

**VIRTUAL MARKETS FOR VIRTUAL GOODS:
THE MIRROR IMAGE OF DIGITAL COPYRIGHT?**

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I. INTRODUCTION

A. Information Anarchism and Information Feudalism

It is now well established that the relationship between the Internet and copyright law is problematic. The rise and fall of Napster,¹ its replacement by numerous second- and third-generation file sharing networks,² and conflicts over the technological enforcement of restric-

1. See A&M Records v. Napster, Inc., 239 F.3d 1004 (9th Cir. 2001).

2. A number of these systems are organized specifically to share music or other multimedia files; others are generalized, multi-purpose information distribution systems. Successive

tions on access to and reproduction of works collectively form an ongoing crisis for copyright law.

The fragile and erratic reign of property privileges over digital information goods has been well explained at least since John Perry Barlow's 1994 essay "The Economy of Ideas."³ The ensuing disorder has been the subject of extensive study, debate, and conjecture. The core difficulty remains that it is simply very ambitious to try to limit the distribution of things that anyone can reproduce with perfect fidelity, across great distances, and at little or no cost. While the newly accessible universe of works in digital form presents a tremendous boon to consumers, it strikes right at the heart of the institutions that capitalist societies use to fund the production of culture.

There appear to be two principal schools of thought on digital copyright, both of which were described in Barlow's original essay. The first, which this Article shall call "information anarchism," advocates the abolition (or at least dilution) of copyright on the Internet, and claims that such a move would not seriously affect the production of music and writing. Most information anarchists claim that the death of the copyright system is desirable, inevitable, or both.⁴

examples, some of which have proven vulnerable to lawsuits from the music industry, include Aimster (*In re Aimster*, 334 F.3d 643 (7th Cir. 2003)), AudioGalaxy (see Kennon Ballou, *RIP Audiogalaxy*, KURO5HIN (June 21, 2002), at <http://www.kuro5hin.org/story/2002/6/21/171321/675>), FastTrack (with clients initially including Grokster, KaZaa, and Morpheus), eDonkey2000, Gnutella, Circle, Chord (see Ion Stoica et al., *Chord: A Scalable Peer-To-Peer Lookup Service for Internet Applications*, PROC. 2001 ACM SIGCOMM CONFERENCE 149, available at http://pdos.lcs.mit.edu/papers/chord:sigcomm01/chord_sigcomm.pdf), and Freenet (see I. Clarke et al., *Freenet: A Distributed Anonymous Information Storage and Retrieval System*, 2001 PROC. ICSI WORKSHOP ON DESIGN ISSUES IN ANONYMITY AND UNOBSERVABILITY, available at <http://freenetproject.org/index.php?page=icsi-revised>). The extent to which each network is susceptible to litigation depends upon the degree of centralization in both the network's architecture and the management of its development. See, e.g., Mathias Strasser, *Beyond Napster: How the Law Might Respond to a Changing Internet Architecture*, 28 N. KY. L.J. 660 (2001). The extent to which Internet Service Providers ("ISPs") enforce regulations against these networks depends upon the number of non-infringing uses for their protocols and the extent to which the protocols make the actions of participants visible.

3. See John Perry Barlow, *The Economy of Ideas: A Framework for Rethinking Patents and Copyrights in the Digital Age*, WIRED, Mar. 1994, available at http://www.wired.com/wired/archive/2.03/economy.ideas_pr.html. This is not to say that Barlow was the first to recognize the profound implications of digital technology for copyright law. See, e.g., BENJAMIN KAPLAN, AN UNHURRIED VIEW OF COPYRIGHT 119–25 (1967). The importance of Barlow's contribution was a combination of broad perspective, prescient analysis, and accessibility; his work not only accurately identified many aspects of the problem but also catalyzed significant debate.

4. For some noteworthy examples of these perspectives, see Brian Martin, *Against Intellectual Property*, 21 PHIL. & SOC. ACTION, July–Sept. 1995, at 7, available at <http://www.uow.edu.au/arts/sts/bmartin/pubs/95psa.html>; John Perry Barlow, *The Next Economy of Ideas*, WIRED, Oct. 2000, available at <http://www.wired.com/wired/archive/8.10/download.html>; Courtney Love, *Courtney Love Does the Math*, SALON.COM (June 2000), at <http://dir.salon.com/tech/feature/2000/06/14/love/index.html>; Eben Moglen, *Anarchism Triumphant: Free Software and the Death of Copyright*, FIRSTMONDAY (Aug. 1999), at http://www.firstmonday.dk/issues/issue4_8/moglen. Cf. Stephen Breyer, *The Uneasy*

Barlow's essay also explored the other side of the current debate, through his description of an approach called "crypto bottling." That idea has evolved into Digital Rights Management ("DRM"),⁵ which is widely advocated by publishing industries. DRM seeks to reinstate copyright in the online environment through the use of cryptography and ubiquitous "trusted systems"⁶ to control the use of information in consumers' homes — and most everywhere else.⁷

The most enthusiastic DRM advocates also regularly argue that there is little or no difference between copyright and material property rights.⁸ They state that, due to the nature of networked computers, anything less than an absolute dominion of exclusive rights will provide loopholes enabling the public to abscond with precious digital goods.

At a practical level, attempts to create real-world DRM systems have involved not only the deployment of technologies to prevent the reproduction of digital media objects, but also the expansion of copyright through legislation designed to ensure that DRM is sanctioned

Case for Copyright: A Study of Copyright in Books, Photocopies and Computer Programs, 84 HARV. L. REV. 281 (1970); Mark S. Nadel, *Questioning the Economic Justification for (and thus the Constitutionality of) Copyright Law's Prohibition Against Unauthorized Copying: § 106*, AEI-BROOKINGS JOINT CTR., RELATED PUBL'N 3-1 (Jan. 2003), at <http://www.aei.brookings.org/admin/pdffiles/Nadel.pdf>.

5. Some of its more vocal critics refer to it as "digital restrictions management." See GNU PROJECT, CONFUSING WORDS AND PHRASES THAT ARE WORTH AVOIDING (July 2002), at <http://www.gnu.org/philosophy/words-to-avoid.html#DigitalRightsManagement>. "Technical protection measures" is an approximately equivalent term that is also widely used. These labels are used to refer to a broad family of technologies, linked more by similar goals than by technical details. While this threatens to render the term ambiguous, it appears that if DRM is to be truly effective at making copying hard, it will have to adopt distinctive features. *See infra* Part III.C.2.

6. A "trusted system" is a computer that is sold to a consumer and used to view information, but which remains, on some key level, under the control of information publishers.

7. The literature advocating DRM is extensive. Even though it failed to anticipate the distressed nature of digital copyright, a frequently cited early work is PAUL GOLDSTEIN, *COPYRIGHT'S HIGHWAY: FROM GUTENBERG TO THE CELESTIAL JUKEBOX* 163–85 (1994). Stefk has presented a more thorough overview of many aspects of the DRM project, along with a normative argument in favor of it. *See* Mark Stefk, *Shifting The Possible: How Trusted Systems and Digital Property Rights Challenge Us To Rethink Digital Publishing*, 12 BERKELEY TECH. L.J. 137 (1997) (proposing a DRM architecture based on trusted systems); Mark Stefk & Alex Silverman, *The Bit and the Pendulum: Balancing the Interests of Stakeholders in Digital Publishing*, 18 AM. PROGRAMMER 18 (1997) (arguing that DRM will be adopted if, and only if, it makes both information producers and consumers better off compared to some *ex ante* baseline).

8. Representatives of copyright trade associations, who claim that copyright infringement is "theft" or "stealing," repeatedly assert or imply this claim, but it also has some defenders within academia. *See, e.g.*, Frank H. Easterbrook, *Cyberspace versus Property Law?*, 4 TEX. REV. L. & POL. 103 (1999); Edmund W. Kitch, *Elementary and Persistent Errors in the Economic Analysis of Intellectual Property*, 53 VAND. L. REV. 1727 (2000). From economic and ethical perspectives, this argument is potentially confusing because material objects are affected by property rights in ways that are sharply distinct from the effect of copyrights or patents on non-rivalrous cultural and inventive goods.

and reinforced by law.⁹ Critics of DRM claim that it is part of a larger political program that threatens to create a dystopian society of “information feudalism.”¹⁰

Fears about overbroad copyright protection and the negative consequences of DRM — whether subtle or dystopian — have combined with the allure of an unfettered cornucopia of digital knowledge to quicken the information anarchist movement. This movement raises its own troubling questions. Would a world without copyright not drive writers and artists further into penury? Would it not hamper the production of great cinema?

There has been no shortage of radical, grassroots suggestions attempting to answer these concerns and suggest ways that authors might make money in such a world.¹¹ Information anarchism has had

9. See, e.g., 17 U.S.C. § 1201 (2004); World Intellectual Property Organization: Copyright Treaty, Dec. 20, 1996, arts. 11–12; Council Directive 2001/29/EEC 2001 O.J. (L 167) 10; Australian Copyright Amendment (Digital Agenda) Act 2000, Schedule 1, Division 2A.

10. See, e.g., Martin Kretschmer, *Feudalism, Retreat or Revolution?*, 2001 PROC. SYMP. ON A NEW FEUDALISM OF IDEAS, available at <http://www.cippm.org.uk/pdfs/martin.pdf> (emphasizing the “feudalistic” aspects of modern copyright); Peter Drahos, Information Feudalism in the Information Society, THE INFO. SOC’Y (1995), at <http://slash.autonomedia.org/print.pl?sid=02/07/30/2024235>; PETER DRAHOS & JOHN BRAITHWAITE, INFORMATION FEUDALISM: WHO OWNS THE KNOWLEDGE ECONOMY? (2002); Richard M. Stallman, *The Right to Read*, COMM. OF THE ACM, Feb. 1997, at 85, at <http://www.gnu.org/philosophy/right-to-read.html>. Stallman has also famously argued that society is likely to see a “War on Copying” reminiscent of the “War on Drugs.” See Richard M. Stallman, *Free Software and Beyond*, Presentation at Wizards of OS: Operating Systems and Social Systems, Berlin (1999) (on file with author). Within the United States, information feudalist legislative proposals have sparked a number of dystopian critiques. These proposals and criticisms include the SSSCA/CBDTPA (see Jeremy Bowers, The CBDTPA is Immune to (Conventional) Criticism, JERF.ORG (2002), at <http://www.jerf.org/writings/CBDTPA.html>); H.R. 5211, the Berman “peer-to-peer hacking bill” (see Michelle Delio, *The Dark Side of Hacking Bill*, WIRED NEWS (July 27, 2002), at <http://www.wired.com/news/politics/0,1283,54153,00.html>); the INDUCE Act/S. 2560 (see James Grimmelmann, *The LawMeme Reader’s Guide to Ernie Miller’s Guide to the INDUCE Act* (July 14, 2004), at <http://research.yale.edu/lawmeme/modules.php?name=News&file=article&sid=1549>), and state laws based on the Motion Picture Association of America’s original “Model Communications Security Legislation” (see, e.g., Letter from Aaron Swartz to Illinois State Legislators (Apr. 21, 2003), available at <http://www.aaronsw.com/weblog/000901>).

11. For a few examples, see, for example, Ian Clarke, *Fairshare — Rewarding Artists Without Copyright* (Mar. 29, 2001), at <http://freenetproject.org/index.php?page=fairshare>; Breyer, *supra* note 4, at 302–26; John Kelsey & Bruce Schneier, *The Street Performer Protocol and Digital Copyright*, FIRSTMONDAY (June 1999), at http://www.firstmonday.dk/issues/issue4_6/kelsey/; Dianne L. Zimmerman, *Authorship Without Ownership: Reconsidering Incentives in a Digital Age*, 52 DEPAUL L. REV. 1121 (2003) (examining parallels between the Street Performer Protocol (“SPP”) and the economy of print publishing in 19th century Britain); Chris Rasch, *The Wall Street Performer Protocol: Using Software Completion Bonds to Fund Open Source Software Development*, FIRSTMONDAY (June 2001), at http://www.firstmonday.dk/issues/issue6_6/rasch/ (extending Kelsey and Schneier’s proposal to software development); Paul Harrison, *The Rational Street Performer Protocol*, (2002), at <http://www.logarithmic.net/pfh/rspp> (last visited Dec. 3, 2004); POTLATCH PROTOCOL, POTLATCH PROTOCOL DRAFT PROPOSAL 0.1 (2001), at <http://www.potlatch.net/protocol.01.html>; Musiclink, at <http://www.musiclink.com> (last visited Dec. 3, 2004). See

some isolated successes,¹² but the models that information anarchists propose remain largely theoretical and often assume that social norms can be harnessed to prevent information users from free riding.¹³ Unless these models begin to achieve widespread bottom-up success, it is unlikely that policymakers will take the anarchist position seriously.

There has been a fierce, if asymmetrical, struggle between the two polar views of digital copyright. Copyright expansionists have, to a great extent, succeeded in rewriting national and international law books to support their cause,¹⁴ but exclusive rights remain difficult to enforce by either technological or legal means. Info-liberationists, who wish to see the role of copyright reduced, removed or recast — or who simply want to watch their DVDs using free software — have

also Infoanarchy, at <http://www.infoanarchy.org> (last visited Dec. 3, 2004) (an information anarchist news site).

12. One example is Stephen King, who collected over \$700,000 in tips from a few chapters of his book *The Plant*. See Stephen King, *The Plant Income/Expense Report Through 12/31/00* (2001), at http://web.archive.org/20011218022225/www.stephenking.com/PlantNumbers_010101.html. It was widely reported that his experiment had failed, *see King Closure*, N.Y. TIMES, Dec. 1, 2000, at A36, although King himself did not appear to take this point of view. See Stephen King, Comments for 12/04/2000 (2000), at http://web.archive.org/20010124090000/www.stephenking.com/sk_120400.html; Stephen King, The Plant: Getting a Little Goofy (2000), at http://web.archive.org/20010124090000/www.stephenking.com/sk_120400_2.html. For other examples of successful donation, see Rusty Foster, *The Fundraiser Ends, and the Next Stage Begins*, KURO5HIN (June 21, 2002), at <http://www.kuro5hin.org/story/2002/6/21/10533/6651>; History, Blender3d.org, at <http://www.blender3d.org/Foundation/?sub=History> (last visited Dec. 3, 2004); *On the Future of LWN*, LINUX WLY. NEWS (July 26, 2003), at <http://www.lwn.net/Articles/5838>. A recurring factor in all of these cases is that the donations have a strong element of contingency and thus appear to have a great deal in common with the SPP. See also the Google Answers service, which is currently the largest operating example of a Wall Street Performer Protocol-like system. *See Google Answers*, at <http://answers.google.com> (last visited Dec. 3, 2004).

13. This criticism is only partially true of the Street Performer Protocol and its variants, which take significant steps to reduce, if not eliminate, the free-rider problem. For an indication of why SPP variants are unlikely to be economically (Pareto) optimal, at least for non-discrete goods, see RICHARD CORNES & TODD SANDLER, THE THEORY OF EXTERNALITIES, PUBLIC GOODS, AND CLUB GOODS 215–17 (2d ed. 1996) (modeling strategies for Lindahl voting games). Despite such imperfections, the Street Performer Protocol deserves more scholarly attention than it has received to date.

14. For accounts of the process by which intellectual property laws are set, see JESSICA LITMAN, DIGITAL COPYRIGHT (2001); JOHN BRAITHWAITE & PETER DRAHOS, GLOBAL BUSINESS REGULATION ch. 7 (2000); DRAHOS & BRAITHWAITE, *supra* note 10. *See also* James Boyle, *A Politics of Intellectual Property: Environmentalism for the Net?*, 47 DUKE L.J. 87 (1997) (explaining why proprietarian interests have overwhelmed “public interest” perspectives in these contests). Despite the very substantial expansion of copyright in the 1990’s, there have been some important limits to the copyright industries’ legislative and legal victories — deriving both from the need to negotiate developments with the telecommunications and consumer electronics industries, and from the complexities of directing the force of law at widespread behavior by the public. *See infra* note 30.

had little trouble poking holes in deployed DRM systems,¹⁵ and file sharing networks are, for the time being, escaping closure.¹⁶

In the music industry, while effective technical protection measures have proved elusive, the use of direct enforcement and the availability of pay-for-download services have decreased the scope of illegal file sharing. It is not clear, though, whether this trend can go further, or whether it is even permanent¹⁷ — and music sales continue to slowly decline.¹⁸ Paid-download schemes are attracting some users,¹⁹ but profits have yet to become apparent,²⁰ and this relatively small fraction of consumption is unlikely to increase in the face of competition from free alternatives.

The situation in other literary and artistic copyright industries varies. Despite the protestations of the Motion Picture Association of America, the film industry seems relatively safe; while the burning of DVDs might result in peripheral revenue reductions, the cinema is likely a secure institution and the bandwidth requirements needed for sharing films will probably remain exorbitant for some time. In the case of the publishing industry, at some point, the authors and publishers of books will face a crisis that will make the current predication of the major record labels look positively cozy.²¹

Another case of interest is the World Wide Web. Although the web appears to be relatively free of serious copyright difficulties — having evolved almost without copyright at all — one may wonder whether the opposite problem is present. Is copyright failing to provide financial support for precisely that kind of liberal and non-exclusive cultural production? After all, there are many websites which would be of much greater use to the public if only their authors could devote sufficient time to them.

The status quo is a situation of instability. Whatever the real extent and urgency of the threat to the viability of “content industries,”

15. In fact, serious questions remain as to whether secure DRM is a real possibility. See *infra* Part III.C.2.

16. See *Metro-Goldwyn-Mayer Studios, Inc. v. Grokster, Ltd.*, 380 F.3d 1154 (9th Cir. 2004) (holding that the *Betamax* defense is applicable to decentralized file sharing networks).

17. See Alex Veiga, *Report: Illegal Music Downloading Climbs*, ASSOC. PRESS (Jan. 15, 2004), at http://customwire.ap.org/dynamic/stories/M/MUSIC_DOWNLOADING?SITE=MIDTF.

18. See Stan J. Liebowitz, *Will MP3 Downloads Eliminate the Record Industry?: The Evidence So Far*, in ADVANCES IN THE STUDY OF ENTREPRENEURSHIP, INNOVATION AND GROWTH (Gary Libecap ed., 2003).

19. See Tony Smith, *Napster Song Sales Hit 5m*, THE REG. (Feb. 25, 2004), at <http://www.theregister.co.uk/content/6/35777.html> (reporting that through December 2003, Roxio's Napster had 5 million paid downloads while Apple's iTunes Music Store had 25 million).

20. See, e.g., Susie Harwood, *Napster Nets \$15m Relaunch Loss*, NETIMPERATIVE (Feb. 5, 2004), at http://www.netimperative.com/cmn/viewdoc.jsp?cat=all&docid=BEP1_News_0000062055.

21. See *infra* notes 90–92 and accompanying text.

the normative and logical basis of copyright law is seriously inconsistent with the limited and non-uniform reality of copyright as a regulatory mechanism for the Internet. This inconsistency continues to cause a great deal of friction and dispute, wasted resources, and wasted opportunities. The predominant analyses — those of information anarchism and feudalism — appear to be flawed, each failing to satisfactorily address questions about the way that the economy of digital culture *should* be fairly regulated and how such regulation should be implemented.

Against this backdrop, there have been many attempts to take an objective view of the copyright crisis and to find ways out of the present ideological impasse.²² Often efforts of this sort succeed only in emphasizing the intractability of the problem. This seems particularly true of approaches that seek more balanced digital arrangements of the same kinds of exclusive rights that have traditionally constituted literary and artistic property.

B. Virtual Markets for Virtual Goods

In order to find coherent middle ground between information anarchism and information feudalism, it may be necessary to step away from the metaphor of property rights into the territory of “compensation without control,”²³ at least with regards to noncommercial copying. While digital technology is rendering the economics of exclusive rights unstable, it is simultaneously opening dramatic and novel possibilities for alternatives.

This Article explores one such class of alternative compensation system — those which are publicly funded and not dependent on a strong central notion of “property.” These systems would create “virtual markets” to provide incentives for information production in

22. For an early attempt in this direction, see THEODOR H. NELSON, LITERARY MACHINES (1993) (introducing the concept of “transcopyright”). More recent examples include the US National Research Council’s “digital dilemma” report. See COMM. ON INTELLECTUAL PROP. RIGHTS AND THE EMERGING INFOR. INFRASTRUCTURE, THE DIGITAL DILEMMA: INTELLECTUAL PROPERTY IN THE INFORMATION AGE (2000), at http://books.nap.edu/html/digital_dilemma/ (attempting to take an objective view of the crisis). For laudable, but potentially impractical, arguments for DRM systems that respect the flexibility and numerous exceptions of existing copyright systems, see Dan L. Burk & Julie E. Cohen, *Fair Use Infrastructure for Copyright Management Systems*, 15 HARV. J.L. & TECH. 41 (2001); Richard Owens, *Digital Rights Management (DRM): A Look Ahead*, 7 INT'L INTELL. PROP. L. & POL'Y (2001). For claims that copyright laws and copyright norms can evolve to reach a sustainable, balanced equilibrium in digital environments, see, for example, Christopher Jensen, *The More Things Change, the More They Stay the Same: Copyright, Digital Technology, and Social Norms*, 56 STAN. L. REV. 531 (2003); Henning Wiese, *The Justification of the Copyright System in the Digital Age*, 24 EUR. INTELL. PROP. REV. 387 (2002).

23. Although this Article develops the idea differently, the terminology is Professor Lessig's. See LAWRENCE LESSIG, THE FUTURE OF IDEAS: THE FATE OF COMMONS IN A CONNECTED WORLD 201 (2001).

much the same way that an actual marketplace provides incentives for the manufacture of physical goods.²⁴ At the same time, they would allow universal noncommercial access to information goods, avoiding the deadweight loss and high overheads of DRM exclusion systems. For convenience, this Article adopts the acronym “VMRS” to refer to virtual market reward/remuneration systems.

By virtue of their technical architecture, these virtual markets could be decentralized, efficient, and in some sense democratic²⁵ — the very qualities of successfully operating markets, which lead so many observers to favor them. Within the proposal, there is a crucial role for government, specifically the use of taxation to solve the underlying free-rider problem. On the other hand, the design of the system ensures that the government has little or no control over the way that these funds are distributed. That role is given to the end-users and cyber-citizenry who pay for and should benefit from the scheme.

The idea developed in this Article is not entirely unprecedented. Part II discusses some of the antecedents, in theory and practice, for the model proposed here. These include the recent and growing literature on alternative compensation systems, to which this Article belongs,²⁶ as well as older explorations of rewards as alternatives to patents,²⁷ and the more limited semi-centralized remuneration schemes that currently form a part of some countries’ copyright systems — private copying levies²⁸ and lending rights for public libraries.²⁹

Historically, there have been many practical limitations on the operation of publicly funded remuneration mechanisms. This stems chiefly from the need to decide who gets how much from the system.

24. The choice of the term “virtual” is discussed further below. *See infra* Part II.B.

25. Whether and how markets are actually democratic is a complicated question and is as much a matter of definition and context as it is a matter of fact. Clearly, there are differences in the way that these institutions aggregate preferences. *See, e.g.*, GEOFFREY BRENNAN & ALAN HAMLIN, DEMOCRATIC DEVICES AND DESIRES 82–84 (2000). The market may disenfranchise more participants than the ballot box and give disproportionate power to fortunate individuals, but it can also provide a greater channel for the expression of the intensity of preferences. *See id.*

26. *See infra* note 47. The novel contributions that this Article has endeavored to add include an emphasis on technological solutions for allocating funding, the structure of an economic comparison between DRM and decentralized “alternative compensation systems,” and further examination of the numerous requirements and implications of public funding as an alternative to exclusive rights.

27. *See infra* Part II.A.1.

28. *See infra* notes 49–51 and accompanying text.

29. *See infra* note 48 and accompanying text. Conceptually, the humble public library, in particular, may suggest a starting point for an efficient and non-obvious model for the infrastructure of a mature information economy. The noble, egalitarian, and highly effective principles that motivate the creation of libraries — access to as much knowledge and culture as possible, for as many people as possible — might also make very prudent cornerstones for Internet regulation. In many countries, public lending rights schemes reward authors and publishers for (sometimes reluctantly) making libraries possible in the first place. The same principle is a key motivation for this article.

Part II.B describes how cheap and ubiquitous computing devices could be used to overcome this problem by collecting enough information, with enough fidelity, to make possible the transformation of copyright marketplaces into reward-based “virtual” marketplaces.

Part III attempts a normative comparison of virtual markets and DRM as alternative institutions for preventing free-riding and financing cultural production. In Parts III.A and III.B, the literature on the economic analysis of copyright is briefly reviewed, and consideration is given to particular problems of modeling digital copyright. This Article shows that there are a number of important factors that limit analytic comparisons, but identify future strategies for creating detailed models to circumvent these problems. Part III.C then presents a structured, semi-analytic argument that weighs the various economic factors that may favor DRM or VMRS — and demonstrates that there are some very strong reasons for the adoption of virtual markets.

Part IV surveys some of the issues that would likely arise if an attempt were made to implement a virtual market. Part V concludes by addressing some common outstanding responses to the idea of virtual markets, and by commenting on the political circumstances that might make them plausible.

The methodology of this Article is deliberately multi-disciplinary. The normative position it advocates has been motivated by an examination of the problem of digital copyright using a combination of computer science and economic reasoning. Consideration of the existing structure of copyright law is used both for comparative purposes and for constructing policy proposals in terms that are as incremental as possible.

II. REWARD SYSTEMS

A. Rewards and Information Production

Copyright, patent, and related *sui generis* regimes operate primarily on the basis of exclusive rights. These are privileges that society grants to the creators of a work (or the corporation to whom they assign them). These rights convey the legal power to forbid people from doing certain things with that work. Commerce has its ways and means, and these powers are often used to demand payment in exchange for access or usage, rather than to prevent such acts completely.

