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

Peter Eckersley[†]

ABSTRACT:

The Internet and Copyright Law are particularly ill-suited to each other. One is designed to give as much information as possible to everyone who wants it; the other allows authors, artists and publishers to earn money by restricting the distribution of works made out of information. The beneficiaries of copyright law are lobbying for the re-design of computers and the Internet to instate "content control" and "digital rights management" (DRM). These technologies are intended to make copyright workable again by re-imposing limits on access to information goods, but they carry high direct and indirect social costs.

One alternative, which has generally received much less attention and legislative support than DRM, is to allow free distribution of works for non-commercial use, while restructuring digital copyright law so as to remunerate authors in ways which avoid those exclusive rights models which are incompatible with the Internet. This paper introduces the concept of a "virtual market" — a decentralized, software-mediated, publicly-funded mechanism which rewards digital authorship and artistry, without restricting flows of information. The virtual market is a sort of "mirror image" of a real marketplace, assigning market-like valuations to works, without an actual process of exchange. The normative economic implications of these systems are considered in detail, along with some of the technological requirements and other practical aspects of their implementation.

This article concludes that virtual markets avoid the very high artificial scarcity ("deadweight loss") and infrastructure costs associated with DRM, and should be seriously considered as a public policy alternative to strengthening copyright law. Furthermore, while there is already a robust case for such alternative compensation systems for musical works, the nature of text and of DRM technology mean that, in time, the need for alternatives to exclusive rights will be even greater for written works.

[†]Department of Computer Science & Software Engineering, and Intellectual Property Research Institute of Australia, University of Melbourne. Email: pde@cs.mu.oz.au. I would like to thank the numerous people who have provided valuable assistance, advice, discussion and criticism during the course of this research project. These include, but are certainly not limited to, Alan Blair, David Brennan, John Cahir, Andrew Christie, Andrew Clausen, Peter Drahos, Suelette Dreyfus, Alison Firth, Terry Fisher, Glenys Fraser, Katerina Gaita, John Gilmore, Volker Grassmuck, Paul Harrison, Ryan Lampe, David Lindsay, Jamie Love, (Professor) Stephen P. King, James McCaw, Lee Naish, Neil Netanel, Toby Ord, Sarah Moritz, Richard Owens, Greg Pomerantz, Miriam Powell, Ron van Schyndel, Felix Stalder, Alan Toner and Eugene Volokh. I am also indebted to seminar participants in the computer science departments of Stanford, the University of Melbourne, the University of Sydney, and Cambridge, and in the law schools at N.Y.U. and Melbourne; as well as attendees at HAL 2001 at the Universiteit Twente, Open Cultures: Free Flows of Information and the Politics of the Commons, the 2003 Annual Congress of the Society for Economic Research on Copyright Issues, and the Berkman Center for Internet and Society's 2003 meeting on Alternative Compensation Systems. All errors are my own.

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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 restrictions on access to and reproduction of works, collectively form an ongoing crisis for copyright.

The problems of property privileges in digital information goods have been recognized clearly at least since John Perry Barlow's 1994 essay "The Economy of Ideas'".[3] They have been the subject of extensive study, debate, and hypothesization. The core difficulty remains that it is simply very ambitious to try to limit the distribution of a thing, when that thing can be reproduced by almost anyone, across great distances, with perfect fidelity, 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 which 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 present in Barlow's original essay. The first, which I shall call "information anarchism",

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[1] *See* Napster v. A&M Records, 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 examples, some of which have themselves proved vulnerable to lawsuits from the music industry, include Aimster (*see in re* Aimster, 334 F.3d 643 (7th Cir. 2003)), AudioGalaxy (*see* Kennon Ballou, *RIP Audiogalaxy*, KURO5HIN, Jun. 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*, *in* PROC. 2001 ACM SIGCOMM CONFERENCE, 149 (2001), 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*, *in* H. Federrath, ed., PROC. ICSI WORKSHOP ON DESIGN ISSUES IN ANONYMITY AND UNOBSERVABILITY (2001), 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. KENTUCKY L.J. 660 (2001). The extent to which they are susceptible to regulation enforced by Internet Service Providers (ISPs) depends on 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 MAG. March 1994, 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.

advocates the abolition or at least dilution of copyright on the Internet, and claims that the production of music and writing would not be seriously affected. Most information anarchists claim that the death of the copyright system is desirable, inevitable, or both.[4]

Barlow's essay also explored the other side of the current debate, through his description of an approach called "crypto bottling". That idea has now evolved into Digital Rights Management (DRM),[5] which is generally advocated by publishing industries. DRM seeks to reinstate copyright in the online environment by using 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] Because of the nature of networked computers, anything less than an absolute dominion of exclusive rights will provide loopholes for the public to abscond with precious digital goods.

