and suppliers of other Parties offering products or services of the parties, treatment no less favourable than:

> (a) that accorded to domestic products, services and suppliers. . . .

Agreement on Government Procurement, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 4, Legal Instruments--Results of the Uruguay Round, 33 I.L.M. 1125 (1994), *available at* http://www.wto.org/English/docs_e/legal_e/gpr-94_e.pdf.

423. Article XVII of the General Agreement on Tariffs and Trade (GATT) provides that:

> (a) Each contracting party undertakes that if it establishes or maintains a State enterprise, wherever located, or grants to any enterprise, formally or in effect, exclusive or special privileges, such enterprise shall, in its purchases or sales involving either imports or exports, act in a manner consistent with the general principles of non-discriminatory treatment prescribed in this Agreement for governmental measures affecting imports or exports by private traders.

> (b) The provisions of sub-paragraph (a) of this paragraph shall be understood to require that such enterprises shall, having due regard to the other provisions of this Agreement, make any such purchases or sales solely in accordance with commercial considerations, including price, quality, availability, marketability, transportation and other conditions of purchase or sale, and shall afford the enterprises of the other contracting parties adequate opportunity, in accordance with customary business practice, to compete for participation in such purchases or sales.

General Agreement on Tariffs and Trade, Oct. 30, 1947, art. XVII, T.I.A.S. 1700, 55 U.N.T.S. 187 [hereinafter GATT].

424.   *Id.*

decision,[425] however, some researchers have suggested situations in which government support for OSS may violate the non-discrimination and commercial considerations.[426] Nonetheless, as discussed previously in Parts III.A.1 and III.B.5, many governments have decided to migrate to OSS because of cost and quality concerns, which are certainly commercial considerations.[427] In such cases, there will not be serious problems associated with non-discrimination and commercial consideration provisions under the WTO.[428]

Similarly, requiring public authorities to procure software with open source code may conflict with the technical specifications of the GPA if such requirements are drafted in a way that is directly or indirectly discriminatory.[429] Nevertheless, if the government procurement rules only "consider" OSS, rather than "prefer" it, such rules are probably not discriminatory because considering OSS does not mean precluding proprietary software in the procurement decision process.[430] However, if a government attempts to subsidize OSS not only for business purposes but also in order to facilitate exportation of the country's OSS products, concerns may arise regarding the subsidies provisions of the General Agreement on Tariffs and Trade (GATT).[431] These provisions, with their underlying comparative advantage hypothesis, reflect an effort to avoid situations in which subsidies are used to inefficiently influence resource allocation in international trade.[432]

---

425.   *See* Report of the Panel, *Korea—Measures Affecting Imports of Fresh, Chilled and Frozen Beef*, ¶ 320, WT/DS161/R & WT/DS169/R (July 31, 2000) (quoting that "an entity infringes the general principles of non-discriminatory treatment where it fails to act on commercial considerations, or afford importers adequate opportunity to compete").

426.   *See* Shanker A. Singham & D. Daniel Sokol, *Public Sector Restraints: Behind-the-Border Trade Barriers*, 39 TEX. INT'L L.J. 625, 637-39 (2004).

427.   *See* discussion *supra* Parts III.A.1, III.B.5.

428.   *See* GATT, *supra* note 423.

429.   *See* SUE ARROWSMITH, GOVERNMENT PROCUREMENT IN THE WTO 304-05 (2003).

430.   *See* discussion *supra* Part II.C.

431.   Article XVI of the GATT by itself does not outlaw subsidies; it must be read in conjunction with Article XXIII, which states that remedies are available whenever "any benefit accruing" to one party under the GATT is being "nullified or impaired" by the action of another party. GATT, *supra* note 423, at art. XXIII. In addition, Articles XVI, VI(3), and VI(6) must be considered. Overall, while not strictly prohibited, subsidies are legally available when those actions would not be considered illegal under the GATT.

432.   Marc Kleiner, *Bananas, Airplanes and the WTO: Prohibited Export Subsidies*, 10 U. MIAMI INT'L & COMP. L. REV. 129, 129 (2002).

IV. CONCLUSION

Despite the fact that more and more public sectors have begun to migrate from proprietary software to OSS, governments find it difficult to legislate an explicit preference for open source software. The policy considerations that inform government decisions are extremely complicated and sometimes interdependent. Although most government attempts to promote the use of OSS derive from the objectives of reducing IT costs and enhancing technological compatibility, there are other complex and important considerations that policymakers should take into account.

The most fundamental argument is that, as a software consumer, a government certainly has more concerns than a business consumer does. The difference between a government user and a business user is that, in lending its support to OSS, the government should take society's long-term interests into account, not merely its own interests as a consumer.

Currently, software compatibility and substantial switching costs are the primary concerns regarding government support of OSS. Nevertheless, OSS provides an alternative for consumers to decrease switching costs and to promote compatibility in the long run. Although open standard may promote software compatibility, OSS has additional policy implications for which open standard falls short. Government adoption of OSS could prevent specific software vendors from monopolizing the software debugging market. Moreover, OSS is better than proprietary software for increasing compatibility and network effects for consumers. Although strong network effects do not imply software market failure, other types of market failure, such as software under-consumption, incompatibility, and the insufficiency of programming education in society, may exist in the software market.[433] These market failures on the whole may, at least to some extent, justify government intervention in the software market through support of OSS. Nonetheless, governments are advised to carefully avoid government failures when intervening in market activities.

---

433. Stefano Comino and Fabio M. Manenti argue there is another type of market failure stemming from consumer information's insufficiency. They believe that social welfare will be increased if governments mandate OSS adoption and provide sufficient information about OSS to consumers. *See* Stefano Comino & Fabio M. Manenti, *Government Policies Supporting Open Source Software for the Mass Market*, 26 REV. INDUS. ORG. 217 (2005).