Exclusive rights also lie at the heart of the digital copyright crisis, because the Internet, with its combination of decentralization, reproductive symmetry, and near-universal coverage has made the task of enforcing such privileges nearly impossible. When enforcement is possible, it requires costly infrastructure and direct enforcement of

copyright law against the public at large, as opposed to enforcement against commercial “pirates.”³⁰ Instead of simply adding a few extra dollars in royalties to the cost of a book or a record, copyright can now cause massive friction for information economies and serious inconveniences for individual information users.

One significant alternative to exclusive rights for information producers is a system of rewards, whereby authors, artists, or inventors are paid from the public purse for the services they have rendered to society. Such an idea might seem quaintly anachronistic to modern sensibility, but it may take on particular importance if society concludes that there is something fundamentally dysfunctional about exclusive rights enforced by DRM.

The efficacy of rewards depends greatly, however, on the nature of the information produced and on the organization of the reward mechanism.

1. Rewards for Inventions

The concept of granting rewards as incentives for the production of information goods is not new; it has been discussed as an alternative to exclusive patent rights for centuries.³¹ In 1660, a utopian essay (probably written by the prominent scientist and patent skeptic Robert Hooke³²) described in some detail a fantastic society which benefited enormously from organizing public rewards for valuable inventions.³³ The idea was not purely utopian: MacLeod gives examples of inventions for which retrospective rewards were provided,³⁴ while Wright

30. For discussions of the implications of this state of affairs, see, for example, Jane C. Ginsburg, *Can Copyright Become User-Friendly?: Review of Jessica Litman, Digital Copyright*, 25 COLUM.-VLA J.L. & ARTS 71 (2002) Richard M. Stallman, *Reevaluating Copyright: The Public Must Prevail*, 75 OR. L. REV. 291 (1996), LITMAN, *supra* note 14. The fact that ordinary people perform mass copyright infringement as frequently as professional “pirates,” combined with the fact that copyright enforcement requires regulation of the private sphere, has also been the root cause of some of the entertainment industry’s defeats in the courts. See *Metro-Goldwyn-Mayer Studios, Inc. v. Grokster, Ltd.*, 380 F.3d 1154 (9th Cir. 2004) (holding that existing copyright statutes do not grant rights holders the power to shut down or regulate decentralized file sharing networks with substantial non-infringing uses, even though many individuals use those networks to infringe copyright); *RIAA v. Verizon Internet Servs., Inc.*, 351 F.3d 1229, 1233 (D.C. Cir. 2003) (holding that the “notice and takedown” provisions in 17 U.S.C. § 512 do not require ISPs to disclose the identity of their subscribers in cases where they simply act as a conduit for end-to-end protocols).

31. See CHRISTINE MACLEOD, *INVENTING THE INDUSTRIAL REVOLUTION: THE ENGLISH PATENT SYSTEM, 1660–1800* ch. 10 (1988) (a historical treatment of ideas about both patents and reward-based alternatives in England before 1800).

32. Robert Hooke (1635–1703) is remembered today for discovering the Newtonian mechanics of springs, for his observation that plants were made from microscopic structures, which he termed “cells,” and for significant inventive contributions to microscopy, telescropy, clockwork, and mechanical engineering.

33. See MACLEOD, *supra* note 31, at 191. It was constructed as an extension of Francis Bacon’s earlier utopia, *New Atlantis*, and credited to “R.H. Esquire.”

34. *Id.* at 191–93.

points out two significant inventions which were prompted by “bounty” rewards.³⁵ Robert Macfie, a British MP and free trade advocate, agitated for an organized reward infrastructure during the mid-to-late 19th century,³⁶ but an inconstant zeitgeist defeated the schemes of Macfie and his supporters.³⁷

During the Second World War, Michael Polanyi, who it appears was aware of the free trade movement’s antipathy toward patents (but not Macfie’s work on developing alternatives), constructed a more extensive version of the argument for rewards.³⁸ Since then, economic analyses addressing the question have periodically concluded that the case for the patent system is not clear, and that either publicly contracted research or taxation-funded systems to reward inventors might well be more efficient.³⁹

A notable example of a large-scale reward infrastructure was the Soviet Union’s system of granting “inventors’ certificates.” The example is hardly inspirational, but the weaknesses of research and innovation in the U.S.S.R. stemmed from such profound problems of industrial disorganization that few conclusions can be drawn about the effectiveness (or otherwise) of rewards as alternatives to patents.⁴⁰

There is little doubt that the most significant difficulty with industrial rewards is the need to index them to the value of inventions. The extent to which an invention is adopted provides significant hints to

35. See Brian D. Wright, *The Economics of Invention Incentives: Patents, Prizes and Research Contracts*, 73 AM. ECON. REV. 691, 744 & n.15 (1983). See also Michael Abramowitz, *Perfecting Patent Prizes*, 56 VAND. L. REV. 115, 120 n.15 (2003), for further sources and commentary on the historical use of rewards.

36. See, e.g., ROBERT MACFIE, RECENT DISCUSSIONS ON THE ABOLITION OF PATENTS FOR INVENTIONS IN THE UNITED KINGDOM, FRANCE, GERMANY AND THE NETHERLANDS 84–87 (1869).

37. Machlup and Penrose provided an excellent account of the historical context for Macfie’s arguments. See Fritz Machlup & Edith Penrose, *The Patent Controversy in the Nineteenth Century*, 10 J. ECON. HIST. 1 (1950).

38. See Michael Polanyi, *Patent Reform*, 11 REV. ECON. STUD. 61 (1944).

39. See Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECON. & SOC. FACTORS (1962) (discussing the desirability of having governments employ contractors to perform research and development); Abramowitz, *supra* note 35 (surveying, critiquing and synthesizing recent proposals); Steve P. Calandriello, *An Economic Analysis of Intellectual Property Rights: Justifications and Problems of Exclusive Rights, Incentives to Generate Information, and the Alternative of a Government-Run Reward System*, 9 FORDHAM INTELL. PROP., MEDIA & ENT. L.J. 301 (1998) (arguing for the superiority of rewards over both patents and copyright); Michael Kremer, *Patent Buyouts: A Mechanism for Encouraging Innovation*, 113 Q.J. ECON. 1137 (1998) (describing a more exotic scheme in which governments purchase patents for the public domain using an auction-based information revelation system); Steven Shavell & Tanguy van Ypersele, *Rewards versus Intellectual Property Rights*, 44 J.L. & ECON. 525 (2001) (comparing rewards, patents, and a mixed regime); Wright, *supra* note 35 (comparing patents, rewards and contracts).

40. See, e.g., Veronika Kabalina & Simon Clarke, *Innovation in Post-Soviet Industrial Enterprises*, in PROC. 6TH WORLD CONFERENCE OF THE ICCEES (2000), available at <http://www.warwick.ac.uk/fac/soc/complabstuds/russia/Innopap.doc>; LOREN R. GRAHAM, SCIENCE IN RUSSIA AND THE SOVIET UNION: A SHORT HISTORY 179–80 (1993).

its value, but such information may be difficult to collect. Even if complete demand curves for relevant items can somehow be measured, the magnitude of the utility provided by each use remains unknown because saleable products usually comprise much more than a single invention.⁴¹

Consequently, although the literature considering the real-world practicality of rewards for inventions appears inadequate,⁴² it is probable that their greatest drawback is simply a lack of information revelation. Unless a government has sufficient information to couple rewards to the social value of inventions, R&D incentives might be skewed and suboptimal. Any successful patent-replacing reward infrastructure must have at its heart a robust mechanism for identifying the value of information.

2. Rewards for Writing and Other Copyright Works

Even in democratic capitalist societies, suggestions that it might be desirable to replace patents with publicly funded alternatives have been relatively persistent. In contrast, copyright skeptics have historically been less enthusiastic in recommending that copyright be replaced with a system of public funding.⁴³

The likely explanation for this distinction is that the perceived losses to society as a result of patent monopolies were much higher than those caused by copyright monopolies. Two interconnected reasons that present themselves are the functional nature of patentable inventions⁴⁴ and the relative strength of patent rights.⁴⁵ Furthermore, the visible example of rewards for authors in communist states was intimately linked with a highly objectionable system of censorship, on

41. Cf. Patrick Croskey, *Institutional Utilitarianism and Intellectual Property*, 68 CHI.-KENT L. REV. 631, 639–40 (1993) (criticizing Polanyi's proposal as one that raises informational difficulties). But cf. Shavell & van Ypersele, *supra* note 39, at 541–42 (expressing optimism that *ex post* sales information in the hands of a government could be as effective as the *ex ante* information that inventors possess).

42. It is possible that there is interesting material in Russian. My personal communication with several investigators who have searched for it has suggested that there was a lack of high-quality introspective examination of the Soviet industrial R&D system.

43. *But see infra* note 123 (citing two examples of 20th century discussion of this issue).

44. The impact of functionality on debates about monopoly incentives and reward systems for particular kinds of information goods can be seen clearly in light of the inclusion of software, which is predominantly functional, in the copyright system. Note the influence of the Free Software Foundation and their early argument that a "software tax" could be used to fund code. See Free Software Foundation, *The GNU Manifesto* (1985), at <http://www.gnu.org/gnu manifesto.html>.

45. Following the analysis of Drahos, see PETER DRAHOS, *A PHILOSOPHY OF INTELLECTUAL PROPERTY* ch. 6 (1996), patent protection is "exclusive," prohibiting the reimplementation of an idea. Copyright, in contrast, is "preventative," and covers only a particular expression of the idea. The presence of the idea/expression dichotomy, combined with fair use and other territorial limitations and exceptions, substantially reduces copyright's limitation on creative activity.

one hand, and state patronage of ideologically acceptable writers on the other.⁴⁶

The near-consensus in favor of exclusive rights for authors has begun to weaken with the advent of digital networks. The prospect of universal, scarcity-free access to much of humanity's knowledge and culture has inspired a growing number of claims that government funding might become desirable.⁴⁷

Public reward systems do in fact operate today with copyrightable subject matter, but they serve as an *addition* to those exclusive rights rather than a *replacement* for them. Examples of these kinds of additional rewards are the coincidental incentives that universities provide (including the prospect of progression in an academic career) or the various literary awards that can make up a significant fraction of a writer's income. It is, however, implausible to suggest that either of these institutions could be expanded to finance an entire information economy.

Perhaps of more interest are two further examples of copyright-oriented reward systems. These are institutions that constitute a part of

46. See SERGE L. LEVITSKY, INTRODUCTION TO SOVIET COPYRIGHT LAW (1964); Dietrich A. Loeber, "Socialist" Features of Soviet Copyright Law, 23 COLUM. J. TRANSNAT'L L. 297 (1984).

47. The development of this idea can be seen in proposals to extend levy-based compulsory or blanket licenses for private copying to widespread private (including peer-to-peer) digital copying. See Richard M. Stallman, *The Right Way to Tax DAT*, WIRED (July/Aug. 1992), available at <http://www.gnu.org/philosophy/dat.html>; Brendan M. Schulman, *The Song Heard 'Round the World: The Copyright Implications of MP3s and the Future of Digital Music*, 12 HARV. J.L. & TECH. 590, 628–30 (1999) (arguing for compulsory licenses to facilitate the use of works in digital contexts); William W. Fisher, III, *Digital Music: Problems and Possibilities*, in PROC. A FREE INFORMATION ECOLOGY IN THE DIGITAL ENV'T CONF. § IV 2 (2000), available at http://www.law.harvard.edu/Academic_Affairs/coursepages/tfisher/Music.html (arguing that taxation-based blanket licenses would be preferable to the status quo); Glynn S. Lunney, *The Death of Copyright: Digital Technology, Private Copying, and the Digital Millennium Copyright Act*, 87 VA. L. REV. 813, 911–18 (2001); Raymond Shih Ray Ku, *The Creative Destruction of Copyright: Napster and the New Economics of Digital Technology*, 69 U. CHI. L. REV. 263, 311–22 (2002). Libraries and public lending rights have also been an inspiration. See Joshua H. Foley, *Enter the Library: Creating a Digital Lending Right*, 16 CONN. J. INT'L L. 369 (2001); David H. Rothman, *Information Access for All*, COMPUTERWORLD (July 6, 1992), at <http://www.teleread.org/computerworld.htm>. Not all of the proposals work from precedents in existing copyright systems. See Calandrillo, *supra* note 39 (advocating government funded rewards funded by income taxation, as replacements for both copyright and patents); Stallman, *supra* note 44 (advocating a tax on computers, allocated by both users and government, to fund software production); Shavell & van Ypersele, *supra* note 39, at 541–42 (mentioning the possibility of copyright-replacing rewards based on usage measurement surveys).

A few authors have been developing detailed proposals for taxation-funded blanket licenses contemporaneously with my own work. See James Love, *Artists Want to be Paid: The Blur/Banff Proposal* (2002), at http://www.nsu.newschool.edu/blur/blur02/user_love.html; Neil W. Netanel, *Impose a Noncommercial Use Levy to Allow Free Peer-to-Peer File Sharing*, 17 HARV. J.L. & TECH. 1 (2003); WILLIAM W. FISHER, III, PROMISES TO KEEP: TECHNOLOGY, LAW, AND THE FUTURE OF ENTERTAINMENT 199–258 (2004) [hereinafter PROMISES TO KEEP]. Comparative references are included at some of the relevant points in this Article.

many countries' copyright systems, and suggest ways that rewards could be used to replace or redefine digital copyright, at least as far as the consumer sphere is concerned. They are the "public lending rights" ("PLRs") that operate in public libraries and the statutory licenses that create levy-based "private copying schemes."

PLR systems are perhaps closest to a complete reward system, allowing users access to large bodies of works through libraries without direct payment. Their nature and legal status varies widely by jurisdiction.⁴⁸ Generally speaking they involve observing the books borrowed from a representative sample of libraries, and then allocating rewards to authors in proportion to the frequency of loans of their writings.

Statutory licensing regimes primarily address the private copying of music or video. Acknowledging the impracticalities (and in some countries, the unconstitutionality) of attempting to enforce copyright inside people's homes,⁴⁹ these systems compensate rights holders using the proceeds of levies on various devices and blank media. They were conceived as a way of addressing reproduction that simply could not be prevented. In the light of the emergence of DRM, the European Union — home to most of the world's private copying schemes — has been exploring plans to phase levies out.⁵⁰ In the meantime, without legislative adjustments, it is assumed that they do not apply to the semi-public acts of copying due to file-sharing networks.⁵¹

48. See Silke von Lewinski, *Public Lending Right: A General and Comparative Survey of the Existing Systems in Law and Practise*, 154 REVUE INTERNATIONALE DU DROIT D'AUTEUR 3 (1992). Aspects of variation include the inclusion of works other than books, the kinds of libraries that are covered, the sampling techniques used to determine borrowing frequency, the way that payments are divided between authors and publishers, whether the schemes are legally a part of the copyright system, and the extent to which they are open to foreign authors.

49. See, e.g., GILLIAN DAVIES & MICHELE E. HUNG, MUSIC AND VIDEO PRIVATE COPYING: AN INTERNATIONAL SURVEY OF THE PROBLEM AND THE LAW (1993); Katerina Gaita & Andrew F. Christie, Principle or Compromise?: Understanding the Original Thinking Behind Statutory Licence and Levy Schemes for Private Copying, Intellectual Property Research Institute of Australia (Working Paper No. 04-04, May 2004), available at <http://www.law.unimelb.edu.au/ipria/publications/workingpapers/IPRIA%20WP%2004.04.pdf> (discussing the nature, scope, and origins of analogue private copying schemes).

50. See P. BERNT HUGENHOLTZ ET AL., THE FUTURE OF LEVIES IN A DIGITAL ENVIRONMENT: FINAL REPORT ch. 6 (2003), at <http://www.ivir.nl/publications/other/DRM&levies-report.pdf> (considering how the EU might implement its stated goal of phasing out private copying levies in the era of DRM). There are a number of reasons why these systems were politically unpopular in cyberspace. Many rights holders and advocates of strong exclusive rights fear that levies legitimize activities which have the potential to replace large segments of the original market for information goods. Some artists and users see the limitations of collecting societies as problematic (particularly because they have only been able to employ indirect estimates of which works are copied privately, because users lack any input into the system, and because underground/alternative markets may escape consideration). Unpopularity amongst users is further exacerbated by the perception that levies are a tax that goes directly to publishing companies (this may, partially, be a problem of perceptions).

51. *Id.* at 41. The law in Canada appears to be following a different trajectory. See Copyright Bd. of Can., *Tariff of Levies to Be Collected by CPCC in 2003 and 2004 on the Sale, in*

It is likely that such localized reward systems have been adopted more widely for writing than for inventions because it is easier to obtain some usable estimation of the (market) value of a book or a record than it is for an arbitrary invention. Public lending rights and private copying schemes suggest that it is possible to create general-purpose mechanisms to remunerate authors, artists, and publishers in contexts where exclusive rights are inefficient, undesirable, or impossible to enforce. In addition, digital technology may provide more effective means for ensuring that the rewards from these systems are fairly distributed according to the social value of each work.

*B. Decentralized Compensation Systems:
Constructing “Virtual Markets”*

How might a reward mechanism be constructed specifically for digital information goods? Placing the standards of copyright aside, imagine a tax-paying Internet user — suppose her name is Alice⁵² — who wishes to use digital music and writing⁵³ in an unrestricted fashion. How should Alice’s society reward the creation of the works that Alice values?

One option would be to count how often Alice downloads different works. The government could organize a basic server infrastructure⁵⁴ and distribute rewards in proportion to popularity of content. Although simple, such a system suffers from the drawback that it cannot determine how much people actually like the different works they access. For example, if Alice downloads two songs, listens to the first, and then deletes it, but listens to the second song every day, the two artists would receive the same reward. It is also limited to works that are downloaded directly, rather than distributed on home-recorded media.⁵⁵

Canada, of Blank Audio Recording Media, CAN. GAZETTE PART I (SUPP.), Dec. 13, 2003, at 20–21, available at <http://www.cb-cda.gc.ca/tariffs/certified/c13122003-b.pdf> (Dec. 13, 2003) (determining that downloading a file from a peer-to-peer network is legal, provided the destination medium for the copy is covered by the scheme and the copy is for the personal use of the downloader); BMG Can. Inc. v. John Doe, [2004] A.C.W.S.J. 4957 (dictum) (stating that until Canada implements the WIPO Copyright Treaty, making files available on a P2P network would not attract secondary “authorization” liability).

52. Sincere apologies are due to both Lewis Carroll and the cryptographic research community (who have a fictitious Alice in the regular employ of their own thought experiments).

53. By “writing,” this Article refers not only to linear texts, which might be made available through the Internet, but also to websites which have significant informational or literary value and which require significant funding to sustain them.

54. The government would not necessarily need to serve the downloads themselves — just provide digital certificates for the content and collect authentication information from the users.

55. In the long term, high-bandwidth connectivity will make physical media increasingly redundant. In the short term, CDs and DVDs will continue to be integral in the distribution

The relative merits of different works might be more accurately observed by asking the public to vote. By giving Alice a certain number of votes (say 100 per month), she could express her preferences in a more accurate fashion. If she has read a novel which is particularly disappointing, she might not reward it at all, or she might give it only a symbolic vote or two. On the other hand, when a novel is extraordinary, she might give it all 100 votes or an ongoing reward each time she re-reads it. However, the disadvantage of regular voting is the effort it involves — continually rating numerous snippets of authorship and artistry could be a chore that many people are inclined to avoid.

Neither counting downloads nor collecting votes is a particularly elegant solution. Alice might find a hybrid solution more efficacious. The arrangement would ultimately be a voting system, but with special software and infrastructure to make accurate voting easy and reduce the impact of non-participation.

To illustrate this idea, imagine that Alice intends to download a few new songs for her collection. Because she has not voted for the past month, her download client pops up with a notice mentioning that she should do so.

Alice now has three choices. She could refuse to vote completely (in which case her downloads alone would be counted).⁵⁶ She could spend the time to vote carefully, considering which works had been of the most value to her recently. Finally, she could allow her computer to suggest a vote.

In this last case, the software and devices she uses to read, listen to, and watch information goods have been collecting statistics on her recent preferences — which songs she has picked out of her playlist, which e-books she has spent hours poring over, and so on. Instead of shipping this information straight off to the virtual market, it is simply handed to Alice on a digital platter. If she wishes, she only has to vote to reward the particular musicians and writers who have been contributing to her life.⁵⁷

If Alice's computer has a representative record of her relative usage of different works, one might ask why it does not automatically report that information to the virtual market. This architecture would certainly be possible, though it would present a number of difficulties. First, direct usage metering might not provide any better information than a voting system because users who were determined to reward

of both legal and copyright-infringing information. To a large extent, the nature of this traffic will be inferable from the combination of download statistics with blank media sales.

56. Downloads might be assigned less weight than explicit votes by users to reflect their lower degree of interest in information production and to provide an incentive for voting. The economic effects of this policy are considered below. See *infra* Part III.C.5.

57. And of course, she does not have to accept this suggested vote at face value — she can simply use it as a starting point for a customized selection.

something other than that which they actually consumed could, for example, easily leave a song playing on repeat with the volume turned down. Second, individuals who, for whatever reason, were uneasy with any form of monitoring of their private actions, even pseudonymous monitoring, would have a clear motivation to interfere with the metering system. A system that treats Alice with respect by giving her the explicit choice between convenient automation and alternatives she could have achieved on her own is more likely to earn her respect in return.

The Article refers to this mechanism as a “virtual market,” not simply because it is a “market” which happens to operate on the Internet. Rather, it is “virtual” in a stronger sense of the word — a sort of “market through the looking-glass.”⁵⁸ Despite the involvement of public funding, the rewards and incentives which flow from VMRS are very similar to those which would result from the exchange of goods and currency in a marketplace, although the exchanges in the virtual version do not occur directly.⁵⁹ And, while there is a centralized governmental authority that collects taxes and distributes royalties, the determination of which information goods should be produced remains a result of the decentralized, privately-held knowledge and preferences spread throughout society.

1. Network Security

It is absolutely essential that any VMRS infrastructure be robust in the face of software-based attacks on client systems. If this were not the case, then worms, viruses, trojan horses, and direct computer security breaches that affect Alice’s computer could all grant the perpetrators control over hard financial resources. Although it would be difficult for crackers to collect such funds anonymously, the risk is still too great to allow.

The virtual market’s security architecture would also be responsible for preventing “ballot stuffing.” No artist or any other individual should be able to skew the operation of the system by downloading

58. The *Shorter Oxford English Dictionary* provides the following definitions (among others) for the word “virtual”: “so in essence or effect although not formally, actually, or by strict definition as such” and the “apparent . . . image resulting from the effect of reflection . . . upon rays of light.”

59. The virtual market model may thus be able to evade a common objection to publicly funded authorship: that since it is not “market-based,” it hands control of publishing to the state. See, e.g., GILLIAN DAVIES, *COPYRIGHT AND THE PUBLIC INTEREST* 256–62 (2002); Shira Perlmutter, *Convergence and the Future of Copyright*, 24 COLUM.-VLA J.L. & ARTS 163 (2001); cf. Wendy J. Gordon, *Asymmetric Market Failure and Prisoner’s Dilemma in Intellectual Property*, 17 U. DAYTON L. REV. 853, 868–869 (1992) (reaching related conclusions on the advantages of market-based, over judicially administered, licensing systems); Robert P. Merges, *Compulsory Licensing vs. the Three “Golden Oldies”: Property Rights, Contracts, and Markets*, POL’Y ANALYSIS, Jan. 15, 2004, at 4, available at <http://www.cato.org/pubs/pas/pa508.pdf>.

thousands of copies of a song or by voting over and over again for the same website. Security could be achieved by authenticating the identity of the user whenever a download or vote is made, and then by normalizing the information recorded so that no individual could have more than a certain, limited effect on the system as a whole.

Fortunately, the task of confirming that Alice has in fact downloaded or voted for a particular piece of music or writing can be performed by cheap, digitally secure hardware.⁶⁰ A simple device⁶¹ to perform this task might be comprised of:

- a microcontroller with an embedded private key⁶² to create digital signatures,
- a symmetric cipher implementation to provide a secure communications channel,⁶³
- a small liquid crystal display “LCD” to show the name of a creative work and its author,
- a “confirm” button, and
- a connection to a PC (this could be any standard data connection, such as a serial or USB port).

Whenever Alice wants to download or vote for material in the VMRS, she would need to confirm that the transaction presented on the LCD was correct.⁶⁴ The device could then sign the details, creat-

60. The hardware would be secure against remote interference, as opposed to secure against physical tampering. Achieving the former is relatively feasible if the device is simple; achieving the latter is an extremely difficult problem. See *infra* Part III.C.2.

61. One might be tempted to call it a “dongle”: it does have some properties in common with the gadgets employed in the 1980’s as software copy protection devices. On the other hand, its purpose is the exact opposite, and it does not suffer from the same classes of categorical insecurity. Perhaps “antidongle” would be more appropriate.

62. Private keys form a part of asymmetric cryptosystems, which can provide both secure digital signatures and public key encryption (secure message “envelopes”). In this case, the private key is a unique secret stored in each device, while the public key is kept on record with the virtual market administration. Anyone possessing the public key can confirm that a message signature was produced by the (secret) private key; possession of the public key also allows the creation of messages which only the private key can decipher. Suitable algorithms might include those introduced by ElGamal, or a special signature scheme with additional privacy-preserving properties. See Taher ElGamal, *A Public Key Cryptosystem and a Signature Scheme Based on Discrete Logarithms*, 31 IEEE TRANSACTIONS INFO. THEORY 469 (1985); see also *infra* note 256 and accompanying text.

63. A symmetric cipher allows two parties who share a common secret key to send messages which only the other can read. If a large volume of data needs to be exchanged, symmetric ciphers have the advantage that they are much faster than public key methods. A good choice might be AES/Rijandel since it is efficient when used in minimalist hardware. See Computer Sec. Res. Ctr., Cryptographic Toolkit (2001) at <http://csrc.nist.gov/CryptoToolkit/aes/>.

64. The device thus defends against the class of attacks discussed by Howard Gobioff. See Howard Gobioff et. al., *Smart Cards in Hostile Environments*, PROC. OF THE 2D USENIX WORKSHOP ON ELECTRONIC COM. (Nov. 1996), at http://www-2.cs.cmu.edu/~hgobioff/papers/usenix_ecommerce_96.ps.

ing an unforgeable receipt to be passed into the virtual market.⁶⁵ The cost of producing such a device in volume would likely be at most a few dollars and would not place a troublesome burden upon an information economy.

Some users might be willing to pay for extra features such as wireless networking or a more sophisticated user interface for adjusting their votes. These could be added to more expensive voting devices without compromising the security of the system.

If a VMRS were using secure hardware of this form, its systems would not be an easy target for cybercrime. Instead of being able to collect rewards from millions of consumers by writing a carefully constructed virus, each incidence of fraud would require the attacker to physically interfere with a piece of hardware. As a result, the cost of attempting to subvert a VMRS at the network level becomes much higher than the potential rewards.

2. Human Security

In addition to the precondition that the VMRS network be resistant to electronic attack, it is also particularly important to guarantee that there are no systematic incentives for consumers to trick the virtual market. If votes can be exchanged for direct material assistance, if they are in practice fungible with cash, then they lose their particular social purpose, which is to facilitate the production of public goods. Incentives to “cash in” votes would at the very least reduce the quality of the information in the virtual market and at worst render the whole system infeasible.

Straightforward examples of this are Alice voting for herself or pre-arranged voting in small cliques.⁶⁶ Alice and her family might vote for her sister Delilah, who has created a fake artist’s account. Some forms of clique voting may be automatically preventable with-

65. Astute readers may observe that, although secure authentication hardware can guarantee that Alice must have approved each important transaction, an attacker with control of Alice’s PC might subtly alter the information provided for approval in the first place. Such mischief could be detected relatively quickly, either by vigilant users, or through the employment of networks of “honeypots”—computers which pretend to be participating in the virtual market but which actually serve to identify assailants and analyze their behavior. See generally LANCE SPITZNER, HONEYPOTS: TRACKING HACKERS ch. 3 (2003) (describing the history and definition of honeypots).

Detection would make attempts to collect large illicit payments from the virtual market rather risky. And, honeypots analysis would, on a statistical basis, allow most of the misreporting of usage rates to be corrected. While having to take such measures would be inconvenient, they would prevent the possibility of vote-stealing leading to a widespread misallocation of funds.

66. This Article uses the word “clique” here in its ordinary English sense. Formally, the situation of concern is a smallish group of voters (less than a few hundred), whose votes flow exclusively, or almost exclusively, to other members of the clique.

out necessarily compromising pseudonymity.⁶⁷ The family plot to channel votes to Delilah could be foiled by a requirement that artists receive support from a significant number of users before being eligible for remuneration. That way, the family votes will only help Delilah if many other people are also voting for her.

A related and perhaps more serious fraud risk is the deliberate transferal of identity. In this situation, Alice could “rent” her voting power to an artist (or a network of conspirators) in exchange for cash. This at first seems like a serious threat because if it occurs with the consent of all parties it will be almost impossible to detect; however, there may be a simple and efficacious mechanism for preventing identity rental. The key is to make the agreements upon which trades are based very difficult to enforce — in this case, by making it costly to verify that Alice’s vote has in fact been cast for a particular person.⁶⁸ If votes are independently unverifiable, then one would have to actually keep the seller’s secure voting hardware (the simple device described in the previous section) in order to reliably buy votes.⁶⁹

So another risk to consider is that Alice might sell her voting hardware. She would only do this if the price she is offered exceeds the costs of making the sale (which include lost opportunities, risks, and side effects). To begin with, she might choose to sell because an artist could offer her half of the present value of her future votes, which would easily outweigh the small risk of being caught. The balance could be shifted, though, if the card had a dual purpose which gives it a direct value to the holder. It might function as a credit or debit card, a public transport card, or a link to some other valuable

67. Pseudonymity here refers to the fact that although different votes made by the same person can be linked together, they cannot be linked to that individual. In this case, pseudonymity applies to all the ordinary users of the system, but not to performers who actually collect money from it (since these are the people who are actually able to vote for themselves or each other). This corresponds with Froomkin’s definition of the term. See A. Michael Froomkin, *Anonymity and Its Ennities*, J. ONLINE L. art. 4, ¶ 31 (1995), at http://www.wm.edu/law/publications/jol/95_96/froomkin.html. If this privacy cannot be compromised, a case can be made for describing it as “anonymity with persistent nym.” See Roger Clarke, Identified, Anonymous and Pseudonymous Transactions: The Spectrum of Choice § 3.6 (April 30, 1999), at <http://www.anu.edu.au/people/Roger.Clarke/DV/UIPP99.html>.

68. Accounting information, telling artists about the number of votes they have received, forms a channel. See Claude E. Shannon, *A Mathematical Theory of Communication*, 27 BELL SYS. TECHNICAL J. 379 (1948), available at <http://cm.bell-labs.com/cm/ms/what/shannonday/shannon1948.pdf>. The problem of determining the verifiability of particular votes, as function of the granularity of users’ choices, the number of other votes being received by the same work or artist, and any quantization and noise introduced by the VMRS, is deserving of a brief article in itself. There probably exist ways of making verifiability unprofitable, though there might be some tradeoffs against the ideal degree of specificity in the rewards which artists receive.

69. If Alice kept the hardware, she could take cash from the conspiracy while continuing to reward her favorite artists.

service.⁷⁰ If the costs associated with losing this gadget were greater than the financial benefits of selling it, Alice would be wise to keep it.

It is inevitable that some people will attempt to find ways to exploit an alternative compensation system. By making the barriers to entry high, it can be ensured that such attempts are not widespread. And by making attempted exploits both risky and unreliable, it can be ensured that business-minded criminals will find easier ways to make money — perhaps by turning to art.

3. Funding Virtual Markets

The reader may by now be willing to believe in Alice, but it would certainly stretch her credulity to insist on the existence of Wonderland — it is relatively easy to give money away, but first one must obtain it from somewhere. Where there is public funding, one usually finds a private taxpayer. With taxation, the question “on whom, and how much?” must be answered because it plays a central role in determining the economic properties (and political fashionability) of any policy endeavor. In the case at hand, a related and equally central question is how to set the total level of funding for the entire virtual market. The interaction between these two variables (on whom and how much in total) is itself variable: different flavors of taxation place different constraints on the level of funding for the entire VMRS.

There are a wide range of taxation models available for funding a virtual copyright mechanism. One important criterion for choosing among them is the degree to which the amount that consumers pay in a tax-based system approximates the amount they would have spent on relevant information goods had a non-tax-based system been employed. The intuitive fairness of the virtual market depends, to a large extent, on this proportionality. In addition, one should give weight to a number of other considerations. Charging more to those with greater ability to pay, as well as adopting a tax formula that is easy to enforce and difficult to sidestep, will improve both normative fairness and utilitarian efficiency. Tradeoffs must be made between these three criteria.

The most straightforward solution is to raise levies on goods and services that are directly complimentary with the consumption of digital culture. This is the approach used in existing private copying systems,⁷¹ and has been advocated for use in alternative compensation

70. Although these proposed solutions are inter-institutional, they may be beneficial to both institutions by providing secure, pseudonymous authentication in an elegant and efficient manner. It might also be desirable to have the devices perform both pseudonymous and identifying authentications for different applications, using separate keys.

71. See, e.g., Copyright Bd. of Can., *supra* note 51 (setting levy rates on cassettes, recordable CDs, and memory in dedicated MP3 players); AUSTL’N COPYRIGHT COUNCIL, REMUNERATION FOR PRIVATE COPYING IN AUSTRALIA: A DISCUSSION PAPER, 9–10 (Sept.

schemes.⁷² The obvious candidates for these levies include Internet connectivity; bandwidth; blank storage media (recordable CDs, DVDs, and perhaps even hard disks); specialized devices for watching, listening to, or reading digital culture; and/or computers in general.⁷³

The chief drawback with these sources of revenue is that they are only imperfect proxies for the underlying consumption of the information goods in question. Taxing a whole class of activities or gadgets, some members of which do not implicate copyright in the first place, amounts to a cross-subsidy to those that do infringe. Beyond a certain point, such cross-subsidization seems unfair, and it may, even at small rates, cause distortionary economic side effects.⁷⁴ To illustrate: taxing blank storage devices and media discourages backups.⁷⁵ Taxing bandwidth usage would encourage people to switch to less data-intensive activities: listening to music rather than watching a film, or from downloading songs to downloading books. Taxing MP3 players and e-books too heavily would encourage the use of general-purpose computers in their place; taxing computers avoids that problem but may lead to others if it means that some people would delay upgrading their machines and choose to suffer with an old, slow computer.⁷⁶

2001), at <http://www.copyright.org.au/PDF/Articles/PrivCopDiscPprAV.pdf> (tabulating the kinds of levies used in national private copying schemes).

72. See, e.g., Netanel, *supra* note 47, at 43–44.

73. One immediate concern that could be raised about these levies is that the computer and consumer electronics industry firms whose products are affected will necessarily constitute an insurmountable political obstacle. This argument is fallacious because the increased availability of digital works will cause a corresponding increase in demand for these goods. It is possible that an alternative compensation system could increase sales on the levied items.

74. Taxation is said to be “distortionary” when it causes shifts between the production and consumption of one kind of good and another, causing divergence from the “natural state” of a free market. Distortions are usually expected to decrease social welfare, unless they act to correct “externalities” (side effects of actions, such as the pollution caused by driving a car) or to redistribute wealth in a way that decreases inequality.

75. Blank media taxes might also, theoretically, affect those who use such media for their own artistic creation. But because the cost of digital media is a small component of the cost of creative activity, this effect is unlikely to be substantial.

76. This would be a serious problem if those affected included businesses, because the particular information goods provided by the virtual market would not be of much use to businesses. See *infra* Part II.B.5 for further explanation. It might be possible to avoid charging levies on computers purchased by firms, depending on the ease with which individuals could avoid taxes by identifying themselves as businesses. If this discrimination is not possible, but a levy on computers was still considered desirable, there are several possible solutions. One would simply be to reduce the income tax rate paid by corporations to compensate. Another would be to allocate a proportionate slice of the levy revenue to providing public goods which increase the value of computers to businesses, such as setting Internet standards, automating bureaucratic interactions with government, or preventing malicious “black-hat” computer crime.

Alternatively, virtual markets could be funded solely by general revenue sources, such as progressive income taxation.⁷⁷ Although there are distortionary effects involved in income taxation, these may be balanced by potential redistributive welfare improvements.⁷⁸

One argument against the use of general revenue sources is that, in order to support the creation of digital culture, there is a redistribution of resources from taxpayers who do not use the Internet for cultural consumption to those that do. Although this will occur, it is not necessarily problematic. Incentives to produce digital writing and music will (almost always) result in great numbers of cheaper works in tangible form. If a progressive form of taxation is employed, the demographics which pay disproportionate taxes are precisely those in that Internet usage is most pervasive.⁷⁹ The point may nonetheless be moot if it is possible to ensure that the progressive tax is only paid by those with Internet access.

An income tax used to fund artistic production could simultaneously be constructed as a surcharge on internet connectivity. This could be done directly, by having the tax agency calculate a surcharge on each Internet connection, or indirectly, by offering a tax credit or reduction to citizens who do not have Internet connections. It would have many of the merits of both progressive and levy-based funding models.

Another way to achieve progressive levies on Internet access would be to introduce a surcharge on residential Internet access that is proportional to the valuation of the property to which the connection is made. This structure has the benefit of being less distortionary than an income-dependent levy,⁸⁰ although in the United States it would be

77. Taxation is said to be “progressive” when the rate of taxation is higher for wealthier individuals. Fisher, for example, advocates this kind of revenue source. See PROMISES TO KEEP, *supra* note 47, at 214–15 (settling on income taxation as the most desirable, if not the most politically feasible, way to raise revenue for an alternative compensation system).

78. Shavell and van Ypersele initially advocated income taxation as the most efficient way of funding a reward system to replace patents. They also observed that the use of intellectual property privileges to fund the creation of information goods carries its own distortionary consequences; during peer review, they relaxed those claims. Compare Steven Shavell & Tanguy van Ypersele, Rewards versus Intellectual Property Rights 29 (1999), available at <http://www.law.nyu.edu/ili/conferences/freeinfo2000/confpapers/Shavell.pdf>, with Shavell & van Ypersele, *supra* note 39, at 544. They also cite Kaplow’s optimistic results on the efficiency of funding public-good production through income taxation, although the application of those results to copyright works is not straightforward. See Louis Kaplow, *The Optimal Supply of Public Goods and the Distortionary Cost of Taxation*, 49 NAT’L TAX J. 513 (1996); cf. *infra* Part III.C.4.

79. See, e.g., George Scialdas, *Unveiling the Digital Divide*, STATIS CAN. (Oct. 2002), at <http://www.statcan.ca/english/research/56F0004MIE/56F0004MIE2002007.pdf>; U.S. DEP’T OF COMMERCE, A NATION ONLINE: HOW AMERICANS ARE EXPANDING THEIR USE OF THE INTERNET 11 (Oct. 2002) (examining statistics on the correlation between income and Internet access), at <http://www.ntia.doc.gov/ntiahome/dn/anationonline2.pdf>.

80. See *infra* note 208 and accompanying text. The author would like to thank Jamie Love for suggesting this solution to the problem of distortions in labor supply.

politically impractical for historical reasons.⁸¹ The other hurdle for these particular levies is the difficulty of associating wireless Internet connections with physical residences; were it not for the possibility that wireless networks will become a primary component of Internet access infrastructure, the Author would advocate this mechanism as the best revenue source for virtual markets. As it stands, property value levies might be practical only once Internet connectivity is effectively universal — since at that point, the levy could be charged on all occupied residential properties, and not solely on those with network connections.

Having chosen the form that taxation will take, it is necessary to determine the rate at which it is levied. Those rates are indirectly determinative of the total funding pool for the virtual market — and thus of the amount which each artist receives from the system. Needless to say, getting this right is both important and difficult.⁸²

Fisher has emphasized that extrapolation from previous sales in the music industry would be invaluable in ensuring a smooth transition from existing systems of cultural distribution.⁸³ The idea is that the amount of tax raised would be adjusted to replace the amount of revenue lost to the industry through file sharing. While helpful in the short term, this approach gives little guidance in the long-run.⁸⁴

There are several more sustainable strategies for setting the tax rates used to fund an alternative compensation system. The simplest is to rely on a governmental or administrative decision-making process in the hope that various interest groups will end up agreeing on a decent compromise. Artists and publishers want higher rates; ISPs and hardware manufacturers want lower rates. Taxpayers want lower rates, unless they are so low that they end up harming the supply of works. While it is possible that the administrative compromise would be reasonable, there would be plenty of room for poor decisions and dissipation of resources through regulatory contests and rent-seeking.

At the other extreme, one might opt for complete decentralization in setting the total tax level: users of the system are informed about the amount that artists are currently earning, they know from experi-

81. See U.S. CONST. art. I, § 2, cl. 3 & § 9, cl. 4. (requiring that direct federal taxes be apportioned among the states according to population); Jeffrey S. Kinsler, *Circuit-Specific Application of the Internal Revenue Code: An Unconstitutional Tax*, 81 DENV. U. L. REV. 113, 120–25 (2003) (finding the origins of the apportionment clause in Southern fears of a disproportionate burden from taxes on land and slaves, and highlighting the enduring constraints on the nature of federal property taxes).

82. Liebowitz illustrates this point powerfully by graphing album revenues over time, although it would be helpful if his graph included a y-intercept and compared this market with likely correlates such as the health of the U.S. economy or sales of complimentary goods. See Stan J. Liebowitz, Alternative Copyright Systems: The Problems with a Compulsory License 16 (Oct. 31, 2003), at <http://www.utdallas.edu/~liebowit/intprop/complpff.pdf>.

83. PROMISES TO KEEP, *supra* note 47, at 212–14.

84. See Liebowitz, *supra* note 82, at 15.

ence the levels of subjectively relevant cultural output, and are then given a regular choice to vote “higher” or “lower” for funding levels. From the perspective of economic theory, this approach appears to be quite effective,⁸⁵ but the task of ensuring that consumers are sufficiently well informed to vote rationally in such a system, and the improbable prospect of governments surrendering control over certain tax rates, makes this possibility more of a theoretical curiosity than a serious policy option.

There is an intermediate option that represents the best combination of political plausibility and economic efficiency. The idea is to establish a statistical picture of the “exchange rate” between willingness to pay and virtual market votes. This exchange rate could be determined by using contingent valuation (“CV”) surveys on relatively small groups of consumers.⁸⁶ They are asked hypothetical questions, such as “at what level would a reduction in VMRS taxes paid be sufficient compensation for the loss of this album,” or “if this particular album was not going to be made available online, how much would you be willing to pay to obtain a copy privately?” When asked under carefully designed circumstances, these questions tend to elicit accurate responses.⁸⁷

Collecting data of this sort not only allows close-to-optimal tax rates to be determined, but it provides an algorithmic test of the consistency of virtual market voting behavior. If the values consumers indicate they are willing to pay in CV surveys are not approximately proportional to the votes those consumers actually make, then it is possible to infer that there are systematic flaws or inconsistencies in the voting process.⁸⁸

The taxation options that could be used to support virtual markets present a spectrum of different choices that will hold different implications in terms of wealth distribution and subsidy effects for various industries. Part III.C.4 examines the tax options a little further in an attempt to identify some of their economic consequences. The com-

85. See *infra* notes 198–202 and accompanying text.

86. Contingent valuation is a method in which public goods are valued based on carefully constructed surveys administered to small focus groups. These surveys usually ask consumers how much they would be willing to pay for the particular good or, conversely, how much they would be willing to accept as minimal compensation for the loss of the good if it already exists. For examples of applications of CV for copyright-related purposes, see Peter Bohm, *Estimating Demand for Public Goods: An Experiment*, 3 EUR. ECON. REV. 111 (1972); David J. Brennan, *Fair Price and Public Goods: A Theory of Value Applied to Retransmission*, 22 INT. REV. L. & ECON. 347 (2002). For an overview of the issues involved in ensuring that CV data is accurate, see Richard T. Carson et al., *Contingent Valuation: Controversies and Evidence*, 19 ENV. & RESOURCE ECON. 173 (2001), available at <http://econ.ucsd.edu/~rcarson/cvconfinal.pdf>.

87. See Carson et al., *supra* note 86, at 179–81.

88. While detecting inconsistencies of this sort would not guarantee that they could be resolved, it would open the possibility of either finding an underlying, addressable problem or statistically correcting for the phenomenon.

mentary here should simply convince the reader that there are a wide range of choices available, that these choices are capable of serving a range of different normative goals, and that particular social and political contexts will play a major role in deciding between them. A completely satisfactory investigation of these issues is beyond the scope of this Article.

4. One Dollar, One Vote?

An additional difference between funding mechanisms is that they can vary in whether and how they enable a link to the distribution of funds to artists from the amount paid by each taxpayer. In other words, some funding models are inherently “one user, one vote,” while others allow a choice between “one dollar, one vote” and “one taxpayer, one vote” allocation formulas.

The simplest approach to administering the funding for a virtual market would be to leave the collection of revenue separate from the process of distribution. Everyone pays their taxes, and then Alice’s vote (or usage, or downloads) determines a reward for each of the artists she likes — rewards the size of which is independent of the amount of tax she herself paid. This is a “one user, one vote” system. Under some circumstances, though, it may be possible to use Alice’s preference to allocate precisely the same amount of cash that she had contributed through taxation.⁸⁹ This is a “one dollar, one vote” approach and would only be feasible for certain kinds of taxes: it would be relatively easy for surcharges on ISP bills, harder for income taxes, and impractically costly for hardware or blank media levies.

“One dollar, one vote” taxation has some advantages and some drawbacks. On some normative accounts, a democratic basis for culture would be particularly desirable, while others might hold that the tastes of well-educated (and hence wealthier) taxpayers are more likely to reach an underlying goal of aesthetic value. Utilitarian analysis would favor weighting by the psychological intensity of demand, a troublesome quantity which might nonetheless be inferred by willingness to part with dollars for complimentary goods⁹⁰ or by indirect means, such as whether individuals make the choice to vote.

89. The author would like to thank Alan Toner for pointing out this possibility and its similarity to 100% tax credits on voluntary donations to media organizations.

90. Purchases of complimentary goods are still less informative than purchases of the actual cultural items in question. This is an economic factor which favors DRM-based copyright. See *infra* text accompanying notes 215–217.

5. Scope: Which Information Markets Could Be Made “Virtual” (and Which Ones Matter)?

This Article pursues the claim that virtual markets might be a normatively superior means for providing incentives for the production of digital writing (either “e-books” or high-quality websites), music, and film. No claims are made on the subject of software copyright because software is economically quite distinct from literary and artistic goods. The problem of evaluating (or proposing alternatives to) exclusive rights in software is separate from the one at hand.

Although this Article examines digital copyright in a broad range of works, the author predicts that the problem — and therefore the value of any solution — will eventually turn out to be most profound for writers. This is not only because the role of writing goes so far beyond “entertainment” (in any sense), but because the crisis of copyright could in time be much more intense for books than it is for music or cinematographic material. To begin, writers rely far more completely on copyright royalties than musicians, who can perform live, or film producers, who are likely to be able to maintain cinema revenues even in the face of intense “napsterization.”⁹¹ Furthermore, the likelihood that DRM will ever work for writing seems much lower than for more complicated information goods.⁹²

At present, the only thing holding off a digital publishing crisis is the fact that electronic devices remain far less convenient for reading than ordinary, printed books.⁹³ The case for virtual markets may be too weak to overcome the inertia of copyright in musical and cinematic works. Once it is possible to curl up in bed with a leather-bound

91. Writers can of course tour lecture circuits (indeed, they often do so in order to encourage sales of their books). But there is little reason to believe that the skills required for great writing are always the same as those required for great oration — or that the size and character of the market for speakers are in any way sufficient to compensate for decreased remuneration for authorship itself.

92. All it would ever take to extract a perfect unencrypted copy of a digital book from a trusted system would be a camera capable of performing Optical Character Recognition (“OCR”) — or alternatively, an enthusiastic typist. Once “liberated,” the book could easily be distributed widely over a peer-to-peer network, including anonymizing networks such as Freenet (*see* Clarke et al., *supra* note 2), which, because of bandwidth overheads, have not proved particularly effective for music. Any hopes of “traitor-tracing” such reproduction back to the original pirate would be hampered by the extreme nature of any durable textual watermark. *See* Mikhail J. Atallah et al., *Natural Language Processing for Information Assurance and Security: An Overview and Implementations*, in PROC. NEW SECURITY PARADIGM WORKSHOP 51 (2000), available at <http://omni.cc.purdue.edu/~vraskin/NSPW-2000.pdf>; Mikhail J. Atallah et al., *Natural Language Watermarking and Tamperproofing*, in PROC. 5TH INT'L WORKSHOP ON INFO. HIDING (2002) (noting that constructing a textual watermark with any degree of durability requires systematic alteration of words and phrases in the document), available at <http://omni.cc.purdue.edu/~vraskin/IHW-2002.pdf>.

93. Many of the distinctions and disanalogies between the impact of digital technology on writing and its impact on other copyright subject matter have been closely examined by Lynch. *See* Clifford Lynch, *The Battle to Define the Future of the Book in the Digital World*, FIRSTMONDAY (June 2001), at http://www.firstmonday.dk/issues/issue6_6/lynch/.

book filled with re-writeable digital paper, however, the need for alternative compensation systems may rapidly become unavoidable.⁹⁴

Importantly, the reader should also note that the claims made in this Article are limited to the desirability of virtual markets for the distribution of digital works to individual consumers. They exclude business and commercial usage because voting mechanisms are particularly connected to the kind of private valuation that is applicable to cultural information goods.

In more theoretical terms, there are two major constraints on the kinds of information goods to which virtual markets could most easily be applied. One constraint relates to the ability of the voting mechanism to extract accurate information about the social value of the work; the other relates to the ability of the VMRS to allocate a fair reward to each person who has contributed to its creation.

The suggestion that virtual markets are most desirable for creative works — the market for which is comprised of individuals, rather than businesses or other organizations — relates to the “accurate information” constraint. The arguments presented in Part II.B.6 about individuals’ incentives to provide correct information are based upon the direct connection between appreciation and a user’s vote. It is not so clear that there is an efficient way to link value and the reporting of that value at an organizational level. Another factor that makes alternative compensation systems more effective for consumer rather than commercial works, relates to the relatively small range of expected prices for these goods. As discussed below, this improves the information that VMRS provides about the value of goods and increases the system’s economic efficiency.⁹⁵

The other constraint on the application of virtual markets results from their interactions with the production of information goods. VMRS is well-suited for digital music, writing, and even film because these works tend to be “monolithic.” That is, the good is made from components which are for the most part free-standing, and the good is created once, rather than undergoing a continuous process of maintenance and development. These properties are important because they make the task of allocating credit generally feasible.⁹⁶

Information goods that are not monolithic — such as software — can present intractable problems for VMRS because the task of re-

94. Significant progress has already been made towards the development of these technologies. See Ruth Wilson, *Displaying Digital Information on Paper-like Devices* (Jan. 2003) (surveying existing and forecasted “digital paper” technologies), at http://www.jisc.ac.uk/uploaded_documents/tsw_03_01.pdf.

95. See *infra* Part III.C.5.c.

96. As an admittedly anecdotal example, Dr. Jim Parker, the U.K. Public Lending Rights Commissioner, stated in a September 2001 talk to the British Literary and Artistic Copyright Association that he was aware of only one intractable dispute between co-authors as to how rewards from a public lending right should be split.

warding authors collides with issues of industrial organization.⁹⁷ To see why this might occur, imagine Alice attempting to choose which software has been of greatest use to her (so that she can vote for it). Perhaps she has found her brand-new 3-D web browser to be particularly helpful, so she gives it lots of votes. On the other hand, it may turn out that the 3-D web interface was a relatively straightforward piece of code to write, because most of the work had already been done in developing libraries for sophisticated 3-D graphics, providing network functionality, and for handling web-related protocols and file formats. Although it appears to Alice that the user-interface-level application is providing numerous useful features, the actual work has been done by many separate components. In addition, each of these software sub-structures may have been written by many different contributors. The virtual market lacks sufficient information to determine where the reward should go.

In a marketplace of proprietary software,⁹⁸ a complex web of contracts, negotiated between software production firms with various levels of market power, acts to define the relative remuneration received by different contributing firms. Compensation for individual programmers is in turn defined by their employment contracts. This market structure can be criticized on the grounds that it interferes with the most efficient ways of writing code,⁹⁹ and because its answer to the credit allocation problem is heavily colored by the effect of monopoly

97. Once an information work becomes an organic, living entity rather than a once-off creation, "peer production" will frequently become the optimal way of organizing its development. For a discussion of the economic conditions which lead to peer production, see Yochai Benkler, *Coase's Penguin, or, Linux and the Nature of the Firm*, 112 YALE L.J. 369 (2002).

The author would like to thank the members of the informal intellectual property and information economics discussion group at Melbourne University (especially Gavin Baker, Alan Blair, Rose Chan, Andrew Clausen, Suelette Dreyfus, Paul Harrison, Toby Ord, and Matt Pattison) who helped determine, through extensive Gedankenexperiments, that arbitrary cultures of peer production are not easily combined with effective virtual market reward structures.

98. Proprietary software is typically characterized by a number of properties. It is usually developed within a single firm by employees who assign their rights, either by default or through work-for-hire contracts, to their employer. The firm carries all of the development risk and reaps all of the returns. Source code is normally protected as a trade secret, while executable object code is distributed to customers. Exclusive rights from copyright (and sometimes patent) law provide courses of action against unauthorized reproduction. The proprietary software development process presents high-to-insurmountable barriers to outside contributions.

99. For critiques of the proprietary software production model, which are widely cited among programmers, see Richard M. Stallman, Why Software Should Be Free (1992), at <http://www.gnu.org/philosophy/shouldbefree.html>; Eric S. Raymond, *On Management and the Maginot Line*, in THE CATHEDRAL AND THE BAZAAR (2000), available at <http://www.tuxedo.org/esr/writings/cathedral-bazaar/cathedral-bazaar/x340.html>. For theoretical work which attempts to explain when open or closed development is efficient, see Benkler, *supra* note 97.

privileges.¹⁰⁰ Still, at least it has an answer; free and open source software development models, which escape many of proprietary software's weaknesses, skip the task of financially significant credit allocation altogether. In order for virtual markets to include software, they would have to find some way to mimic the proprietary web of contracts, without also importing the associated web of constraints. This is an open problem.

Similar credit allocation puzzles may arise for some forms of digital music and writing that are non-monolithic. For example, the development of general reference works, textbooks, collage art, and the compilation of sample libraries from which others produce music all display the same tensions between freedom for efficient production and the need to identify fair levels of remuneration. These cases, however, are the exception rather than the rule.¹⁰¹ And even here, the magnitude of the problem pales by comparison with that of rewarding contributors to large, heterogeneous software projects.¹⁰²

6. The Role of Social Norms

Why should users participate in a VMRS? Surely it would be quicker and easier not to worry about voting, to download files by whatever means was easiest, and to save time by not rewarding the files' creators. This Article nonetheless argues that there are reasons why this is not a serious problem for VMRS systems.

First, the process of voting participation can be made easy through user interface design, and the incentive to bypass voting can be minimized. As previous sections have suggested,¹⁰³ a virtual market could automatically track downloads and usage with a minimum of labor.

Provided that there are no barriers to participation, there is actually a direct and unambiguous incentive to allocate one's votes in accordance with one's preferences. If you read a book by an interesting writer, but fail to give her votes for her troubles, then it is less likely that she will write other books. Even if she does publish again, it is

100. This may be a result of poorly architected intellectual property regimes for software. For a serious normative treatment of those design issues, see generally Pamela Samuelson et al., *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 COLUM. L. REV. 2308 (1994).

101. If this were not the case, then transaction costs and strategic behavior associated with the exclusive right of derivation would present a significant problem for the operation of copyright law. This Article leaves to the reader the question of whether the inclusion of software in the scope of copyright poses any such problem.

102. The Linux kernel is a paradigmatic example; as of version 2.4.17, there were over 200 significant contributors credited. Deciding the value of their relative contributions fairly, and without interfering in the culture of Free Software development, is prohibitively complicated.

103. See *supra* text accompanying notes 56–64.

likely to take longer, because she will have to support herself by other means. Enthusiastic following and support for authors and artists is widespread, even in the absence of direct incentives.

There would nonetheless be a role for education in encouraging public-spirited participation in a VMRS. One can easily imagine cultures in which rewards would be allocated “correctly,” in the sense of voter honesty, and cultures in which they would not be.¹⁰⁴ This educative task is far less daunting than the idea of convincing teenagers to respect DRM, because a VMRS removes the need to “condition away” the free rider problem.¹⁰⁵ While self-interest might dictate that many consumers should avoid or attempt to neutralize technologies which prevent them from copying files between computers, there are no serious reasons for individuals to avoid participating in virtual markets.

III. AN ECONOMIC COMPARISON OF VIRTUAL MARKETS AND DIGITAL RIGHTS MANAGEMENT

Having proposed a fairly detailed alternative to rigid copyright, a question follows naturally — “is a virtual market really a good idea?” This section attempts to answer this question by comparing the economic properties of VMRS and DRM as two alternative sets of institutions for funding cultural production. The problem is intricate, and many details of the comparison deserve research projects in their own right. Indeed, this section can only reach the minimum depth necessary to address the matter, and any analytic approach must be limited by the absence of real-world experience in building alternative compensation systems. However, pending practical experimentation or more extensive research, and with some important caveats, one can reach a cautious expectation that public funding schemes are capable of funding cultural production more harmoniously than DRM.

104. Many similar problems have been faced in the field of CV, where surveys are employed to value public (usually environmental) goods. Although there are important differences, such as the role of passive use and the fact that CV is used for centralized decision making rather than decentralized allocations, the extensive research on the applicability of CV suggests that if citizens are given appropriate information about the role of their contributions, they will provide high-quality information on the value of public goods. See Carson et al., *supra* note 86, at 179–81.

105. There have been regular claims that education will be critical to the success of technologically enforced copyright. See, e.g., INFOR. INFRASTRUCTURE TASK FORCE, INTELLECTUAL PROPERTY AND THE NATIONAL INFORMATION INFRASTRUCTURE: THE REPORT OF THE WORKING GROUP ON INTELLECTUAL PROPERTY RIGHTS 201–10 (1995), at <http://www.uspto.gov/web/offices/com/doc/ipnii/ipnii.pdf>; *Education Programs Needed to Combat Consumer Piracy, Experts Say*, 2 WORLD E-COM. & IP REP. 25 (2002); Oliver R. Goodenough, *The Future of Intellectual Property: Broadening the Sense of “Ought,”* 24 EUR. INTELL. PROP. REV. 291 (2002) (providing a more exaggerated development of this notion, which goes so far as to suggest that neuroscience may have a role in conditioning people to obey copyright law).

Part III.A makes some general observations about the economic nature of information goods such as digital music and writing. Part III.B then examines the approaches available for comparing VMRS and DRM and discusses some of the conclusions that can be drawn from existing literature on each approach. Although these methodologies solve some pieces of the puzzle, it seems that is no simple economic model can be elegantly constructed to shed substantial light on the desirability of virtual markets — there are simply too many facets to the problem.¹⁰⁶ Instead, Part III.C provides a structured argument from utilitarian ethics¹⁰⁷ to show that it is very likely that, in the real world, a virtual market could be more efficient than a “real” marketplace built out of digital locks.

A. General Observations on the Economics of Copyright

1. Information as a Public Good

In economic theory, a good is said to be a “public good” when it possesses two properties — it is non-rivalrous and non-excludable. Non-rivalrous goods are those that each member of a community can enjoy without detracting from the enjoyment of others. A non-excludable good is such that once it has been created and given to the public, everyone in the community benefits. A public good is said to be “pure” when it possesses these properties unambiguously; impure public goods, which are slightly rivalrous or are not easily excludable, are much more common than pure public goods.

Historically, writing and music were impure public goods for most intents and purposes. More specifically, the authorship of writing and music creates a pure public good, but the physical objects (for example, books, records, etc.) which embody them are composite entities. A book contains both a public information good (authorship)

106. Part III.B.3 suggests a route by which rather more complicated models might be constructed to realistically evaluate the impact of copyright (or alternatives) on an information society.

107. By “utilitarian,” the Article refers to a progressive interpretation of the Benthamite notion of “the greatest good for the greatest number” — or maximizing some notional sum of fulfillment over the entire population. Note that, when prudently applied, consequentialist utilitarianism should not discard the peculiarities of human nature, the subtleties of social issues, or the importance of justice (as opposed to exclusively material welfare). This point frees utilitarianism from many of the weaknesses of its neoliberal economic interpretation. For example, the Article does not follow the distinction drawn between “utilitarianism” and “social planning theory” by Fisher. See William W. Fisher, *Theories of Intellectual Property, in NEW ESSAYS IN THE LEGAL & POL. THEORY OF PROP.* 168 (S. Munzer ed., 2001). Rather than being differences in normative ethics, these two approaches represent different ways of estimating the same quantities.

Utilitarianism is not a perfect moral philosophy, and the Author would not consider himself a utilitarian. However, no other ethical calculus has established the same degree of legitimacy when examining the public policy questions faced by democratic societies.

and a private physical good (paper, ink, and distribution). As the digital distribution of music and writing has become more practical, the “impurity” of physical structure has become increasingly optional, moving the economic logic of copyright closer to that of pure public goods.

Economic models suggest that in most cases, a free market will not produce adequate quantities of public goods, because at Nash equilibrium¹⁰⁸ individuals will “free ride” on the public goods created by the rest of society.¹⁰⁹ Even though society might be better off with a greater level of the public good, there is no way to simultaneously persuade everyone to contribute to it.

There are various responses to this predicament. One is to raise taxes and appoint a government to choose which public goods should be provided. The difficulty here is identifying the desirable levels of different public goods, and fashioning a suitable taxation system to collect the necessary funding.

Another response to the free rider problem is to attempt to remove the natural non-excludability of the public good. Property rights can then be created to facilitate a marketplace solution. Copyright law is a perfect example of such a strategy.

2. Measuring the Economic Efficiency of Copyright Law

There are two main costs associated with attempting to solve the free rider problem by creating excludability.

The first is the direct cost of the exclusion mechanism. In the context of historical copyright, this cost was quite low. It comprised the cost of policing the relevant laws (e.g., court cases, copyright management, and the creation of collecting societies) that have traditionally been small compared to the overall value of information goods to society. However, this Article argues below that the pure public good nature of digital information means that these costs will be much higher in a DRM system.¹¹⁰

The second cost is the indirect cost of exclusion. This cost results from giving producers a monopoly on access to the public goods they have created. Economists term this a “deadweight loss”¹¹¹ — the loss

108. “Nash equilibrium” is a state in which all actors are pursuing their own self-interest in the face of similar strategies from others. See CORNES & SANDLER, *supra* note 13, at 26.

109. It may be more accurate to use the term “easy riding,” because Nash equilibrium contributions are often low but non-zero. See Richard Cornes & Todd Sandler, *Easy Riders, Joint Production, and Public Goods*, 94 ECON. J. 580 (1984).

110. See *infra* Part III.C.2.

111. In analytical terms, this deadweight loss is the integral of the demand curve between marginal cost and the price at which the vendor chooses to sell. In economic theory, any cost to society which could be relieved without harming anyone may be described as a deadweight loss. The particular sense this Article has described here appears in the literature

to society because some people who could be given the good at the marginal cost of provision¹¹² are denied it because they cannot or will not pay the copyright/monopoly price.¹¹³

The economic analysis of copyright law has generally been concerned with determining whether the legally enforced exclusion of information goods is better than taking no steps to support their production; and if copyright rules are desirable, determining their optimal duration and scope.

Influential historical contributions to this literature include the work of Plant,¹¹⁴ Hurt and Schuchman,¹¹⁵ and Breyer.¹¹⁶ These scholars critiqued natural rights justifications of copyright and argued forcefully instead for a utilitarian evaluation of intellectual property privileges. They concluded that the case for copyright was particularly marginal and that even if copyright should be maintained, its extent should be prudently constrained.¹¹⁷ Stallman has provided a modern extension of these perspectives to the context of digital copyright.¹¹⁸ Although his position remains consequentialist, it has the interesting property of being couched in terms of freedoms (both positive and negative) rather than the distribution of economic value.

Only relatively recently did economists begin constructing formal mathematical models to evaluate the desirability of copyright laws. Although some earlier work involving models of the effects of piracy exist, the article by Landes and Posner has generally been acknowledged as laying the foundations for evaluating copyright in terms of neoclassical economics.¹¹⁹ Other authors, such as Koboldt¹²⁰ and Watt,¹²¹ have extended the approach taken by Landes and Posner.

on monopolies, and hence, in the literature on copyright and patent law. To prevent confusion, this Article uses the term solely in this sense.

112. For digital information goods the marginal cost of provision is almost zero.

113. This price is, at least, the average price to recover the cost of producing the public good in the first place, but may be more depending on the structure of the market in question. For further explanation of this point, see *infra* note 152 and accompanying text.

114. Arnold Plant, *The Economic Aspects of Copyright in Books*, 1 ECONOMICA 167 (1934), available at <http://www.compilerpress.atfreeweb.com/Anno%20Plant%20Copyright.htm>.

115. Robert M. Hurt & Robert M. Schuchman, *The Economic Rationale of Copyright*, 56 AM. ECON. REV. 421 (1966), available at <http://www.compilerpress.atfreeweb.com/Anno%20Hurt%20&%20Schuchman%20Econ%20Rationale%20Copyright.htm>.

116. See Breyer, *supra* note 4. For a response to Breyer, see Barry W. Tyerman, *The Economic Rationale for Copyright Protection for Published Books: A Reply to Professor Breyer*, 18 UCLA L. REV. 1100, 1101–02 (1971). But see Stephen Breyer, *Copyright: A Rejoinder*, 20 UCLA L. REV. 75 (1972).

117. See, e.g., Breyer, *supra* note 4, at 322 (citing and concurring with Machlup's earlier conclusions on patent rights — that the evidence is ambiguous as to whether they are beneficial at all, and that uncertainty is the greatest reason for maintaining them). See STAFF OF SENATE COMM. ON THE JUDICIARY, 85TH CONG., AN ECONOMIC REVIEW OF THE PATENT SYSTEM 79–80 (Comm. Print 1958) (authored by Fritz Machlup).

118. Stallman, *supra* note 30.

119. See William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325 (1989).

Ultimately, these studies have concluded that, while there are potentially problematic costs associated with copyright, and while breadth and duration should be carefully constrained, the need to provide authors and artists with incentives for their work creates a persistent need for property rights in writing.¹²² The past literature on the economics of copyright said little about the comparison between the enforced-exclusion model and the alternative of public funding.¹²³

The more recent post-digital literature is only beginning to address this issue. Watt's treatise on the economics of copyright, for example, considers levies briefly in the context of private copying¹²⁴ but rules out public funding on account of the distortionary effects of taxation. Nadel, in the course of an economic critique of digital exclusive rights, points out that public lending rights are an important alternative.¹²⁵

A rigorous comparison of copyright and the alternatives may in a sense be more difficult than evaluating copyright on its own because it requires weighing the overlapping strengths and weaknesses of the two institutions. Relevant recent discussions can be found in articles by Calandrillo¹²⁶ and Ku.¹²⁷ Calandrillo provides a broad comparison of *ex post* income tax funded rewards with the traditional copyright and patent systems.¹²⁸ His paper identifies many of the important issues involved in comparing copyright with rewards (to which this Article will return in Part III.C) but does not attempt to construct a framework within which to weigh them. The article only briefly examines some of the more subtle potential weaknesses of rewards, such as the accuracy of the statistics the government can collect. And although the article touches upon distortions due to taxation,¹²⁹ the actual nature and peculiarities of those distortions are not considered. To a significant extent, these limitations are an inevitable result of considering patents and copyright together in the same inquiry.

120. Christian Koboldt, *Intellectual Property and Optimal Copyright Protection*, 19 J. CULTURAL ECON. 131 (1995).

121. RICHARD WATT, *COPYRIGHT AND ECONOMIC THEORY* (2000).

122. This conclusion is not surprising, since only the most enthusiastic critics of copyright have maintained that the free-rider problem does not discourage desirable forms of authorship; such positions are only tenable amongst commentators who discard the profit-seeking model of information producers which is ubiquitous in economic modeling.

123. Historically, scholars of copyright have occasionally mentioned, and even approved, the possibility of publicly funding creators. See, e.g., Hurt & Schuchman, *supra* note 115, at 424 & 432. But it is unsurprising that the idea was not taken very seriously before the widespread adoption of the Internet, because the case for rewards was at that point much weaker. See, e.g., Breyer, *supra* note 4.

124. See Watt, *supra* note 121, at 132–34.

125. See Nadel, *supra* note 4, at 29–30.

126. Calandrillo, *supra* note 39.

127. Ku, *supra* note 47.

128. Calandrillo, *supra* note 39, at 326–41.

129. *Id.* at 337–38.

Ku argues that, in practice, the primary function of the copyright system has been to provide incentives for publication rather than creation.¹³⁰ In the music industry, for example, it is live performances and merchandising, but not royalties, that reward artists. According to this picture, a record label offers performers publicity, but only in exceptional cases does it pay them money. Ku contends that when the Internet can provide free distribution and “viral” marketing, copyright is essentially irrelevant to musicians because they continue to derive the bulk of their incomes from live performances and merchandising. Finally, if the latent incentives for creation do in practice turn out to be insufficient, they could in the future be augmented by a levy-based statutory license.¹³¹

Although Ku’s logic may be compelling, it does not constitute a generalized claim that public funding is superior to digital copyright. It relies on anecdotal evidence to argue that currently in the music industry copyright serves principally as an incentive for publishers. In order to draw more rigorous conclusions, it is necessary to compare public funding to a realistic DRM system in which disintermediation (artists benefiting from exclusive rights by selling directly to the public) is to some extent possible.

The remainder of this section presents a structured argument that in the context of digital consumer information goods, it is clearly possible for virtual markets to operate more efficiently than DRMs.

B. Models to Compare DRM and Rewards

1. Microeconomic Models with Asymmetrical Information

In some cases it is possible to construct simple economic models that tease out the distinction between operating publicly funded reward systems and using exclusion mechanisms as incentives. Examples include the work of Wright¹³² as well as Shavell and van Ypersele,¹³³ who compare patents and rewards as incentives for invention. A central property of these analyses is the information asymmetry¹³⁴ between potential inventors and government, revealing the relative inefficiencies of imperfect information (in the reward case) and deadweight loss (in the exclusion case).

130. Ku, *supra* note 47, at 305–11.

131. *Id.* at 311–22.

132. See Wright, *supra* note 35.

133. See Shavell & van Ypersele, *supra* note 39.

134. Note that the word “information” has two important and distinct meanings in this Article. One is the relatively straightforward meaning of data stored on computers of various sorts, which might be of value — including “information goods” such as digital music or writing. The other meaning, used here, is drawn from the economics literature to mean information possessed by consumers, producers, governments, or other economic actors, about the value or costs of different actions, goods, and services.

It is not clear, however, that the same asymmetry of information applies in a virtual market. The government is not guessing at the value of an invention; they are inferring it *ex post* from voting or other data. These measurements may have a degree of error to them, determined by the technologies for usage measurement and the social norms surrounding voting. Those errors, however, may not be the most important economic test of an alternative compensation system.

If one were to construct a single-information-good microeconomic model of a virtual market, one would observe that imperfections in the information collection system increase the uncertainty of devoting resources to authorship and artistry, but do not necessarily change the *expected* return, because an author may be just as likely to benefit from strange voting cultures as to suffer from them.¹³⁵ It is only when skewed voting patterns become entrenched that social welfare suffers. This mode of failure is, however, unambiguously cultural,¹³⁶ and it is unlikely that microeconomic models of information asymmetry will shed much light on the issue.

In any case, there are other, perhaps more important, questions that remain unanswered by this kind of microeconomic analysis. If all citizens have equal numbers of votes in the VMRS, what effect will this have compared to market-driven cultural production? What are the true costs for the technological infrastructure of both options? Are there perverse incentives or public choice problems involved in the management of either system? How do the redistributive and distortionary properties of taxation affect the desirability of different incentive structures for information economies?

One cannot employ the standard microeconomic technique of decoupling these issues from questions of efficient resource allocation, because on some levels, the comparative economics of virtual markets and exclusive rights are deeply tied to the particular distribution of wealth and preferences in particular societies.¹³⁷ In other cases, the analysis needs to consider explicitly technical factors that are not normally included in economic models.

135. See also Abramowitz, *supra* note 35, at 123 (reaching the same conclusion about patent prizes).

136. One could also imagine incentive-compatibility failures in VMRS voting, but as this Article argued in Part II.B.2, these can be addressed in the design of the system.

137. This approach is usually grounded in the fundamental theorems of welfare economics: mathematical results showing that under highly stylized conditions markets always produce Pareto-optimal outcomes, and that any such outcome can be produced by a market with the correct initial distribution of wealth. However, the real-world applicability of these results is quite narrow. See JOSEPH E. STIGLITZ, *WHITHER SOCIALISM?* (1994); ROBIN HAHNEL & MICHAEL ALBERT, *A QUIET REVOLUTION IN WELFARE ECONOMICS* (1990).

2. Theoretical Results in Mechanism Design

The question of how to design institutions and voting systems for the efficient production of public goods is not new to economics. This field is referred to as *mechanism design*.

Whereas models like those discussed in the previous section make direct assumptions about the quality and nature of information available to governments, the mechanism design literature focuses on explicit messages or votes passed from consumers to governments. A resource allocation mechanism specifies how much taxation should be raised from each citizen and how much of the public good should be produced as a function of these messages.

Economists have examined a number of general properties of resource allocation mechanisms:¹³⁸ first, whether they are Pareto optimal;¹³⁹ second, whether they are incentive compatible (resulting in the honest disclosure of necessary information about individuals' preferences, without which goods cannot be produced at optimal levels); and third, whether they satisfy an individual rationality participation constraint (that is, whether all the participants in the mechanism would be involved if they were given a choice about the matter).

Under many circumstances, there is an unavoidable tradeoff between these different properties,¹⁴⁰ and as a result, there is no universal and perfect solution to public good allocation problems. It is thus not possible to simply invoke the mechanism design literature to assess whether virtual markets will perform better than DRM. This comparison must descend into much messier details. Nevertheless, this Article will consider some mechanism design results while examining aspects of the comparison more closely in Part III.C.

3. Agent-Based Computational Economics

An alternative approach which might be applied to modeling the differences between VMRS and DRM is *agent-based computational economics* ("ACE"). Rather than employing analytical mathematics to prove general results from assumptions about general economic sys-

138. For surveys of this literature, see DONALD E. CAMPBELL, RESOURCE ALLOCATION MECHANISMS (1987); CORNES & SANDLER, *supra* note 13, at 113–31.

139. Pareto optimality indicates that no individual can be made better off without causing someone else to be worse off. It is the predominant measure of efficiency used in the economics literature, although it does not address important concerns about the equity of wealth distribution. See, e.g., CORNES & SANDLER, *supra* note 13, at 220.

140. For example, Roberts showed that if participants are well-informed and employ long term strategies, then Pareto optimal resource allocation mechanisms will not produce honest preference disclosure. See John Roberts, *Incentives in Planning Procedures for the Provision of Public Goods*, 46 REV. ECON. STUD. 283 (1979).

tems, ACE uses computers to simulate the behavior of economies of agents, each of which is represented by a computer program.¹⁴¹

Generally speaking, ACE allows practitioners to explore aspects of the behavior of economic systems that are beyond the reach of simple models. Although much of the literature has focused on explaining emergent phenomena, there has also been some interest in exploring the implications of governmental policies on markets.

ACE may be relevant to problems in mechanism design, and particularly the comparison of DRM with alternatives, because it provides tools for analyzing the coupled welfare implications of resource allocation and the distribution of wealth and preferences.

One may claim, for example, that the deadweight loss of DRM is more severe than the distortionary effects of a one-citizen, one-vote virtual market. The truth of this claim is actually dependent upon the particular society about which the claim is made. ACE approaches allow one to explore these questions by hypothesizing different distributions of wealth and preferences and collecting statistics from computer simulations.

Furthermore, when these distributions are cross-referenced against real-world data, it is possible to identify with a degree of certainty how the claims apply to actual societies.

In order to construct an ACE model that elucidates the issues involved in comparing virtual markets to DRM, it would be necessary to specify a number of components. As a foundation, one would need to specify a hypothetical population of individuals with varying amounts of personal wealth.¹⁴² Their tastes for private goods and information goods also need to be described statistically.¹⁴³

The aspect of information markets that is much harder to model is the demand for hypothetical information goods that are collectively endogenous.¹⁴⁴ As an illustration, imagine a textbook on advanced quantum field theory. What is the value of this good to particular consumers? The answer, of course, depends in part on whether they have previously studied books on mathematics and introductory quantum mechanics. The same issue underlies much of the relative valuation of information goods — be they literary, artistic, or purely educational. Appreciation of both ideas and expression depends inherently upon

141. For an overview of the ACE literature, see Leigh Tesfatsion, *Agent-Based Computational Economics: Growing Economies from the Bottom Up*, 8 ARTIFICIAL LIFE 55 (2002).

142. This can be created by a simple statistical model and cross-referenced against real data on wealth distribution.

143. Here the issue of correction against econometric data is more complicated. Preferences for private and information goods, as a function of wealth can be identified from aggregate market statistics or through interviews. Uncertainty in the results can be handled by changing these variables across hypothetical economies.

144. Literally, endogenous means originating from within; in this context, notional demand for a good depends on previous consumption of that good.

the framework of other ideas and experiences into which they are placed.¹⁴⁵

In order to ground the very abstract and indefinite questions of valuation for literary works, a reasonable model might categorize works along broad lines of originality, relevancy, and cultural factors. An ACE analysis would draw heavily on results that are stable across a wide range of these models; these models would also serve as vehicles for collection and application of econometric data to guide and verify the simulation parameters. The models would form the core of a successful application of computational economics against which to compare VMRS and DRM.

Any use of agent-based computational economics is beyond the scope of this Article. The technique seems to present a promising approach to difficult multi-dimensional problems in the economics of copyright. The technique deserves further attention from researchers seeking to obtain simultaneously nuanced and concrete evaluations of the impact of intellectual property policy choices.

C. Economic Factors Affecting the Desirability of Virtual Markets

The preceding sections have demonstrated that attempts to make an accurate, formal and unified comparison between DRM and VMRS are constrained significantly by the difficulty of modeling several complicating factors, which include the role actual wealth and preference distributions play in determining the efficiency of the compensation system;¹⁴⁶ the degree to which different cultural goods are substitutes for each other;¹⁴⁷ the need to explicitly account for differences in the technology involved;¹⁴⁸ and the balance of cultural, rational and transaction cost influences on whether and how one votes in a virtual market.

One way forward is to break the question into parts. It is possible learn a great deal by examining aspects of the comparison separately; this buys thoroughness at the expense of a little more ambiguity in the conclusion. The decomposition used in this Article is as follows:¹⁴⁹

145. See David Throsby, *The Production and Consumption of the Arts: A View of Cultural Economics*, 32 J. ECON. LITERATURE 1 § II (1994). For a review of the psychological literature on the basis of music preferences, see Alexandra Uitdenbogerd & Ron van Schyndel, *A Review of Factors Affecting Music Recommender Services*, in PROC. 3D INT'L CONF. ON MUSIC INFOR. RETRIEVAL (2002), available at <http://ismir2002.ismir.net/proceedings/02-FP07-1.pdf>. For an empirical study illustrating the endogeneity of music preferences in particular, see Morris B. Holbrook & Robert M. Schindler, *Some Exploratory Findings on the Development of Music Tastes*, 16 J. CONSUMER RES. 119 (1989).

146. See *infra* text accompanying notes 158–160.

147. See *infra* notes 151–152.

148. See *infra* Part III.C.2.

149. This arrangement of distinct economic factors cannot claim to be canonical. When attempting to compare sets of hypothetical alternative institutions, differing in myriad intricate ways, there are inevitably divergent formulae for decomposing the important distinc-

- The effect of the artificial scarcity (or “deadweight loss”) caused by exclusive rights.
- The relative cost of the technological infrastructure required for each system to operate.
- The relative size of transaction costs associated with rights clearance and royalty payments.
- The effects of employing taxes or levies to fund cultural production.
- The nature and quality of the information each institution uses — implicitly or explicitly — about the value of each cultural work to reward that work’s creator.

A section is devoted to discussing each of these factors.

1. The Cost of Artificial Scarcity

Once a copyrighted work has been created, a group of people values copies of it enough to cover its marginal cost, but not to the extent that they will purchase the good at the price set by the copyright owner. These lost opportunities for distribution are termed a “dead-weight loss.”¹⁵⁰ It is the principal cost of enforcing scarcity in a good which is otherwise available in abundance. Alternative compensation systems avoid this downside of exclusive rights. The task of this section is to provide some indications of the size of that advantage.

Markets which depend on copyright are in practice constructed from a ubiquitous web of monopolies. While prices are sometimes affected by competition between substitutes,¹⁵¹ the essential character of monopoly pricing perseveres.¹⁵² Deadweight loss is always likely

tions between them. Cases could probably be made for rearranging some of the specific matters discussed in the following sections, but such changes are unlikely to affect the nature of the argument.

150. See *supra* note 111 for a formal microeconomic definition of deadweight loss.

151. Substitutability refers to the fact that consuming one good may reduce the desire for (or the benefit which can be obtained from) another. As others have argued, the extent of substitutability in various information markets is poorly understood, and deserves further empirical research. See, e.g., Julie E. Cohen, *Lochner in Cyberspace: The New Economic Orthodoxy of “Rights Management,”* 97 MICH. L. REV. 462, 520–22 (1998). While some economic models have attempted to capture substitutability for culture, they are, of necessity, heavily stylized. See, e.g., Sherwin Rosen, *The Economics of Superstars*, 71 AM. ECON. REV. 845, 847–48 (1981).

152. This is a subtle point. To understand the situation completely, it is necessary to realize that there are two levels at which competition can occur in information markets. There is competition amongst information creators to produce novel ideas and modes of expression first (since the reputational and market share benefits of marketing these first can be large). Then there is competition in the distribution of particular expressive works, where copyright creates a monopoly. This is the monopoly which is partially overcome by substitution, but reputation effects and artists’ varied talents combine to seriously constrain substitutability in many cases.

to be present, although to varying extents and with varying degrees of significance. There is evidence that artificial scarcity effects a very significant reduction in the distribution of music.¹⁵³ In the longer term deadweight loss for some kinds of writing could be even higher. Since writing is perhaps the most important tool for education and knowledge distribution, the exclusion of written works creates huge costs, particularly in developing nations.¹⁵⁴

Many advocates of strong copyright rules argue that deadweight losses are overcome by price discrimination,¹⁵⁵ some even argue that they do not really exist.¹⁵⁶ The idea is that publishers have an incentive to minimize deadweight loss by producing cheap versions of their works to capture the demand at the bottom end of the market. The price discrimination theory is thoroughly critiqued elsewhere,¹⁵⁷ but this Article provides a brief treatment of some of the issues here.

One potential disadvantage of market structures involving price discrimination is that those with high demand who might have had the good more cheaply are forced to pay more for it, thereby reducing consumer surplus.¹⁵⁸ Another is that some kinds of versioning will involve deliberate degradation of the good in order to (negatively) differentiate the cheaper version.

The monopoly effects created directly by copyright are thus distinct from other consequences of market power in entertainment industries, which can limit competition between substitutes. See, e.g., *In Re Compact Disc Minimum Advertised Price Antitrust Litigation*, MDL Docket No. 1361 (D. Me. 2003), available at <http://www.musiccdsettlement.com/english/finaljudgmentorder.pdf>. That market power is likely to arise naturally from the fixed costs and barriers to entry into distribution and marketing systems, and is only marginally increased by copyright *per se* (through rights clearance costs, for example).

153. See *infra* notes 162–165 and accompanying text.

154. See, e.g., ALAN STORY, STUDY ON INTELLECTUAL PROPERTY RIGHTS, THE INTERNET, AND COPYRIGHT, U.K. COMM’N ON INTELLECTUAL PROP. RIGHTS § 4 (2002), at http://www.iprcommission.org/papers/pdfs/study_papers/sp5_story_study.pdf.

155. Price discrimination is said to occur when the producer of the good creates several versions, and sells those versions at different prices to consumers with different levels of demand. Alternatively, inter-temporal price discrimination can occur when the producer lowers the price over time, selling to high-valuing consumers first and to lower-valuing consumers at later dates.

156. See, e.g., Easterbrook, *supra* note 8, at 112. Judge Easterbrook seems to claim that because information is sometimes distributed freely, one might conclude that “when free distribution is socially optimal, people will not enforce their property right to withhold publication or demand fees.” *Id.* No explanation is offered as to why rights holders will, in general, seek socially optimal outcomes. This is a pressing question, because under copyright, attempts to eliminate deadweight loss will often undermine rights holders’ revenues.

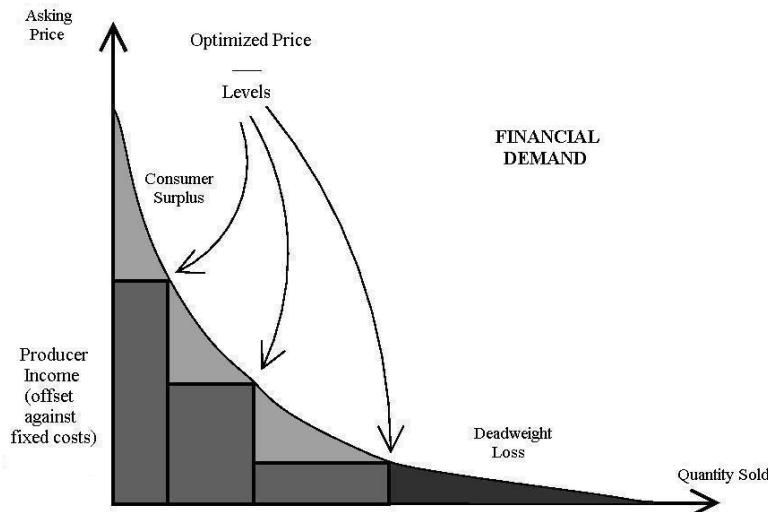
157. See James Boyle, *Cruel, Mean or Lavish?: Economic Analysis, Price Discrimination and Digital Intellectual Property*, 53 VAND. L. REV. 2007 (2000).

158. This is an old-fashioned example of the dependence of social welfare outcomes upon the initial distribution of wealth. Cf. *supra* note 137. One might believe that dollars in the hands of consumers will produce more benefit than dollars in the hands of recording industry executives and shareholders; conversely, one might believe that dollars in the hands of artists will do more good than dollars in the hands of the public at large. Where the dollars are needed most, and who actually ends up with them, is an empirical question well beyond the scope of this paper.

There is, however, a more subtle, important problem with a social dependence on price discrimination to minimize or prevent dead-weight loss, which is frequently left unconsidered in economic analyses. The symptom is that rights holders systematically discriminate at prices that are too high. The root cause is that the area beneath the demand curve does not capture the true utilitarian scope of dead-weight loss, particularly in situations of intra-national or international inequity.

Deadweight loss amplification occurs because of the difference between notional and financial demand. In the high-value range, demand from wealthy consumers will cause market forces to overstate the benefits of works to those wealthier individuals. People who have almost no income, on the other hand, are incapable of expressing financial demand for a good. As a consequence, there is disproportionately little incentive for the producer to cater to this market segment, even with price discrimination.

Figure 1: Financial Deadweight Loss

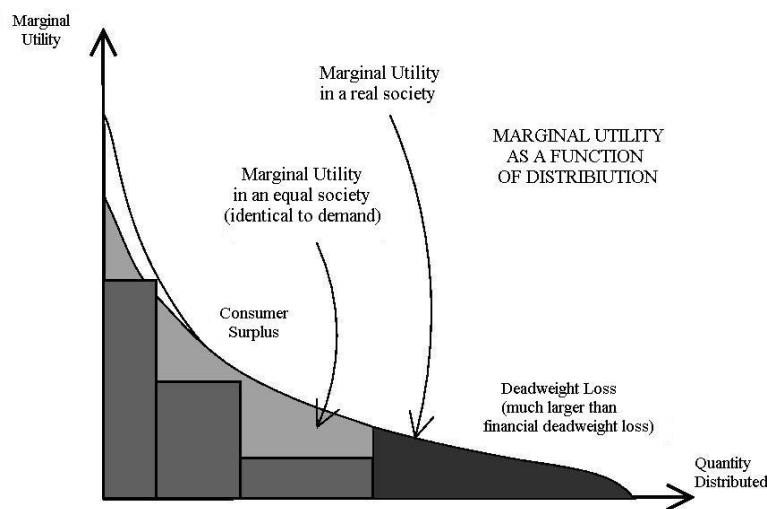


The situation is illustrated in the contrast between Figure 1, which shows financial deadweight loss¹⁵⁹ in a market for an excluded, non-rivalrous good with realistically effective price discrimination, and Figure 2, which illustrates utilitarian deadweight loss in the same

159. Figure 1 illustrates a Marshallian measure of deadweight loss, but the income-related effect in question is not an ordinary “income effect” and would not be quantified by considering Hicksian demand. Rather, they involve inter-personal utility comparisons and presuppose a utilitarian social welfare function.

market. Examples are abundant: there is little direct incentive for a textbook publisher to distribute textbooks at cost to those who cannot otherwise afford them, little incentive for record companies to give teenagers with minimal pocket money free or cheap access to all of the music they would like, and (embarrassment aside) little incentive for pharmaceutical firms to allow distribution of drugs at cost to impoverished nations.

Figure 2: Utilitarian Deadweight Loss



Ideally, if a welfare system was acting to redistribute wealth to those devalued by the demand curve, then price discrimination could be expected to reasonably constrain deadweight loss. Because in practice this tends not to occur, employing exclusive institutions to finance information production will exacerbate the problem.¹⁶⁰

Such structural considerations provide a reason to believe that the costs of artificial scarcity are likely to be large, and weigh heavily in favor of alternative compensation systems. How large is large? Two examples may serve to illustrate the scope of deadweight loss in copyright markets: (1) the retail price of CDs, which provides some information about the scale of price discrimination employed by rights holders; and (2) the ratio of pirated music files to licensed music sales,

160. For example, when the United States employed the threat of trade sanctions to persuade developing nations to enact strong copyright and patent laws and ultimately to sign the Agreement on Trade-Related Aspects of Intellectual Property Rights ("TRIPS"), *see* DRAHOS & BRAITHWAITE, *supra* note 10, ch. 7, it did not consider combining this with aid packages to correct the billions of dollars of inequitable wealth redistribution that TRIPS might cause.

which is related to the number of copies proscribed by copyright. Unfortunately, these examples do not allow a complete quantification of the cost of artificial scarcity because no one can currently calculate the financial, let alone utilitarian, implications of these lost opportunities¹⁶¹ — but they do allow a glimpse at the order of magnitude of the bottom line.

Consider the case of compact disc sales. Although inter-temporal price discrimination is visible in CD markets where older CDs are sold at discounted prices, these prices rarely fall close to the marginal cost of distribution (at least in first world markets); the price of most CDs never falls below 200–400% of marginal cost, even in the presence of inter-temporal price discrimination.¹⁶² While price discrimination trims at the edges of artificial scarcity, it leaves the core of deadweight loss intact.

Volumetric data on piracy give some insight into the amount of distribution that may be encompassed by deadweight loss. Since the CD prices discussed above were observed in Australia, this Article will continue to use that market as an illustrative example comparable in size and composition to one of the larger, urbanized U.S. states. Survey data indicates that last year at least 770 million songs were reproduced and distributed without authorization from copyright holders, 430 million over file sharing networks, and 340 million with CD burners.¹⁶³ In 2003, a record-breaking year, Australians purchased about 677 million legal songs.¹⁶⁴ In this market, piracy now accounts for more than 50% of music distribution.¹⁶⁵

161. Cf. Richard Watt, *The Past and Future of the Economics of Copyright*, 1 REV. ECON. RES. ON COPYRIGHT ISSUES 151, 167–68 (2004) (emphasizing the lack of data on demand curves as the primary hurdle for the development of economic understandings of copyright).

162. Anecdotal observation of the Australian market would suggest that a mass-market CD may sell in the range of AUD \$20–\$30, discounted older or fringe CDs sell for AUD \$10–\$20, while a bootlegged or unauthorized CD can sell for as little as \$5.

163. These figures come from a study commissioned by the Australian Record Industry Association (“ARIA”). See QUANTUM MKT. RES., UNDERSTANDING CD BURNING AND INTERNET FILE SHARING AND ITS IMPACT ON THE AUSTRALIAN MUSIC INDUSTRY (2003), at http://www.aria.com.au/pages/documents/ArialIllegalMusicResearchReport_Summary.pdf, which found file sharing usage by 11% of 16.6 million Australians aged ten or older. This equals 1.83 million downloaders × 19.6 average files per month × 12 months, totaling 430 million songs downloaded in 2003. The report also found that 40% of 16.6 million people received copied CDs, which equals 6.64 million CD recipients × 3.9 average CDs per year × 13 songs per CD, totaling 337 million songs on copied CDs. The total of 770 million may significantly underestimate the true volume of copying, because the survey did not ask about the practice of copying music collections directly between computers and/or portable music devices.

164. Broken down, this is 50.6 million albums × 13 songs per CD + 9.5 million singles × 2 songs per CD, which totals 677 million songs sold on CD. See AUSTRAL. REC. INDUS. ASSOC., 2003 ARIA YEARLY STATISTICS (2004), available at <http://www.aria.com/news/stats2000.htm>. There were no licensed music downloading services operating in Australia at the time.

165. Specifically, 53%, according to the approximate figures, *supra* notes 163–164.

The connection between these piracy levels and deadweight losses is not entirely straightforward. For the present normative comparison of VMRS and DRM, this Article will make the simplifying assumption that an effective DRM system will prevent the great majority of pirated distribution.¹⁶⁶ In that case, the number of copies encompassed by deadweight loss is equal to the number of pirated copies, minus the number which would be replaced by purchased copies if consumers lost the option to pirate,¹⁶⁷ plus the number of additional copies which would be made today were it not for the illegality and inconvenience of piracy. Clearly, the number of copies which are prevented by copyright is comparable to, and quite possibly larger than, the number of copies which it allows.

Data is not available to provide, precisely, the relative value of these two sets of copies. It is certainly reasonable to assume that copies sold will on average be valued more highly than those which are preempted by artificial scarcity; consumers will of course purchase more subjectively valuable works even at higher prices, though there are effects relating to both inequality¹⁶⁸ and imperfect information¹⁶⁹ which mitigate against this pattern of organization. It is possible, however, to employ a conservative assumption that consumer valuations are uniformly distributed beneath the lowest available price to obtain a lower bound on financial deadweight loss.¹⁷⁰ In that case, an estimate of deadweight loss in Australia under effective DRM would be seventy-five Australian cents¹⁷¹ times the number of works affected, which is about 770 million songs per year. Thus, financial deadweight losses from music copyright in Australia would be, roughly, AUD \$500 million (\$350–375 million) per year. As a percentage of GDP,

166. This may not be the case for all imaginable scenarios in which DRM plays a prominent role, but the fact that illegal copyright infringements may make DRM-based copyright marketplaces more efficient is not a point acknowledged by DRM advocates, so this Article places it aside for the time being.

167. On the size of this switch, see Felix Oberholzer & Koleman Strumpf, *The Effect of File Sharing on Record Sales: An Empirical Analysis* (Mar. 2004) (suggesting that it might be negligible or even negative), *at* http://www.unc.edu/~cigar/papers/FileSharing_March2004.pdf; *see also* Eric Boorstin, *Music Sales in the Age of File Sharing* (2004) (unpublished senior thesis, Princeton University), *available at* <http://www.princeton.edu/~eboorsti/thesis/Music%20Sales%20in%20the%20Age%20of%20File%20Sharing.pdf>. *But see* STAN J. LIEBOWITZ, *PITFALLS IN MEASURING THE IMPACT OF FILE SHARING* (2004) (surveying and critiquing empirical studies on the effect of file sharing on music sales, including those by Oberholzer and Strumpf and Boorstin, and concluding that at this stage one should still expect that file sharing is at least partly responsible for the recent decline in U.S. record sales), *at* <http://www.utdallas.edu/~liebowit/intprop/pitfalls.pdf>.

168. *See supra* notes 158–160 and accompanying text.

169. *See infra* Part III.C.5.

170. Or, equivalently, that demand is linear beneath this point.

171. Due to the uniform distribution assumption, this is half the typical lowest price — $\frac{1}{2}$ × AUD \$20 being AUD \$10, per album or about AUD \$.75 per track. This rate is more or less equivalent to half of the “lowest available price” for most songs, which is the US \$1 charged by iTunes.

the equivalent cost in the United States would be a little over seven billion dollars per year.¹⁷² These are of course approximate estimates,¹⁷³ and they cover only music. A prediction for the total social cost of artificial scarcity would be larger, both because other media must also be included, and because of the amplification effects discussed above.¹⁷⁴

It is clear that the deadweight losses associated with DRM-enforced copyright may be very high. It is not possible to create artificial scarcity for information goods without incurring problematic costs for society. From this perspective, the virtual market alternative would provide substantial efficiency gains.

2. Technological Infrastructure and Security Costs

Both the VMRS and DRM models for information markets require computational infrastructure. For a virtual market, the required infrastructure is the voting system and a means to distribute rewards to artists and publishers. Technologically enforced copyright depends upon several components: a network of trusted systems (in order for the public's use of information goods to be controlled, each device that has access to the underlying digital works must be "trusted" by rights holders),¹⁷⁵ cryptographic channels to ensure that copies cannot be captured *en route* to those trusted systems, mechanisms to approve particular reproductions and uses of works, and the means to pursue "leaks" in the system and prosecute infringers.¹⁷⁶ The relative cost of these two alternative infrastructures is an important factor in determining which policy scheme is more desirable.

172. The U.S. GDP is \$10.98 trillion, while Australia's is \$570 billion. CENT. INTELLIGENCE AGENCY, THE WORLD FACTBOOK (2004), available at <http://www.cia.gov/cia/publications/factbook>.

173. For causes of both uncertainty and conservatism in the estimate, see *supra* note 167 and accompanying text.

174. See *supra* notes 158–160 and accompanying text.

175. On the necessary role of trusted systems in making DRM an economic possibility, see, for example, Stefik, *supra* note 7; Stuart E. Schechter et al., *Trusted Computing, Peer-To-Peer Distribution, and the Economics of Pirated Entertainment*, 2 PROC. ANN. WORKSHOP ECON. & INFO. SEC. §§ 1–2 (2003), at <http://www.eecs.harvard.edu/~stuart/papers/eis03.pdf> and Ryan Roemer, *Locking Down Loose Bits: Trusted Computing, Digital Rights Management, and the Fight for Copyright Control on Your Computer*, 2003 UCLA J.L. & TECH. 8 § II (2003), at http://www.lawtechjournal.com/articles/2003/08_040223_roemer.php.

176. Attempts to reduce loss through leaks would be greatly assisted by secure digital watermarks, which allow a pirated file to be linked back to the user who purchased the original. However, considerable research efforts have yet to produce a robust "traitor tracing" algorithm which operates on public networks such as the Internet. In the absence of watermarking, leaks must be traced using traditional police investigations — a strategy which is likely to prove hopeless. Even if secure watermarks were implementable, leaks would still occur (because the contents of stolen computers and/or files could be "liberated" without traceability); but in this much smaller set of cases, criminal investigations might have some effect.

The cost of a VMRS infrastructure is also substantial, including the secure hardware to certify downloads or votes,¹⁷⁷ the development of software to administer the system, and possibly the maintenance of servers to ensure that cultural material is openly accessible (although P2P provides a good way to “externalize” this cost). Note that the cost of the actual rewards is not part of this overhead. One component of a DRM system carries a set of costs of a nature and magnitude similar to those of VMRS. These include the servers, authentication mechanisms, and rights clearance systems required by technologically-mediated copyright. However large these costs are their normative consequences are limited, because they are likely to remain quite symmetrical across the two alternative systems.

It is true that there are other, much larger technological overheads associated with enforcing digital exclusive rights. The most significant costs in DRM infrastructure relate to the extreme difficulty of designing and maintaining systems, including consumer devices, to be secure. Kelsey and Schneier, amongst others, have emphasized that any digital trusted system must have analogue outputs;¹⁷⁸ even if the digital links are secure, high-quality digitizations (of music, at any rate) will be easy to obtain.¹⁷⁹ Even the digital part of a trusted DRM network is likely to suffer from serious and persistent security problems.

Because a single point of failure can cause the collapse of an entire DRM network, millions of consumer devices need to be virtually tamper-proof.¹⁸⁰ This degree of security is a costly proposition to say the least, but just how costly is difficult to say without having achieved it.¹⁸¹ Informally, many security professionals have claimed

177. See *supra* Part II.B.1.

178. Kelsey & Schneier, *supra* note 11.

179. The Motion Picture Association of America has proposed that all analogue-to-digital converters (“ADCs”) be regulated to require that they recognize and refuse to digitize material which carries a standardized watermark. See MPAA, CONTENT PROTECTION STATUS REPORT, available at http://judiciary.senate.gov/special/content_protection.pdf (filed with the U.S. Senate Judiciary Committee 2002). From an engineering perspective, this is a very radical proposal because ADCs are a fundamental building block for electrical systems, and watermark detection circuitry is much more complicated than an ADC itself. It is not clear at this stage that such a proposal deserves serious cost and feasibility studies.

180. Designing consumer devices which are literally tamper-proof is almost certainly impractical if not impossible. See Ross Anderson & Markus Kuhn, *Tamper Resistance — A Cautionary Note*, in PROC. 2ND USENIX WORKSHOP ON ELEC. COMMERCE (1996), available at <http://www.cl.cam.ac.uk/users/rja14/tamper.html>. Instead, the degree of tamper resistance must be so high that only attackers with substantial resources can succeed—and, as Anderson and Kuhn went on to demonstrate, even this will be very challenging. See Ross Anderson & Markus Kuhn, *Low-Cost Attacks on Tamper Resistant Devices*, in SECURITY PROTOCOLS: 5th INT'L WORKSHOP 125 (1997), available at <http://www.cl.cam.ac.uk/~mgk25/tamper2.pdf>. In addition, large amounts of information must remain enclosed when security compromises do occur, and every significant instance of tampering must be traceable before it inflicts massive economic damage.

181. See BRUCE SCHNEIER, SECRETS AND LIES: DIGITAL SECURITY IN A NETWORKED WORLD ch. 14 (2000).

that it is sufficiently difficult to be considered impossible. There has, however, been some technical progress on tamper-resistance, and a number of approaches can be used to predict a possible price tag. Extrapolation from the price of existing hardware gives a figure in the range of \$20–\$150 per consumer device.¹⁸²

A more ambitious back-of-the-envelope calculation can attempt to account for a wider range of possible weaknesses by inferring costs from other areas of IT security. The author tried this, and it resulted in a remarkably coincidental figure — \$150 per device.¹⁸³ These estimates of the price of effective copyright protection are drawn in the broadest of brushstrokes, but they accurately reflect the kinds of expenses necessary to avoid “competing with free.” A DRM network is only as strong as its weakest link. In order to prevent break-ins at a

182. This approach begins by considering state-of-the-art tamper resistant devices for financial cryptography. The IBM 4758 co-processor is an example of an extremely sophisticated “trusted” hardware platform. See Sean W. Smith & Steve Weingart, *Building a High-Performance, Programmable Secure Coprocessor*, 31 COMPUTER NETWORKS 831 (1999), available at http://www.research.ibm.com/secure_systems/papers/arch.pdf. The security features of the 4758 would stand a reasonable chance of preventing serious economic damage due to digital content leakage, although in deployment it is not necessarily immune to software flaws. See Richard Clayton & Mike Bond, *Experience Using a Low-Cost FPGA Design to Crack DES Keys*, 2523 LECTURE NOTES IN COMPUTER SCI. 579 (2003), available at <http://www.cl.cam.ac.uk/~rnc1/descrack/DEScracker.html>. The 4758 currently sells for around \$4,000 in a relatively small market; there are only about 300,000 ATMs in the United States. See, e.g., *Terminals Online*, 19 BANK NETWORK NEWS 4 (2000).

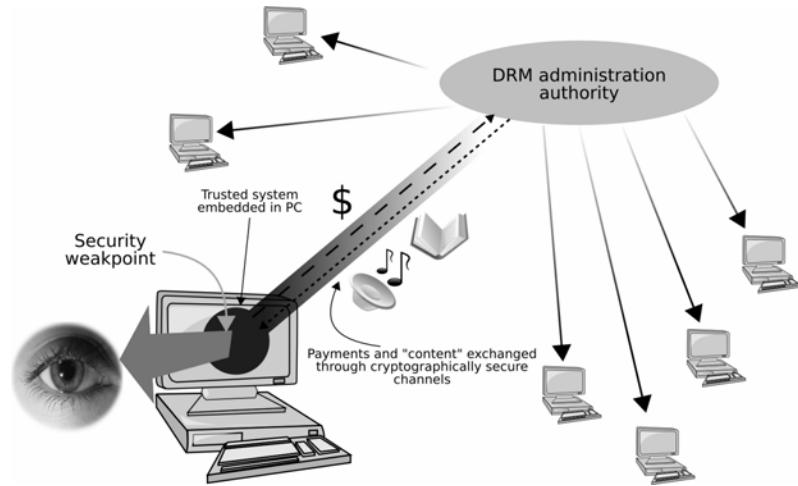
Unofficial estimates undertaken at IBM’s Thomas J. Watson Research Center (obtained by personal communication) indicate that the 4758 itself, even in very large volumes, would still cost over \$500. A miniaturized version would probably cost \$100–\$150. It might be conceivable to get as low as \$20 or \$30 if a single-chip equivalent device could be designed, although this would require significant research and development. Even with the most optimistic figures, this kind of hardware would represent a very sizeable tax if it were required in all consumer media devices.

183. A recent survey of 503 organizations’ experience in dealing with computer crime indicates that \$375.6 million is lost annually in incidents of a kind which might be applicable to a DRM network. See Richard Power, *CSI/FBI Computer Crime and Security Survey*, 8 COMPUTER SEC. ISSUES & TRENDS § 10-1 (2002) (excluding the listed categories of losses from insider abuse of Net access, laptop theft, and denial-of-service attacks), available at http://www.gocsi.com/forms/fbi/csi_fbi_survey.jhtml. These measurable losses were spread over 44% of the population surveyed, amounting to \$1.7 million per organization affected. The importance of these loss figures is that they provide some indicative lower bound for the price of achieving security; if effective protection is cheaper than the expected losses due to security breaches, then most organizations will quickly deploy it.

Adopting the lower bound, effective security for a controlled corporate network costs between \$750,000 (average measured losses per organization) and \$1.7 million (average loss for organizations which measure their losses). The cost for a device in a consumer’s home might in some respects be higher since these locations are not controlled by rights holders and in other respects may be much lower because some security risks scale with the number of computers or users on the network. The weakest assumption is that costs per device are the same as costs per employee. The average number of employees for the organizations in the survey was about 5,000. *Id.* at 3 (assuming median numbers for each interval, and 15,000 employees for organizations in the 10,000 or more category). Hence, if one divides the minimum organizational cost of close-to-bulletproof security (\$750,000) by the number of employees per organization (5,000), the result is a ballpark conservative prediction of effective security costs for an embedded consumer device: \$150.

few unknown but crucial points, extreme precautions must be taken everywhere. This is a fundamental problem of digital copyright, illustrated in Figure 3.

Figure 3: Information Flows in a DRM System



It is helpful to compare this problem to the task of securing VMRS. Both DRM and VMRS networks contain security-critical points of failure. In a DRM regime, these are all the devices in users' homes (illustrated in Figure 3¹⁸⁴). In a virtual market, the only security-critical systems are the handful of government-run computers which allocate the rewards (as shown in Figure 4¹⁸⁵). By giving up on exclusive rights, it is possible to design around the massive security headaches of trying to enforce them.

There may be another fundamental reason why the costs of security under a DRM regime are much greater than those under an alternative compensation system. Every stable, successful digital network ever built has operated on an unstated principle — the vast majority of participants want the network to function. The Internet is, of course, the most striking example of this phenomenon. Participants attach computers to the Internet and those computers execute code which is generally compliant with a set of agreed standards for communication. Even a small proportion of defecting nodes which attempt to subvert this arrangement can cause serious network problems.¹⁸⁶ Perhaps the

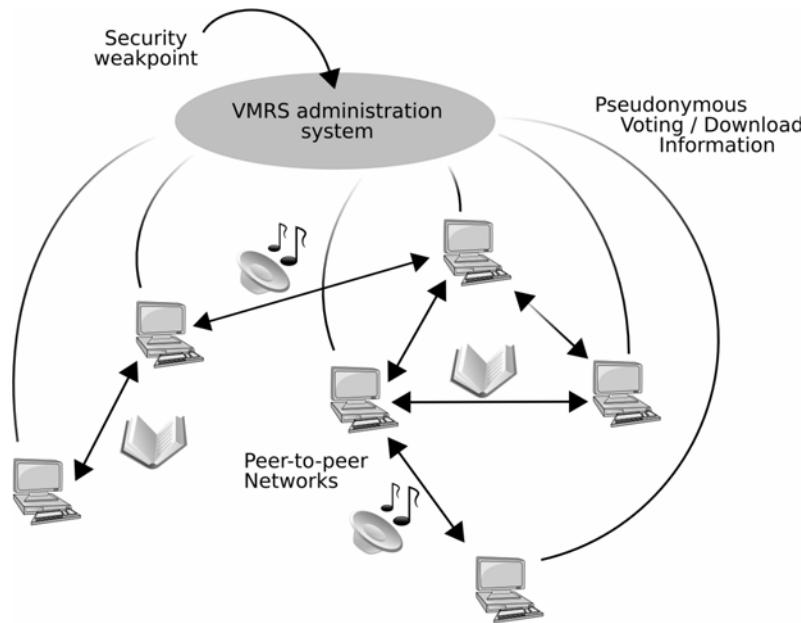
184. Thanks to the Open Clip Art Library, <http://www.openclipart.org>, for providing the components of this diagram.

185. *Id.*

186. The work of Nisan and Ronen has sparked a growing literature on incentive-compatible network protocols, but this literature does not consider the more complicated

clearest example of this is the effect that a tiny minority of spammers have had on SMTP-based email infrastructures.¹⁸⁷

Figure 4: Information Flows in a Virtual Market



A DRM network cannot expect cooperative behavior from its participants. As peer-to-peer file sharing has demonstrated, many users are eager to exchange copyrighted information with disregard to publishers' and authors' legal privileges. While most of these actors will not have the skill to write software which attempts to redefine the network, they would be more than willing to download and run it. Designing a network which functions while most of its participants attempt to cause its downfall is a problematic and expensive proposition.

There are both specific technical reasons and more general structural reasons for expecting effective digital copyright enforcement to be extremely expensive. In consequence, it is safe to conclude that the

question of enforcing participation in an intrinsically unpopular protocol. See Noam Nisan & Amir Ronen, *Algorithmic Mechanism Design*, in PROC. 31ST ACM SYMPOSIUM ON THE THEORY OF COMPUTING 129 (1999), available at <http://citeseer.nj.nec.com/nisan99algorithmic.html>.

187. For an indication of the size and obstinacy of the spam problem, see David Geer, *Will New Standards Help Curb Spam?*, COMPUTER, Feb. 2004, at 14–16, available at <http://www.computer.org/computer/homepage/0204/TechNews/r2014.pdf>. There may be incentive compatible alternatives to the present infrastructure, but they are likely to be much more complicated. See Thede Loder et. al., *An Economic Answer to Unsolicited Communication*, in PROC. 5TH ACM CONF. ON ELECTRONIC COM. 40 (2004).

infrastructure costs involved in deploying and maintaining DRM will be much higher than those associated with virtual markets.

3. Rights Clearance Transaction Costs

A virtual market allows open access to a huge body of works by default and then retrospectively organizes remuneration for those works in retrospect. DRM, in contrast, prohibits most forms of access until appropriate rights have been licensed to the user. This distinction may give rise to systematic differences in the effort parties must expend to agree upon license terms.

On the distribution side, the need to formally clear all of the rights required for the use of a work is not a huge problem in most situations.¹⁸⁸ A majority of users will fit neatly into one of a few categories. Their terms of access can easily be codified, and licensing can occur automatically with each purchase.

A number of use cases remain for which rights clearance is inherently a major problem, particularly cases relating to indexing, search, and analysis tools that operate over large collections of works. It is only when primary materials are available in open information ecosystems that competition can freely drive the development of the most usable and sophisticated value-added search services. Due to the operation of what is effectively “implied” or “opt-out” licensing, Web-based tools have been able to avoid transaction cost problems — perhaps the two most noteworthy examples are Google¹⁸⁹ and CiteSeer/ResearchIndex.¹⁹⁰ The majority of humanity’s art, culture, and wisdom is not on the Web, though, and falls outside the scope of this particular solution.

In some cases, the barriers which exclusive rights pose to large-scale indexing and analysis services may be overcome either by limitations and exceptions to copyright¹⁹¹ or by collective licensing. Solu-

188. Distribution-side rights clearance is, of course, very different from production-side rights clearance. Identifying exactly who owns the various rights applicable to a particular work in order to pay them for a performance or derivative work (whether by a collecting society, a firm running a DRM system, or a VMRS administration) may sometimes be difficult, but these costs apply equally to exclusive rights-based and alternative compensation systems.

189. See Sergey Brin & Lawrence Page, *The Anatomy of a Large-Scale Hypertextual Web Search Engine*, 30 COMPUTER NETWORKS & ISDN SYSTEMS 107 (1998), available at <http://www-db.stanford.edu/pub/papers/google.pdf>.

190. CiteSeer was originally developed in NEC’s research laboratories, though it is now operated by Pennsylvania State University. See CiteSeer, at <http://citeseer.ist.psu.edu> (last visited Dec. 3, 2004); see also C. Lee Giles et al., *CiteSeer: An Automatic Citation Indexing System*, in 3rd ACM CONFERENCE ON DIGITAL LIBRS. 89 (Ian Witten et al. eds., 1998), available at <http://citeseer.nj.nec.com/giles98citeseer.html>.

191. See, e.g., *Kelly v. Arriba Soft.*, 336 F.3d 811 (9th Cir. 2003) (holding that making cached “thumbnail” copies of images, in order to provide them as search results, constituted fair use).

tions based in fair use, though, are inherently limited and uncertain, while licensed solutions will often need to prohibit or restrict many features of existing search tools. Any search facility which provides information about the context of results (as Google does with search terms, and CiteSeer does with citations) is also providing parts of the actual text of the document. It is a relatively straightforward process to write software which combines these snippets of text, recreating the entire original document.¹⁹² Preventing these forms of revelation (for example, by attempting to track the users of search facilities) may be possible, but is likely to be costly.

There is some clear evidence that transaction costs are holding back the development of extremely valuable information services. As a relatively small example, the features of research tools such as CiteSeer and ArXiv (which index freely available papers, primarily in computer science and physics, respectively) in some respects go well beyond those of proprietary databases that index copyrighted research material,¹⁹³ but they cannot extend those benefits to the entire corpus of scholarly literature because it is largely owned by the proprietary competitors. A more striking example is the retarded development of searchable full text databases of ordinary books. Despite their remarkable utility, these services have only started to appear in the last year;¹⁹⁴ clearing rights for them is a daunting task, and many of the most valuable works are likely to be excluded for precisely the reasons discussed above.¹⁹⁵

The indexing, search, and analysis cases in which rights clearance is a problem for digital copyright appear to be an instance of the

192. For an example of the consequences of this concern, see *infra* note 195.

193. Examples of this are Thomson ISI's Web of Knowledge, Thomson West's Westlaw, or Reed Elsevier's LexisNexis. Because proprietary databases are the only viable option in many areas, researchers in those fields may not have compared their functionality to services like CiteSeer. Admittedly, the comparison between research services is also complicated by the role of patented algorithms, see, for example, U.S. Patents No. 5,265,065, 5,794,236, 6,285,999, & 6,289,342, and the significant amount of human labor involved in some of these databases (ISI Web of Knowledge includes manually indexed citations, while Westlaw's KeyCite depends upon manual categorization of legal material).

194. See Gary Wolf, *The Great Library of Amazonia*, WIRED, Dec. 2003, at 214, available at http://www.wired.com/wired/archive/11.12/amazon_pr.html; see also Stephanie Olsen, Google Tests Book Search, CNET NEWS.COM (Dec. 17, 2003), at http://news.com.com/2100-1038_3-5128515.html.

195. See, e.g., E-mail from The Authors Guild, Amazon's New Database Likely to Help Sales of Some Works, May Undermine Others, to members of The Authors Guild (Oct. 24, 2003), at http://www.authorsguild.org/news/10_24_03.htm (suggesting that the authors of reference, travel, and cookbooks, as well as some scholarly collections and college texts, should consider attempting to have their books removed from full-text search services). The involvement of the Authors Guild also succeeded in disabling printing from Amazon's service to address fears that the results of multiple searches could be stitched together to obtain a complete copy of the work. See Stephanie Olsen, *Amazon Jams Print Feature on Book Search*, CNET NEWS.COM (Nov. 5, 2003), at http://news.com.com/2100-1032_3-5102917.html.

"tragedy of the anticommons,"¹⁹⁶ in which too many overlapping property rights render beneficial projects inconveniently or prohibitively expensive — though on a scale which is perhaps less systematic than that which can occur under other intellectual property regimes.¹⁹⁷ This problem for DRM systems is not insurmountable, but neither is it insignificant. Virtual markets and similar alternative compensation systems do not suffer from it, and the transaction costs associated with DRM will be higher than those associated with alternatives.

4. The Implications and Side Effects of Taxation

One common objection to virtual markets might be simply expressed as "Why should I pay taxes for music I don't listen to or writing I don't read?" or "What if I would pay a lot for something, but VMRS limits how much power my wallet carries?"

These objections result from the fact that virtual markets reveal the pure public-good nature of information. Similar objections can be made by pacifists, outraged that their tax dollars go to the military, or by libertarians who wish to reduce public funding for academic research. There are also elements of disanalogy, because in a virtual market each taxpayer gets to pick *which* public goods they want their taxation to fund. It is only people who are disinclined towards information goods of all sorts who will be immediately worse off with VMRS — and even then, only if the funds are drawn from income tax rather than levies on appropriate devices. Fundamentally, the extent to which these effects will be present depends on how the taxation for the virtual market is implemented.

Nevertheless, there may be some advantage to the DRM model because it guarantees that people are paying precisely for the things they want. In a marketplace, they have significant control over the magnitude, and some control over the allocation,¹⁹⁸ of their contributions. The relevant question is: how large is the advantage which can be obtained through direct payment rather than voting for the creation of information goods?

There are a number of results in the mechanism design literature which concern the efficiency of voting schemes for producing public

196. See Michael A. Heller, *The Tragedy of the Anticommons: Property in Transition from Marx to Markets*, 111 HARV. L. REV. 621 (1997).

197. See, e.g., Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation?: The Anticommons in Biomedical Research*, 280 SCI. 698 (1998); Jerome H. Reichman, *Of Green Tulips and Legal Kudzu: Repackaging Rights in Subpatentable Innovation*, 53 VAND. L. REV. 1742 (2000) (advocating liability-rule regimes as an alternative to creeping exclusive rights which are likely to give rise to anticommons effects).

198. Consumers' control over allocation has some significant limitations because they must take or leave each good at a price set by the distributor. In a virtual market, they receive a fixed number of free votes; in a copyright marketplace, they have a variable number of constrained votes.

goods. Bowen showed that if majority voting¹⁹⁹ is employed to decide the level of taxation-funded provision of a single public good, then, under strict but not implausible assumptions, the result will be Pareto optimal.²⁰⁰ Under the conditions which Bowen modeled there are no problematic “one user, one vote” effects.

It turns out that the biggest problem with applying Bowen’s result to a virtual market is the “single public good” assumption. Although it is tempting to regard existing public sector institutions as fixed, and propose the output of a VMRS as a single public good which is to be regulated by a single stand-alone plebiscite, it is not correct to do so.

A virtual market provides incentives for the creation of a bundle of distinct public goods, and individuals’ preferences will be widely distributed within the space of possible tastes. Existentialist fiction, hyperactive cartoons, and soufflé recipes must be regarded as separate public goods.

Unfortunately, the results suggesting the optimality of median voting only apply to an economy with *one* public good. Once several are present, there is no guarantee that voting by a community with heterogeneous preferences will provide a stable, optimal outcome. Indeed, Bucovetsky has shown that a majority equilibrium exists only if the many-dimensional space of public good preferences can be reduced to two taste variables.²⁰¹

Bucovetsky’s result seems to guarantee that a virtual market could be suboptimal, because it will inevitably face a population with highly heterogeneous and complicated tastes. There is, however, cause for optimism if instead of a majority-voting model, an incremental approach is used.

De Trenqualye has shown that if cost-sharing (tax) rules are fixed in advance, then an incremental voting system that adjusts the budget allocations to many different public goods in a continuous fashion

199. “Majority voting” refers to finding an outcome such that it will win a two-choice election against any other alternative. It is easy to show that if there is a single parameter to be chosen, and each voter’s preferences are single-peaked, then the median vote will command a majority. See Howard Bowen, *The Interpretation of Voting in the Allocation of Economic Resources*, 58 Q.J. ECON. 27 (1943).

200. In Bowen’s model, taste for public and private goods are independent, each individual pays an equal share of the cost of producing the public good, and preferences are assumed to be normally distributed. This result is generalized in CORNES & SANDLER, *supra* note 13, at 205–12, where it is shown that majority voting can be Pareto optimal whenever individual variation in preferences for the public good is independent of consumption of private commodities, using a more general Lindahl taxation formula which combines lump-sum and fixed-rate income taxation. Also, the requirement for bell-curve preferences is relaxed to include any symmetrical preference distribution.

201. See Sam Bucovetsky, *Choosing Tax Rates and Expenditure Levels Using Majority Rule*, 46 J. PUB. ECON. 113 (1991).

will reach a Pareto-optimal equilibrium.²⁰² This model has some significant similarities to the virtual market proposal.²⁰³

This encouraging result is not quite the end of the story. The problem lies within the assumption of fixed tax-sharing rules. For any given tax formula it is true that VMRS will work well and may approach Pareto optimality. The same question, however, returns: whether there is a tax formula that is as good as the DRM-based copyright marketplace.

Any tax formula used to fund public goods can be decomposed into a component that is “benefit offsetting”—citizens are left indifferent after the introduction of the tax and the creation of the public good—and a component that is both distortionary and redistributive.²⁰⁴ An ideal tax system must both fund public goods that pass a cost-benefit test and perform socially desirable redistribution, although this latter goal is inevitably subjective.

Some plausible funding schemes for VMRS were introduced in Part II.B.3. Each is likely to entail redistributive and distortionary effects. The significance of those effects, however, depends on both the choice of social welfare function and the particular society under consideration.

A market constructed from exclusive rights raises funds quite efficiently. Its limitations are intimately related to the operation of price discrimination techniques. If price discrimination under DRM is imperfect (and it always is, to some extent), it may create inefficient distortionary incentives for consumers to expend resources circumventing price discrimination. There will also be distortionary or redistributive consequences where publishers of information goods possess market power.²⁰⁵

202. See Pierre de Trenquayle, *An Extension of Bowen's Dynamic Voting Rule to Many Dimensions*, 15 SOC. CHOICE & WELFARE 141 (1997). De Trenquayle's model assumes voters make decisions based on their immediate preferences, Pareto optimality at equilibrium and local incentive compatibility depend on convex preferences, and the existence and inevitability of equilibrium depends on Euclidean preferences. *Id.*

203. The largest difference is that De Trenquayle's model is completely dynamic, adjusting the previous budget at each increment. The virtual market is a static rule, but it produces persistent public goods—once written, a book stays written. Limitations in this interpretation may arise through the evolution of people's preferences; the value of many cultural works might be more accurately modeled with exponential decay than with constant value. One can interpret the ratio of each user's votes (for different works) as defining a line in \mathbb{R}^N , where N is the number of different information goods which can be chosen (note that this space could probably be compressed into a lower-dimensional “taste space”). Then if users are given a way of choosing how much revenue should be allocated to the virtual market, their choice uniquely determines a point on that line. The normalized vector from the current state of the virtual market to this point forms one of the votes used in De Trenquayle's model. His assumption of non-strategic local voting is particularly justified in the virtual market transposition because of the extreme difficulty in collecting useful information about the global preference landscape, and because preferences are likely to be dynamic anyway.

204. For a discussion of this decomposition, see Kaplow, *supra* note 78.

205. See *supra* note 152.

The chosen taxation model will largely determine a virtual market's redistributive or distortionary effects.²⁰⁶ So, for example, using income taxation to fund artistic and literary production will have side effects where the incidence of that particular tax offsets the benefits; because valuations of information goods will not be homogeneous within each tax bracket, there will be transfers of wealth from low-valuers to high-valuers.²⁰⁷ The use of an income tax is also likely to distort the supply of labor from some taxpayers. Why work so many hours if the income tax rate has gone up? This particular effect may be amplified because many information goods are likely to be complements to leisure.²⁰⁸

Levy-based taxation systems can be expected to produce quite different results. One notable effect of flat levies on various kinds of hardware, or on Internet access, is to make these purchases less attractive for users who do not benefit from information goods covered by the virtual market. For example, computer users may be discouraged from buying writeable CDs to make backups if there is a significant levy charged to support artists. A tax on Internet connections may discourage marginal "e-mail-only" users if they have to pay a surcharge to support websites or film swapping. The extent to which this is a problem for society turns on empirical facts about how many people fall into these categories and how wealthy they are.

Schemes that combine basic indicators of technology use with a progressive revenue source may be the best option. Progressive Internet-connection levies based on income or property valuation are examples. If properly designed, these are likely to get much closer to being "benefit offsetting" than simpler formulae. While there will inevitably be "edge-case" redistributions, these may prove to be quite marginal.

In conclusion, an existing taxation system represents an optimal balance, then the distortionary effect of higher taxes is a factor that unambiguously favors using technology to enforce exclusive rights. Claiming that the political processes that govern welfare and taxation systems actually produce optimal social welfare outcomes, however,

206. See *supra* notes 71–81 and accompanying text.

207. The social welfare implications of such a redistribution are particularly difficult to estimate. On one hand, they appear to exacerbate a pre-existing "digital" or "cultural" divide. On the other hand, there may be significant endogenous demand factors at work in such divisions, and granting universal free access to digital works may, on balance, serve to reduce them.

208. That is, for many people, paying higher income tax to have free access to music, writing, film, etc., makes working less a doubly attractive proposition. A tax on house values may have the opposite interaction, because a nicer house is likely to make the consumption of copyrighted goods more attractive.

is rather unrealistic.²⁰⁹ In practice, tying the remuneration system for authors and artists to institutions that reduce wealth inequality may have unique advantages. The utilitarian implications of using taxation to power sectors of the information economy are uncertain, but it is entirely possible that they are beneficial on balance. In the absence of detailed data on the distribution of wealth and preferences in a society contemplating an alternative compensation system, it is safest to assume that the distortionary costs of taxation weigh in favor of the DRM alternative, but one should also be mindful of the positive side effects that can accompany them.

5. Information Revelation

In order for any resource allocation mechanism, including a market, to function efficiently, it needs to ensure that information about the value of particular goods, as measured by users' preferences, is employed to determine which goods are produced — or at least, which acts of production are rewarded. It would be naive to regard the satisfaction of consumer demand as an ideal guide for cultural creativity.²¹⁰ Still, all other things being equal, information economies should be led toward the public's tastes and not away from them.

In a DRM system, valuation information is revealed through the act of users' payment for access to various works; in a virtual market, information is signaled through the process of voting (or allowing downloads or usage to be sampled). In each case, imperfections in the information transmission mechanism can result in economic inefficiency. The effect is not direct, because information is blurred and delayed by the filter of *ex ante* production decisions. Over time, if particular kinds of works are rewarded more or less richly, then the choices made by authors, artists, and publishers will gradually be influenced. There are many subtle differences between the informational imperfections that are inherent in VMRS and DRM. It is the intention of this section to examine these imperfections, with a view to determining whether they might provide grounds for preferring one system over the other.

209. See, e.g., David Brooks, *The Triumph of Hope Over Self-Interest*, N.Y. TIMES, Jan. 12, 2003, at 15 (reporting a survey finding that 39% of U.S. citizens believe they either are, or will at some point during their lives be, within the wealthiest 1% of the population).

210. See *supra* notes 144–145 and accompanying text. In this sense, the existence of a virtual market would not affect arguments for organizations such as the National Endowment for the Arts, which have aesthetic goals other than popularity and may play an important role in the development of artistic tastes.

a. Transparency

The non-transparent nature of many information goods is a profound problem with information revelation under DRM: Alice cannot really tell what they are, until she has “consumed” them.²¹¹ So, for example, if consumers have to pay for a piece of writing before they read it, then they will be signaling their anticipated valuation, rather than an actual valuation.

To some extent, transparency problems are attenuated by the provision of sample chapters of books, trailers for films, or by allowing, as iTunes does, music purchasers to listen to thirty-second clips before they buy songs. Depending on the particular medium, there are various transaction costs and limitations associated with these strategies; song clips are quite informative, while sample chapters are of moderate use and trailers even less so. Lack of transparency creates a degree of inefficiency in copyright systems of all sorts, and DRM only partially alleviates the problem. In contrast, because VMRS allows users to signal whether they like things *after* they have experienced them, it is capable of providing incentives that are more closely attuned to consumer preferences.

b. Reliance on Non-Payment Signals

When Alice has to pay money in order to obtain a work, her dollars act as a limited sort of “guarantee of sincerity.” In this respect, it is relatively certain that a DRM-based marketplace is, up to a point, reporting the public’s preferences accurately.²¹² A virtual market based on usage metering and votes, in contrast, does not require Alice to “put her money where her mouth is.” One must wonder what implications this could have for the preferences so revealed.

211. See Arrow, *supra* note 39, at 615 (highlighting similar problems in markets for industrial information); J. Bradford DeLong & A. Michael Froomkin, *Speculative Microeconomics for Tomorrow’s Economy*, FIRSTMONDAY (Feb. 3, 2000) (emphasizing the importance of transparency in modern information economies), at http://www.firstmonday.dk/issues/issue5_2/delong; Lisa N. Takeyama, Piracy, Asymmetrical Information, and Product Quality Revelation (Jan. 2002) (arguing that these effects should be counted against strict copyright systems in economic analyses), at <http://www.serci.org/2002/takeyama.pdf>. A similar concept is captured by Nelson’s distinction between “experience” and “search” goods. See Phillip Nelson, *Information and Consumer Behaviour*, 78 J. POL. ECON. 311 (1970).

212. This is not a rigorous guarantee; if piracy was more prevalent amongst certain demographics — teenagers being an extreme example — their preferences might receive a discounted response from the market. There are certainly some claims that this is beginning to occur in music markets. See Darren Davis, *Moby Attributes Sales Slide To The ‘Pearl Jam Effect,’* YAHOO! LAUNCH NEWS (Jun. 23, 2002), at <http://launch.yahoo.com/read/news.asp?contentID=209387>. Conversely, no doubt, one could find examples of people paying for things that they do not really want.

One concern is that the samples collected by a voting system might somehow be skewed, particularly if certain sub-demographics of Internet users were statistically more likely to vote than others. Provided that download or usage statistics are available as a fallback, this effect is unlikely to be problematic. Alternative compensation systems can cast wide enough nets for their data that even the rarest of netizens will be represented in the results.²¹³

A second possible cause of inaccurate preference revelation in a virtual market — conscious misrepresentation of preferences in votes — is more complicated. As argued in Part II.B.6, in the absence of clear incentives to do otherwise, a combination of self-interest²¹⁴ and cultural factors should make accurate voting a default behavior.²¹⁵ So while there is no financial guarantee that Alice must vote accurately, it seems that the system can be designed to avoid incentives to vote inaccurately. Even if there was a degree of misinformation, the residual imperfections in the results would not necessarily decrease the efficiency of the system.²¹⁶

One should also acknowledge a subtle interaction between the artist and the audience that affects preference disclosure. In much the same way that successful street performers cajole their audience into making payments, or some recording musicians discourage their audiences from free-riding with pirated music downloads, many artists working in a virtual market would no doubt encourage their audiences to vote early and often. It could be argued that this creates an incentive distortion that disadvantages artists who are either unable or unwilling to guide their audiences in this manner. This argument is certainly valid, but perhaps it applies almost as extensively to copyright-based markets as it does to their virtual alternatives.

So while it does not appear that there are grounds for regarding the role of non-payment signals as particularly problematic in an alternative compensation system, it remains the case that DRM systems — absent piracy — perform this particular task optimally. This constitutes a reason, albeit a marginal one, for preferring the latter system.

213. The notable exception to this would be subcultures that had the specific philosophy of working to avoid informing the virtual market of anything at all. Provided, however, that appropriate steps are taken to ensure the protection of participants' privacy, *see infra* Part IV.C, it is difficult to see why they would bother doing this.

214. Cf. de Trenqualye, *supra* note 202 (establishing theoretical conditions under which it is rational for groups of people to disclose their preferences honestly).

215. This depends significantly on the absence of any financial incentives to the contrary; *supra* Part II.B.2 discusses where these incentives might come from and how they can be removed.

216. *See supra* note 135 and accompanying text.

c. One-User-One-Vote Effects

A DRM based marketplace is a “one dollar, one vote” system. As discussed above,²¹⁷ it might be possible to weight votes in a virtual market in order to create something similar (though not entirely identical because the amount of tax one pays in a virtual market is not a direct function of the number of works one consumes). In itself, this need not affect the information extracted from the system; while statistically some very enthusiastic purchasers of copyright works will have their tastes attenuated by this effect, if there are others whose similar tastes are being amplified, the results will be equivalent.²¹⁸ Inefficiencies only become an issue if there is a very strong correlation between certain tastes and a willingness to pay significantly more than the tax rate.

Under certain circumstances, where the range of consumer preferences is highly skewed, the lack of a true “democracy of dollars” might undermine the ability of users to support the production of high-value, small-market works. This is a drawback that should be counted against alternative compensation systems. The DRM model could avoid these limitations. This Article will argue, however, that there is an important ameliorating factor, which, although it does not eliminate “one user, one vote” problems, serves to significantly reduce them. It results from the application of virtual markets solely to digital information goods and solely to non-commercial uses of information.²¹⁹

First, consider the case in which a high-value, niche work might be produced and funded by large payments from a few wealthy contributors. Certainly, there are examples of these works — valuable paintings, sculptures, and prints; operatic and theatrical performances; and detailed market research and business intelligence documents. Among artistic works, though, a high-value nature is consistently associated with a high-quality, authentic item or experience, and with poor substitutability for mass-market copies. By definition, it is almost impossible for digital art to possess these properties. Lower value reproductions (recordings of operas, posters of artistic masterpieces) exhibit something which this Article terms the “phenomenon of near constant prices.”²²⁰ These more abundant goods could fit ele-

217. See *supra* Part II.B.4.

218. Cf. *supra* note 200 (linking optimality in public goods production mechanisms with symmetry in the distribution of preferences).

219. See *supra* Part II.B.5.

220. The observation here is simply that the market has arrived at very similar prices for different kinds of easily reproducible mass-market artistic and literary works. Most books, films, and sound recordings fall within a small range of prices despite the fact that their production costs vary enormously. To illustrate: two successful contemporaneous films, *The Blair Witch Project* and *Titanic*, cost vastly different amounts of money to make (\$1.5 million and \$260 million respectively, including marketing costs), but they, like almost all

gantly within a virtual market without causing problematic incentive distortions. Alternative compensation systems seem to handle these unusual cases reasonably well, even without recourse to the still-available addition of commission and patronage as sources of support for high-value, small-market digital artistry.²²¹

d. Network Effects and Contests Over the Definition of “Cultural Space”

Mark Nadel has argued that the role of advertising in cultural industries is problematic in a rather subtle way.²²² Copyright works play a crucial role in defining and manipulating something that this Article terms “cultural space”—the *lingua franca* of those interactions between individuals and amongst social groups that are mediated by culture. That perfectly natural role may, indirectly, lead to a wasteful dissipation of resources through marketing contests. If this is correct, it would be relevant to know whether alternative compensation systems could avoid such problems.

Many cultural goods create a subtle system of network externalities amongst their audience. Ordinary human interactions are regularly filled with references to both popular and niche culture, and the art and entertainment on consumes unavoidably colors one’s perspectives on the world. Many adults read Harry Potter novels rather than other works of fantasy so they can follow dinner party conversations, not because they expect to enjoy those particular books more. Naturally, building and exploiting networks around their products is an important strategy for copyright owners. As Nadel points out, the existence of cultural externalities results in marketing contests over the definition of cultural space; there are many tunes which are capable of

films, were sold to the public for virtually identical prices. *Blair Witch Project* DVD Liner Notes (stating that the *Blair Witch Project* cost \$22,000 to make); *Titanic* (1997 Movie), WIKIPEDIA: THE ONLINE ENCYCLOPEDIA, at http://en.wikipedia.org/wiki/Titanic_%281997_movie%29 (last visited Dec. 3, 2004) (stating that the *Titanic* cost \$200 million to make); *Blair Witch Casts a Strong Spell*, WIRED NEWS (Aug. 2, 1999), at <http://www.wired.com/news/culture/0,1284,21045,00.html> (stating that *Blair Witch* advertising costs were \$1.5 million); Pete’s Movie Page, at <http://www.petesmoviepage.com/Titanic/news2.shtml> (stating that *Titanic*’s advertising costs, domestic and international combined, were approximately \$60 million).

Similar disparities between production cost and retail price can be observed in the market for musical compositions and recordings. The situation is less clear for writing, where retail prices vary more widely, and production costs are less extreme; but to a large extent, these distinctions are caused by variations in the cost of the physical object itself (books are diverse, rivalrous objects), and the fact that the publishing industry really supplies many separate kinds of goods (books of photography having little in common with novellas).

221. *But see* Barlow, *supra* note 4 (arguing that a modern-day form of patronage plays an important role in supporting creators of digital works). In general, it appears quite problematic to depend on patronage, at least in the old-fashioned sense, for important kinds of cultural production. It is perhaps less drastic in the context of unusual, niche market works.

222. *See* Nadel, *supra* note 4, at 13–16.

capturing the human psyche, but only a few of them will top the charts.²²³

These expensive advertising contests are in some respects similar to the “race to invent” or “common pool problem” discussed in the literature on patent systems.²²⁴ There is no general solution to this problem unless the institutions that provide financial incentives can somehow obtain and respond to comparative information about all of the players competing for each niche in cultural space.²²⁵

On one level, exclusionary copyright and publicly funded rewards appear to suffer equally from races to define cultural space. Because virtual market returns mimic real market returns, there will be an excess of investment in marketing a few costly cultural products, even though society would be better off with a level playing field of more works, the best of which evolve to define cultural space. In mathematical terms, optimal cultural production can occur only when the returns on information goods are not just an increasing function of demand or value for the good, but also a decreasing function of the resources dissipated in embedding them in networks of cultural externalities. It is not at first obvious how institutions for financing creativity could achieve this.

While a formulaic solution to the problem is impractical, social processes made possible by a virtual market could conceivably mitigate redistributive problems. If users reward works according to both their subjective quality and the fact that they are not supported by strong marketing, then resource dissipation through races will decrease. Some people would be inclined to engage in this behavior naturally (“I’ll vote for independent bands as a matter of principle, even though I enjoy Britney’s music”), but it could also be explicitly encouraged. The extent to which it might succeed in short-circuiting marketing contests depends, of course, on the way that individuals make these tradeoffs, and lies well beyond the scope of the present inquiry. Regardless, it is apparent that the option given to people by virtual markets — to allocate remuneration that is not in strict proportion to consumption — is potentially advantageous.

223. See *id.*; cf. Moshe Adler, *Stardom and Talent*, 75 AM. ECON. REV. 208 (1985) (modeling a similar phenomenon, but using imperfect information, rather than preference-altering externalities per se). Adler only identified “luck” as the tiebreaker in these contests, while the author finds Nadel’s nomination of advertising more persuasive.

224. See, e.g., Wright, *supra* note 35, at 691, 693–94 (describing this effect, and surveying relevant comments in the literature).

225. Cf. *id.* at 694 (identifying conditions for a solution to the “race to invent” problem). Wright’s institutional solutions are not directly applicable to the present problem, because the roles of uncertainty and quality are different in the two kinds of markets.

e. Information About the Size of the Market

The preceding discussions have addressed the role of information in defining the relative value of different works. Another kind of information, which is also of great importance, relates to the total demand for digital culture — or equivalently, about the appropriate size of the market.

In an ordinary copyright marketplace, the volume of production is adjusted continuously as consumers spend more, or less, on cultural works. Virtual markets should in some way attempt to emulate this process. Some of the methods by which this could be achieved were discussed above, settling on contingent valuation surveys as the most practical and effective method of measuring total demand.²²⁶ Even if these surveys were producing excellent data, though, it is hard to see how they could be as reliable as a market-based solution.

This is not to say that exclusive rights guarantee an optimal level of cultural production. There are many aspects of copyright law that are the subject of political decision making — including the duration of rights, thresholds of originality, and the scope of fair use and other exceptions. Most of these decisions ultimately affect the size of the market. One need look no further than the retrospective Sonny Bono Copyright Term Extension Act of 1998 to see that governments can get these decisions completely wrong. And it has been demonstrated that, at least under some circumstances, strong exclusive rights can lead to overproduction.²²⁷

Because of the possibility of imperfections in the size of an alternative compensation system, market size information probably provides grounds for preferring the use of exclusive copyright. While it is not clear that the total volume of compensation would always (or even usually) be inappropriate, that possibility is clearly present. Although governments clearly make grave errors in setting copyright policies, most, but not all, of the ensuing negative consequences are unrelated to information revelation. It is safest to conclude that market size information should be counted in favor of DRM.

226. See *supra* notes 82–88 and accompanying text.

227. See Earl A. Thompson, *The Perfectly Competitive Production of Public Goods*, 50 REV. ECON. STAT. 1 (1968) (showing that a competitive market of public good producers, with perfect price discrimination, would result in excessive production). *But see* CORNES & SANDLER, *supra* note 13, at 243–48 (reviewing Thompson’s model and citing numerous authors who disagree with his premises). Interestingly, the extreme assumptions in Thompson’s analysis are probably more plausible for cultural works covered by omniscient DRM than for any other kind of public good.

f. Information Revelation as a Whole

Having examined the comparative informational properties of virtual markets and DRM-based copyright, it is apparent that one must consider a number of subtle effects when determining how much cultural producers should be paid. Neither institution can claim to be optimal; lack of transparency and contests over cultural space are clearly inefficient aspects of copyright markets, while the need to determine the size of a virtual market is potentially problematic, and the use of votes rather than dollars has some more peripheral drawbacks.

Under VMRS, market size effects might make entertainment industries less responsive to fluctuations in aggregate demand; at the same time, discouraging contests over cultural space, and avoiding of the need to “buy before you try,” might go some way toward reducing some excessive and objectively undesirable commercialistic aspects of modern cultural goods.

These informational phenomena would make the two systems genuinely different in economic terms, but it also seems that too many psychological factors are at work for economic models to be of much normative guidance on the matter. This Article would be reluctant to conclude that this aspect of the comparison could be anything other than ambiguous.

D. Economic Conclusions

Part III.C enumerated and examined diverse sets of points of economic comparison between virtual markets and technologically-enforced exclusive rights. This analysis is summarized in Table 1. One of those sets, relating to comparative informational imperfections, does not clearly favor either kind of remuneration system. Each model had a small efficiency lead in one set: the distortionary costs of taxation for DRM, and transaction costs for VMRS. Finally, there were two sets where virtual markets were clearly superior: deadweight loss and infrastructure costs.

After canceling terms, there are two major economic factors that favor VMRS, without comparable countervailing effects. Though tentative, the magnitude of the result indicates that society could, on the balance of probabilities, expect better outcomes under a well-implemented alternative compensation system than under a well-implemented system of technologically-enforced exclusive rights.

While various results in the economics literature apply to parts of this analysis, many aspects of this economic comparison deserve further research projects of their own. Even then, an overall conclusion could only aspire to reliability in the presence of solid experimental experience — experience that is unavailable, because at this juncture

virtual markets are hypothetical institutions, and DRM remains an immature and heavily contested branch of technology.

Table 1: Summary of Economic Comparison Between DRM and Virtual Markets

Factor (and sub-factors)	Immediate Effect Favors	Ameliorating Points	Conclusion
Artificial scarcity (Part III.C.1)	VMRS		Substantial advantage for VMRS
Price discrimination	DRM	Negative distributional side-effects possible	Mitigates artificial scarcity to some degree
Interactions with social inequality	VMRS	Only if welfare systems already prevent poverty	Amplifies cost of scarcity; limits price discrimination
Computer security and infrastructure costs (Part III.C.2)	VMRS		Substantial advantage for VMRS
Rights clearance transaction costs (Part III.C.3)	VMRS	Fair use and collective licensing	Clear advantage for VMRS
Distortionary taxation (Part III.C.4)	DRM	Use of taxes on complimentary goods	Likely to favor DRM
Redistribution effects can decrease inequality	VMRS		Clear benefit of VMRS
Information revelation (Part III.C.5)	Ambiguous	Numerous	Ambiguous
Non-payment signaling	DRM		Slight advantage for DRM
Lack of transparency	VMRS	Samples are effective for some goods	Advantage for VMRS for some media
One user, one vote effects	DRM	Phenomenon of near-constant prices	Slight advantage for DRM
Contests over cultural space	VMRS	Requires a culture of voting for unusual works	Difficult to quantify advantage for VMRS
Information about the size of the market	DRM	Copyright policy affects market sizes too	Likely advantage for DRM

It would be undeniably quixotic to expect a nation so large and so healthily skeptical of government as the United States to plunge headlong into an attempt to create virtual markets on the basis of nothing more than academic research. A more practical and prudent conclusion is that experimentation with alternative compensation systems is desirable. Such experiments should perhaps be encouraged in smaller, more “out of the way” markets where less is at stake, where the political obstacles might be less daunting, and where experience could be collected about the pitfalls associated with these systems. If the evidence then suggested that virtual markets could work efficiently in practice, larger nations might be in a position to seriously evaluate them as policy alternatives.

IV. IMPLEMENTING VIRTUAL MARKET REWARD SYSTEMS

Implementing a virtual market system for digital music and writing, even on a temporary, “experimental” basis, is a non-trivial prospect. As with any other proposal for large-scale infrastructure, consideration must be given to legality, technical feasibility, and to any unintended side effects that VMRS might entail. Even if virtual markets remain a purely hypothetical notion, the complexities and implications which would accompany an attempt to make them real should be included in any evaluation. This section comprises a set of brief observations on these issues.

A. Legal Requirements

1. Blanket Licenses

The minimalist approach to constructing a legalized virtual market would not involve an overhaul of the copyright system. Instead, a government could issue blanket licenses to cover the specific activities required by VMRS.

In particular, this would be a license for the exclusive rights of reproduction and communication to the public — as required by Article 8 of the 1996 World Intellectual Property Organization (“WIPO”) Copyright Treaty — and relevant neighboring rights. It would only cover copies made by individual citizens for non-commercial purposes, within the operation of and where remuneration is being provided by a virtual market. Other exclusive rights, such as the rights of publication or derivation, and rights for commercial uses of works, would be unaffected.²²⁸

228. The exclusive right of derivation raises another set of complicated normative challenges for digital copyright law. It is natural for authors examining alternative compensation systems to suggest that they should also replace derivation rights. See, e.g., PROMISES TO

It is important to note that numerous acts of reproduction — such as making works available for download by the citizens of nations not participating in the virtual market, or making unauthorized copies for commercial purposes — would still constitute copyright infringement.

Finally, in the long term, it might not even be necessary to make the VMRS license compulsory; provided the terms that authors and artists receive from it were fair, most rights holders should choose to participate voluntarily. In the context of a nation experimenting with the creation of a virtual market, however, a universal license would be indispensable in ensuring that rights clearance did not become an insurmountable obstacle to launching the system. Once the project had been running for a reasonable period, it would become possible to evaluate the need for universal coverage.

2. International Treaty Obligations

In the area of intellectual property, perhaps more than in any other area of policy, national rules are constrained by the mechanisms of international law. In particular, the Berne Convention for the Protection of Literary and Artistic Works,²²⁹ the World Trade Organization (“WTO”) Agreement on Trade-Related Aspects of Intellectual Property Rights (“TRIPS”)²³⁰ (which incorporates most of the Berne Convention), and the 1996 WIPO Copyright Treaty (“WCT”)²³¹ and Performances and Phonograms Treaty (“WPPT”)²³² constrain national sovereignty with respect to copyright. Each of these four treaties includes a codification of the so-called “Berne three-step test,” which sets out criteria that national exceptions to copyright would have to satisfy.²³³ Although there are other avenues for exceptions to some particular rights, none are sufficiently broad to address file sharing,

KEEP, *supra* note 47, at 234–36 (proposing that artists who include elements of others’ works within their own should be required to declare that fact, thereby passing a relatively small fraction of the revenue from the modified work back to the creator of the original); cf. Netanel, *supra* note 47, at 38–39 (suggesting that exemptions from the exclusive right of derivation should only be available for non-commercial purposes, and that all of the remuneration for those modified works should flow to the original artist). While these proposals have some attractive features, it seems that the question of derivative works remains to some degree independent of the central problem of reproduction.

229. The Berne Convention for the Protection of Literary and Artistic Works, Sept. 9, 1886, 828 U.N.T.S. 221 (Paris revision, July 24, 1971) [hereinafter Berne Convention].

230. Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, available at http://www.wto.org/english/tratop_e/trips_e/t_agm0_e.htm [hereinafter TRIPS].

231. WIPO Copyright Treaty, adopted Dec. 20, 1996, S. Treaty Doc. No. 105-17, 36 I.L.M. 65 (1997) [hereinafter WCT].

232. WIPO Performances and Phonograms Treaty, adopted Dec. 20, 1996, S. Treaty Doc. No. 105-17, 36 I.L.M. 76 [hereinafter WPPT].

233. For further discussion of the spread of the three-step test, see Thomas Heide, *The Berne Three-Step Test and the Proposed Copyright Directive*, 21 EUR. INTELL. PROP. REV. 105 (1999).

for example. The three-step test was devised during the 1960's to ensure that nations could not use exceptions to dilute the exclusive rights with which copyright was constructed. Unsurprisingly, it could not anticipate the more vexed problems of digital copyright, and it is entirely possible that it precludes experimentation with policy proposals such as virtual markets, which are designed to address them.

Article 13 of TRIPS, on Limitations and Exceptions to copyright, is the most important instantiation of the three-step test,²³⁴ not least because conformance with TRIPS is a World Trade Organization membership condition, and WTO dispute resolution mechanisms can be used to enforce it against recalcitrant nations. Article 13 reads:

Members shall confine limitations or exceptions to exclusive rights to certain special cases which do not conflict with a normal exploitation of the work and do not unreasonably prejudice the legitimate interests of the right holder.²³⁵

The juridical interpretation of this terminology is made difficult by its broad scope and the generality of the language. A number of legal commentators have explored the test in great depth,²³⁶ and there has been one WTO panel ruling dealing with the legality of United States secondary broadcast performance exemptions under Article 13.²³⁷ There has also been one WTO panel ruling on TRIPS Article 30, which is a derivative application of the three-step test to patents.

234. Note that the terminology of WCT Article 10, and Article 9(2) of the Berne Convention is slightly less restrictive, referring to the "author" rather than the "right holder." WPPT Article 16 refers to the "performer or producer of the phonogram." The Berne article covers only the exclusive right of reproduction, and is thus significantly weaker. The result of ratifying all of these variants of the test, however, is a conjunctive requirement that is slightly more constraining than TRIPS alone.

235. TRIPS, *supra* note 230, at art. 13.

236. See SAM RICKETSON, THE BERNE CONVENTION FOR THE PROTECTION OF LITERARY AND ARTISTIC WORKS: 1886–1986, at 482–89 (1987); Jane C. Ginsburg, *Toward Supranational Copyright Law? The WTO Panel Decision and the "Three-Step Test" for Copyright Exceptions*, 187 REVUE INTERNATIONALE DU DROIT D'AUTEUR 3 (2001); Mihály Ficsor, *How Much of What?: The "Three-Step Test" and Its Application in Two Recent WTO Dispute Settlement Cases*, 192 REVUE INTERNATIONALE DU DROIT D'AUTEUR 110 (2002).

237. See WTO Dispute Settlement Panel, *Report on Section 110(5) of the United States Copyright Act*, WT/DS160/R (June 15, 2000), available at http://www.wto.org/english/tratop_e/dispu_e/1234da.pdf [hereinafter WTO Panel]. The two exemptions in question allowed shops, bars, and restaurants to play radio or television broadcasts on their premises without licenses from collecting societies. One exemption covered the use of a single "homestyle" stereo or television and was allowed by the WTO. The other exemption covered premises smaller than a certain size or using fewer than a certain number of speakers or televisions (and was held to violate Article 13). For an extensive commentary on the licensing regimes and politics which led to the dispute, see Laurence R. Helfer, *World Music on a U.S. Stage: A Berne/TRIPs and Economic Analysis of the Fairness in Music Licensing Act*, 80 B.U. L. REV. 93 (2000).

It would not be productive to reproduce here the voluminous reasoning available in these sources. Instead, this Article will attempt to highlight the aspects of the test that interact with proposals for alternative compensation systems, and to identify the points of jurisprudence that are most important in allowing or disallowing VMRS under Article 13.

1. Blanket licenses can only be granted in “certain special cases.” It would be straightforward to argue that a VMRS exception would not be a special case because it is not a “narrow” license for the right of reproduction.²³⁸ Such an exception would cover many works for many users. Although this is true, it relies on the strictest linguistic interpretation possible. Of all the myriad ways and contexts in which rights of reproduction could be infringed, downloads that are part of a specifically organized public reward mechanism are peculiar and limited, and in the ordinary English usage of the expression, they are certainly a special case of infringement.
2. Blanket licenses may not conflict with “a normal exploitation of the work.” This requirement poses the greatest hurdle for VMRS legality. Attempts to interpret it are fraught with circularity, since legal exceptions, cultural practices, and changing technology all conflate in defining “normality” (and each other).

There are two fundamental senses in which “normal exploitation” can be read — a positive measure of how works are used and a normative statement of how they should be used.²³⁹ The WTO panel stated that it should measure both.²⁴⁰

238. The WTO dispute settlement panel has stated that the word “special” should be interpreted as meaning “narrow.” See WTO Panel, *supra* note 237, ¶ 6.109. Dictionaries are more likely to suggest partial synonyms such as “peculiar,” “exceptional,” “distinctive,” or “limited.” The panel report itself cites several definitions from the *Oxford English Dictionary*: “having a limited application or purpose,” “containing details; precise; specific,” “exceptional in quality or degree; unusual; out of the ordinary,” or “distinctive in some way.” *Id.* The word “narrow” adds a further, significant constraint beyond all of these meanings; it would perhaps be equivalent to “having limited application or purpose,” but not “having a limited application or purpose.”

239. The strength of the normative component may not be apparent from a direct reading of the test itself. It can, however, be found in the 1964 report of a Study Group set up by the Swedish Government and the Bureaux Internationaux Reunis pour la Protection de la Propriete Intellectuelle (“BIRPI”), the predecessor of WIPO — the original proposal that evolved into the three-step test. The Study Group stated that “all forms of exploiting a work, which have, or are likely to acquire, considerable economic or practical importance, must be reserved to the authors.” WTO Panel, *supra* note 237, at ¶ 6.179. Although the form of Berne Article 9(2) changed through political debate at the Stockholm conference, see Ficsor, *supra* note 236, §§ II.1–3, casting ambiguity on its enactors’ intentions, returning to the original Study Group documents for interpretation of the test seems to be allowed under Article 32 of the Vienna Convention on the Law of Treaties.

The panel went on to state that exceptions would conflict with the normal exploitation of a right “if uses, that in principle are covered by that right but exempted under the exception or limitation, enter into economic competition with the ways that right holders normally extract economic value from that right to the work . . . and thereby deprive them of significant or tangible commercial gains.”²⁴¹

It is thus likely that if the blanket license which enabled VMRS curtailed forms of exploitation of considerable economic importance, it would be found to violate Article 13 of TRIPS. On the other hand, if the reality of peer-to-peer file sharing, the ineffectiveness of technical protection measures, and the comparatively small size of licensed download markets deny some copyright holders a “normal exploitation” of their work on the Internet, then in those cases a blanket license might constitute, rather than conflict with, the normal use of the work.²⁴²

3. Blanket licenses must not “unreasonably prejudice the legitimate interests of the rights holder.” The dispute settlement panel indicated that a significant part of this step involves evaluating the economic harm suffered by copyright owners.²⁴³

Although the panel left open the possibility of considering normative factors other than economic value when identifying “unreasonable prejudice” to rights holders’ “legitimate interests,” any such factors largely overlap the “normal exploitation” step of the test.²⁴⁴

It therefore seems that if the blanket licenses in question are able to pass the second step of the test, being demonstrably the most practical means of rewarding authors for digital distribution of their works, then, if properly funded and fairly administered, they would not unreasonably prejudice those authors’ legitimate interests.

With its extremely high minimum requirements for exclusive rights, TRIPS poses a formidable barrier to constructive reform of (or

240. See WTO Panel, *supra* note 237, ¶ 6.166.

241. *See id.* ¶ 6.183.

242. Ginsburg implies something similar when considering digital private copying exemptions: “an exception for large-scale ‘private’ copying of the ‘sharing’ type might well conflict with a normal exploitation (*assuming the copyright could be enforced in this kind of situation*).” Ginsburg, *supra* note 236, at 16 (emphasis added).

243. See WTO Panel, *supra* note 237, ¶¶ 6.227, 6.229.

244. Cf. Ginsburg, *supra* note 236, at 16 (arguing that private copying exceptions are endangered by the second step).

even experimentation with) the structure of national copyright systems. Adjustments to TRIPS require an international consensus and would not occur if any major rights holder objected strenuously.²⁴⁵ Should a nation try to deploy a virtual market reward system, it must consider what changes in jurisprudence would be required for a dispute resolution panel to allow VMRS under Article 13. Following the reasoning above, it would be necessary to resolve two key jurisprudential issues and satisfy one key empirical condition about the circumstances under which the virtual market appears.

The empirical condition requires that DRM — technologically mediated copyright — fail to deliver satisfactory mass-markets for information goods. Peer-to-peer file sharing would have to be prevailing in competition with licensed music download services. This condition is also an important political prerequisite for VMRS, and it is therefore unlikely that the matter would reach a WTO dispute settlement panel if digital copyright was proving workable. Any government defending a virtual market license would likely appear before a dispute settlement panel equipped with significant evidence of DRM's practical shortcomings.

The first legal issue relates to the panel's determination to read the first part of Article 13 as a stringent constraint on the ability of sovereign states to adjust their approach to copyright in response to public policy dilemmas. If the WTO reads the term "special" as "narrow"-ly as possible, then VMRS (and indeed almost any digital private copying measure) is clearly precluded. On the other hand, if "certain special cases" is read literally, then these kinds of blanket licenses should be admissible.²⁴⁶

The second legal issue hinges on whether the failure of DRM to prevent widespread unauthorized sharing of information goods would allow virtual markets to avoid conflicting with the "normal exploitation" of works. One point that complicates this question of "normalcy" is the role of states in policing copyright and adopting "TRIPS plus" policies. It is quite possible that in states where TRIPS and WCT standards are implemented predominantly by providing civil remedies, "user pays" enforcement will prove insufficient to make DRM workable. Digital exclusive rights might require large taxpayer expenditure on the policing of copyright, indirect public expense by

245. The debate over TRIPS and access to essential medicines in developing countries is illustrative here. Despite being an issue of exceptional political potency, developing countries and NGOs could achieve only an interpretive concession at the Doha WTO meeting in November 2001. Even after that point, it took some time for the U.S. administration to accept compulsory licensing and parallel importation as a legitimate solution to health crises in Africa. See Consumer Project on Technology, Patent Exception for Exports to Address Health Needs, at <http://www.cptech.org/ip/wto/p6/> (last visited Dec. 3, 2004) (containing articles and resources chronicling the essential medicines debate).

246. *See supra* note 238 and accompanying text.

requiring ISPs to take a proactive role in copyright enforcement, or the enactment of specific laws that curtail file sharing.²⁴⁷ If these phenomena were to occur in some states and not in others, differing pictures of the “normal” use of copyrighted works might arise.

The Berne three-step test was devised as a mechanism to reinforce a model of copyright based in exclusive rights. The remarkable *realpolitik* of intellectual property has seen the test globalized and reinforced as a component of an all but ubiquitous set of trade institutions. The virtual market model is inherently based on the theory that exclusive rights are not the most efficient or practical mechanism for regulating consumer use and access to digital culture. Article 13 of TRIPS is certainly the eye of a needle, and perhaps alternative compensation systems have some cameliform tendencies. Nonetheless, because the test is based on descriptive principles and constructed with English words, it might just prove itself flexible enough to allow some limited experimentation with virtual markets. If such experiments prove successful, then TRIPS might become a less substantial obstacle to alternative compensation systems.

B. National Versus International Virtual Markets

While it is simplest and undeniably tempting to analyze the economics of incentive structures as an isolable question of government policy, the reality of copyright is inherently multilateral. Since a global transition from exclusive copyright to virtual markets is inordinately improbable, any approach to VMRS would not only have to be localized and experimental, but would also have to mesh — at least to some degree — with the existing system of international trade in information goods.

The need to have alternative compensation mechanisms running side-by-side with traditional copyright systems, separated only by permeable national borders, gives rise to some concerns. Would not the whirlwind of file sharing and digitization encouraged by the virtual market of the hypothetical Republic of Freedonia destabilize the vigorously enforced, licensed and digitally rights-managed endeavors of neighboring Copyrightland? Would many of those unencrypted files find their way onto Copyrightland’s computers?

The answer, to some extent, must be yes. Such transfers would not be legal on either side of the border,²⁴⁸ but they would occur. If the DRM systems deployed in Copyrightland were watertight, then cross-border piracy of this sort would pose a distinctive threat to the sustainability of Copyrightland’s policies; but, as this Article has ar-

247. Such as those whose proposal sparked the debates previously cited. *See supra* note 10.

248. *See supra* Part IV.A.1.

gued, watertight DRM is likely to be prohibitively expensive.²⁴⁹ For Copyrightland's DRM systems to be sustainable, they must successfully "compete with free" within Copyrightland itself. Thus the existence of additional free material from Freedonia poses no greater threat to copyright in Copyrightland than the existence of digital technology alone.

Another question raised by the operation of reward systems in a global context is whether most of the taxation revenue distributed by the virtual market of Freedonia would be sent to foreign publishing companies, authors, and artists. Taxpayers might be disinclined to support that state of affairs, thereby undermining the stability and feasibility of VMRS. A similar dilemma confronts countries operating private copying and public lending rights schemes today, though on a smaller scale.²⁵⁰

One predictable political response to this situation would be to constrain the fraction of virtual market funding which could flow overseas. Such proposals might be based on reciprocity in flows of rewards (if other countries have also implemented VMRS) or in flows of ordinary copyright royalties. Arguments would no doubt be made that the total amount flowing from Freedonia to Copyrightland should be limited to the total flow of comparable copyright royalties from Copyrightland to Freedonia. A system of reciprocity in funding for cultural production might find some supporters in certain quarters of states (other than the United States) that are particularly critical of processes of "cultural globalization." Legally, this approach is all but precluded by the national treatment principle embodied in international treaties on intellectual property.²⁵¹ According to that norm, virtual market funding which replaced the royalties of the copyright marketplace would have to be distributed without consideration of national boundaries.

The best solution to the political problems of imbalanced cultural trade may be to emphasize that the responsibility for these transfers lies with taxpayers themselves. This would be precisely the case if each VMRS participant had exact control over his or her own tax contribution,²⁵² but should also be possible even if there is some redistribution of votes in the process. The logic of a virtual market with national treatment is the same as the logic of a free market in gen-

249. *See supra* Part III.C.2.

250. *See, e.g.*, Michael Rushton, ECONOMIC IMPACT OF WIPO RATIFICATION ON PRIVATE COPYING REGIME (2002) (report prepared for Canadian Heritage Department's Copyright Policy Branch), available at <http://www.pch.gc.ca/progs/ac-ca/progs/pda-cpb/pubs/ompi-wapo/wapo.pdf>.

251. Article 5(1) of the Berne Convention on Literary and Artistic Works, and Article 3 of TRIPS, implement "national treatment," which requires that any rights granted domestically by a member state to its own authors must also be granted for works originating in other signatory states.

252. *See supra* Part II.B.4.

eral — Freedonia's dollars are moving offshore precisely when Freedonia's taxpayers are sending them there. It is then up to each individual to weigh the value of different goods, including their contribution to cultural diversity and the parochial interest of supporting the local economy — in the same way that this occurs in ordinary, private goods markets or in the existing copyright system.

C. Privacy Implications

Would an alternative compensation system result in massive violations of individual privacy?²⁵³ In the long run, a virtual market would contain a database of the cultural and informational preferences of every individual in an entire society. Private information about intellectual consumption should be shielded, not only by laws preventing the use of information pertaining to individuals, but by cryptographic mechanisms which ensure that such information could not be extracted at all.

The voting or download mechanisms in a virtual market would be most wisely implemented using a system of pseudonymous identities,²⁵⁴ so that at first inspection it would be possible to tell that some participating citizen had registered a particular set of votes, but not identify that citizen directly. The important variable in this arrangement is the strength of pseudonymity. Depending on the method by which keys are allocated to the public, it would be possible to achieve strong or weak identity protection.

In a strong scheme, the identities would be created using "blind signatures."²⁵⁵ In that case, the government would be able to tell that it has authorized a particular pseudonym, but unable to determine which authorized user is employing it.

In a weak scheme, identities would be certified by a so-called "fair blind signature,"²⁵⁶ which allows a "trusted third party" ("TTP"), such as a judge, to remove pseudonymity in cases where there is evidence of fraud. The TTP's records would have the potential to reveal the reading and listening habits of every member of society, and a design that left open the possibility of indiscriminate access to these records would be unwise. It would be necessary for pseudonymity-

253. It is not only alternative compensation systems that have troubling privacy implications. The difficulty of protecting personal information under DRM may even be greater. See, e.g., Julie E. Cohen, *DRM and Privacy*, 18 BERKELEY TECH. L.J. 575 (2003).

254. See *supra* note 67.

255. See David Chaum, *Blind Signature System*, in PROC. CRYPTO 83, 153 (D. Chaum ed., 1984).

256. See Markus Stadler et al., *Fair Blind Signatures*, in PROC. EUROCRYPT '95, at 209 (1995), available at http://www.ubilab.org/publications/print_versions/pdf/sta95.pdf. An alternative signature scheme would be "magic ink" signatures. See Markus Jakobsson & Moti Yung, *Distributed "Magic Ink" Signatures*, in PROC. EUROCRYPT '97, at 450 (1997). In that case, the role of a TTP is replaced by a quorum of signing servers.

compromising information to be stored offline. It would also be wise to split the TTP role between several different organizations,²⁵⁷ all of which would have to cooperate in order to reveal a VMRS participant's identity.

Even if the very strong steps this Article suggests are not taken, virtual markets would do little to decrease online privacy. In individual cases, law enforcement agencies already have access to much more revealing information through sources such as "Carnivore" devices at ISPs²⁵⁸ or through the monitoring of email traffic on the Internet backbone. When used, Carnivore gives the U.S. government knowledge about when individual Americans browse the web, what they have read and what they have searched for. Resourceful hackers are perfectly capable of turning computers that they control into their own private equivalents of Carnivore.

It is true that knowledgeable Internet users can find ways around online surveillance — software such as GnuPG²⁵⁹ or PGP,²⁶⁰ and services such as Hushmail,²⁶¹ can provide secure email systems; anonymizing proxies allow (limited) browsing privacy.²⁶² Note, however, that maintaining one's digital privacy is a difficult activity that few individuals will likely motivated to pursue. Most of the exceptions are likely to be the technically adept, people with strong political opinions about privacy, or intelligent criminals. It is only people in these groups whose privacy stands to be substantially affected by either DRM or VMRS — and it is precisely these same groups that are most likely to possess the technical wherewithal to continue obtaining information goods through unlicensed (underground or offline) channels.

D. Impacts upon Existing Structures of Cultural Production and Distribution

Virtual market models are likely to disrupt existing economic structures for cultural production and distribution. One may pause to wonder whether virtual markets would cause the role of the publisher

257. These organizations could include NGOs as well as public sector institutions.

258. Carnivore appears to comprise a filtering packet sniffer and post-collection analysis software. For further information, see Electronic Privacy Information Center, EPIC Carnivore FOIA Litigation (May 28, 2002), at <http://www.epic.org/privacy/carnivore>.

259. The "GNU Privacy Guard." See The GNU Privacy Guard, at <http://www.gnupg.org> (last visited Dec. 3, 2004).

260. "Pretty Good Privacy." See PGP Corporation, at <http://www.pgp.com/> (last visited Dec. 3, 2004).

261. See Hushmail-PGP Compatible Secure Free Email-Login, at <http://www.hushmail.com> (last visited Dec. 3, 2004).

262. Traffic analysis and pattern recognition attacks render all but the most extravagant anonymization efforts transparent. See Ronggong Song & Larry Korba, *Review of Network-based Approaches for Privacy*, in PROC. 14TH CAN. INFO. TECH. SEC. SYMPOSIUM (2002), available at <http://citeseer.nj.nec.com/song02review.html> (surveying research in this area).

to gradually shrink and disappear. Independently of the fate of publishers, explicit encouragement of the use of digital works at zero marginal cost would likely result in the rapid “cannibalization” of markets for physical information goods (such as books, CDs, or DVDs) by an alternative compensation system. These paired effects would be traumatic for the numerous people currently employed in these sectors of the entertainment industry. The prospect of cannibalization also undermines the possibility of incremental introduction of alternative compensation systems that only replace those revenues lost to rights holders from file sharing.²⁶³

Fortunately, the extent of these effects is not quite as disruptive as might at first be imagined, especially when disruptions in information production already occurring in the transition from a marketplace based on physically embodied information goods to one based on digital files are discounted. Consider the role of publishing companies. Publishers often make indispensable contributions that assist authors in producing written works. They organize and conduct the editing, layout, and marketing of books — digital or otherwise — and they may regularly shoulder some of the risk in a publishing venture by paying the author an advance. All of these roles have close or identical equivalents in other cultural industries — and all of them continue to be relevant and necessary in a virtual market. The one significant task that publishing companies lose under VMRS is that of a clearing-house for digital rights to the works they have published, and it does not seem that this alone would constitute catastrophic disruption.

Other organizations that will likely be disadvantaged by virtual markets are those involved in the distribution and sale of physical information goods. If virtual markets are funded by general taxation, then music and book stores, for example, might charge that VMRS represents a cross-subsidy to digital media, one that places them at a significant disadvantage. While these effects are likely to occur anyway as technologies for purely digital distribution improve, it is correct that if VMRS applies only to works distributed on the Internet, then it does amount to a cross-subsidy.

One possible answer to this problem may be to identify ways in which virtual market votes could also apply to non-digital works.²⁶⁴ For example, a record store might be able to sell royalty-free CDs of custom-burned songs, provided the purchasers were making corresponding virtual market votes at the same time. Similarly, book stores could sell titles at royalty-discounted rates, or use print-on-demand systems to sell works that they do not have in stock. Ideally, this kind

263. See Liebowitz, *supra* note 82, at 6.

264. Rather than operating through a blanket license, arrangements like this for physical works might require permission from rights holders.

of intervention would reduce the cost of books and CDs by the rate of royalties paid, leaving consumers free to choose whichever distribution medium they prefer, at prices that reflect the underlying costs of those media.

E. The Prospect of Censorship

If artists are dependent on VMRS for their incomes, then a government that decides to engage in censorship might be able to avail itself of direct control over the financing of cultural production. Opponents of censorship might regard this as a serious disadvantage of VMRS.

On close examination, it is not genuinely clear that VMRS would be any better for censors than a system of copyright patrolled by technology. A DRM mechanism would almost certainly require centralized processes for rights clearance and policing; if a government is intent on denying censored authors access to remuneration, they could do so almost as easily under an infrastructure of digital exclusive rights.²⁶⁵

Artists attempting to distribute censored material have found, and will continue to find, the Internet to be a useful medium. Whether or not they will be able to claim substantial payment for their efforts is another issue — but it is not really affected by the “legitimate” incentive structures created and supported by governments.

Separate from the concern that an alternative compensation system would facilitate censorship is the possibility that it would make censorship more politically probable. The problem here is the involvement of taxpayer money; those who pay tax while taking exception to particular kinds of works would soon be clamoring to have the system sanitized. One way of circumventing this difficulty lies in guaranteeing that each user’s dollars go exclusively to works that they themselves appreciate.²⁶⁶

Issues of censorship, and indeed most of the considerations discussed in Part IV, are of genuine importance and should not be brushed aside. At the same time, all of these matters are resolvable and most of them manifest in a strikingly similar way under DRM systems. If and when a country is willing to actually consider experimenting with an alternative compensation system, it does not appear that any of them would prove impractical to address.

265. See Lynch, *supra* note 93 (arguing that DRM may in fact be a particularly useful tool for facilitating censorship). The author is inclined to suspect that DRM will not have much effect in cases where authors want to distribute their banned material anyway.

266. See *supra* Part II.B.4. Eugene Volokh observed (by personal communication) that this scheme can be used to address the political problems of pornography under reward systems.

V. CONCLUSIONS AND COMMENTS

A. Outstanding Objections

The argument presented in this Article — that VMRS systems might well produce more better outcomes for society than DRM-enforced copyright — is reasonably robust. It is still useful to examine some of the more common objections to virtual markets.

The government simply has no role to play in information markets. This is a common ideological objection to VMRS. It is, however, somewhat inconsistent as a defense of DRM, because the government must create and police a costly infrastructure of exclusive rights, anti-circumvention laws, and possibly standards, in order for DRM to work.²⁶⁷ Therefore, rather than representing a choice between regulation and free markets, DRM and VMRS embody two different forms of regulatory infrastructure.²⁶⁸

It is also worth noting that the instinctive mistrust of government intervention in the marketplace is usually inspired by corruption or inefficiency in public monopolies. Because VMRS ties the hands of government, admitting only a small bureaucracy to administer the public's votes, it is relatively resistant to these modes of failure.

Having said this, it is clear that libertarians (who place an ethical concern for liberty ahead of utilitarian concerns about the welfare of society) have reason to prefer completely non-coercive systems of cultural production, such as the “street performer protocol” and its variants²⁶⁹ to either virtual markets or exclusive rights.

Artists would be in a very vulnerable position if they depended on government for their income. This objection seems at first to have some validity. A more cynical observer might also say, however, that artists who depend on record companies, radio stations, or on the administrators of DRM systems, may suffer from a similar problem. Whenever creative workers rely on some form of infrastructure for their income, there is the possibility that the infrastructure will not meet their needs — or that the infrastructure itself will find some way of appropriating the value of their work.

By making VMRS as transparent as possible, and by giving the public a great deal of say in the scope and allocation of rewards, it

267. At this point, it is unclear to what extent governments will become seriously involved in setting DRM standards. See Drew Clark & Bara Vaida, *Digital Divide*, NAT'L J., Sept. 6, 2002, at <http://nationaljournal.com/about/njweekly/stories/2002/0906nj1.htm>; Susan P. Crawford, *The Biology of the Broadcast Flag*, 25 HASTINGS COMM. & ENT. L.J. 603 (2003).

268. Cf. Thomas B. Macaulay, *A Speech Delivered to the House of Commons*, Feb. 5, 1841, quoted in WILLIAM PATRY, 3 COPYRIGHT LAW & PRACTICE 1686 (1994) (famously observing that copyright “is a tax on readers for the purpose of giving a bounty to writers”).

269. See *supra* notes 11–13 and accompanying text.

would at least be possible to build a system that guarantees artists a fair return for their work. In a digital context, it is not clear that any other scheme can reliably achieve this goal.

VMRS reduces the number of choices creators have for the distribution of their work. This is a valid concern that results from the issue of blanket licenses for a VMRS system. Whereas authors currently have the choice of different publishers, or the option of self-publishing online,²⁷⁰ under a VMRS the system sets the default conditions under which digital material is distributed. While the virtual market would provide authors with an important, sustainable, and previously unattainable alternative, a restriction of other options is a legitimate cause for concern.

The natural solution is to give authors the opportunity to object and exclude their work from the VMRS system. This may or may not be a net positive policy during the initial stages of a virtual market, when an expansive catalogue would be necessary to encourage public participation, and skepticism among publishing interests would be highest. If a stable and popular alternative compensation system can be created, these issues might be much less pressing, and creators could enjoy the right to “opt-out” if, for some reason, they regarded a virtual market as problematic.

B. Epilogue: Towards Information Democracy?

What to do about digital copyright can, without exaggeration, be characterized as the most important policy question arising from the advent of networked digital computers. Lawmakers have set out to strengthen this form of regulation while nature conspires to do away with it. This is an unsurpassed recipe for disharmony — but as this Article has endeavored to demonstrate, there are real alternatives to the present course of attempting to implant copyright into the digital world.

The whole issue illustrates a subtle but profound limitation in the policy treatment of technological development. After a decade of the widespread use of networked computers, people have reached a fairly deep understanding of the way that these tools can be employed to serve private ends. But in some matters — cultural production is a perfect example — where the aggregated pursuit of private interests may be insufficient to achieve the public good, the assistance that digital technology could offer remains largely unexplored. It is entirely possible that applied correctly, digital technology could make constructive new forms of economic organization both feasible and

270. Assuming, of course, that they are willing to make their own peace with piracy or distribute their work for free.

efficient. This Article is just one attempt to guess at what some of those forms might be.

Whether or not the “virtual market” is the right way to go forward, it seems that wise societies should be searching for ways to ensure that technology grants their citizens the greatest possible access to art, knowledge and learning, greater opportunities for creativity and collaboration, and greater sovereignty over the world around them. This, perhaps, is an ideal of “information democracy” that lies between the extremes of “information anarchism” and “information feudalism.”

The challenge is one of inertia. The metaphor of physical property, in its application to books, sheet music, vinyl records and video tapes, may have done past societies more good than harm. It would be an irresponsibility of the highest order if that increasingly stretched and ill-fitting metaphor were allowed to preempt serious consideration of how future societies should govern the relationships between authors, artists, and publishers, and the rest of their citizens.

Readers with the professional habit of reasoning in the logic of copyright law will no doubt perceive some of the notions proposed in this Article as radical departures from established institutions. This perspective, however, is inherently susceptible to underestimation of the degree to which “digital rights management” is in turn a radical imposition on the natural logic of the computer. In this matter, it seems, we are all radicals. Given the weight and novelty of the issues at work, we should choose our stripes carefully.