At a practical level, attempts to create real-world DRM systems have involved not only

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[4]For some noteworthy examples of these perspectives, see Brian Martin, *Against Intellectual Property*, 21 PHIL. & SOC. ACTION 7 (1995), http://www.uow.edu.au/arts/sts/bmartin/pubs/95psa.html; Eben Moglen, *Anarchism Triumphant: Free Software and the Death of Copyright* FIRST MONDAY Aug. 1999, *at* http://www.firstmonday.dk/issues/issue4_8/moglen/; John Perry Barlow, *The Next Economy of Ideas* WIRED MAG. Oct. 2000, http://www.wired.com/wired/archive/8.10/download.html; Courtney Love, *Courtney Love does the math* SALON Jun. 2000, *at* http://dir.salon.com/tech/feature/2000/06/14/love/index.html. Compare Stephen Breyer, *The Uneasy 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 Join Center, Related Publication 03-1, Jan. 2003, http://www.aei.brookings.org/admin/pdffiles/Nadel.pdf.

[5]Also commonly known as "technical protection measures", or "digital restrictions management", by some of its more vocal critics — *see* http://www.gnu.org/philosophy/words-to-avoid.html#DigitalRightsManagement (since Jul. 2002). DRM can be 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* III.C.2.

[6]A *trusted system* is a computer which 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. A frequently cited early work is PAUL GOLDSTEIN, COPYRIGHT'S HIGHWAY: FROM GUTENBERG TO THE CELESTIAL JUKEBOX Chapter 6 (1994), although it failed to anticipate the fraught nature of digital copyright. Stefik has presented a more thorough overview of many aspects of the DRM project, along with a normative argument in favor of it; *see* Mark Stefik, *Shifting The Possible: How Trusted Systems and Digital Property Rights Challenge Us To Rethink Digital Publishing*, 12 BERKELEY TECH. L.J. 137 (1997), http://www.law.berkeley.edu/journals/btlj/articles/vol12/Stefik/html/reader.html (proposing a DRM architecture based on trusted systems); Mark Stefik and 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]This claim is repeatedly asserted or implied by the representatives of copyright industry trade associations, who claim that copyright infringement is "theft" or "stealing". But it also has some defenders within academe; *see, e.g.*, Frank H. Easterbrook, *Cyberspace versus Property Law?*, 4 TEXAS 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), http://law.vanderbilt.edu/lawreview/vol536/kitch.pdf. 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.

the deployment of technologies to prevent the reproduction of digital media objects, but also the expansion of copyright through the enactment of legislation to ensure that DRM is sanctioned and reinforced by law.[9] A larger political program, of which this is a central part, is seen by its critics as threatening to create a dystopian society of "information feudalism".[10]

Fears about overreaching copyright and the negative consequences of DRM — whether subtle or dystopian — have combined with the allure of a cornucopia of unfettered digital knowledge, to quicken the information anarchist movement. The most important questions raised by this movement are whether a world without copyright would in fact drive writers and artists further into penury, or perhaps 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] and information anarchism has had some

[9]*See, e.g.,* 17 U.S.C. § 1201 (1999); World Intellectual Property Organization: Copyright Treaty, December 20, 1996, art. 11–12; European Parliament & Council Directive 2001/29/EC on the Harmonisation of Certain Aspects of Copyright and Related Rights in the Information Society, art. 6–7, 2001 O.J. (L 167) 10; Australian Copyright Amendment (Digital Agenda) Act 2000, Schedule 1, Division 2A.

[10]*See, e.g.,* Peter Drahos, *Information Feudalism in the Information Society* THE INFO. SOC'Y (1995), http://slash.autonomedia.org/print.pl?sid=02/07/30/2024235; PETER DRAHOS AND JOHN BRAITHWAITE, INFORMATION FEUDALISM: WHO OWNS THE KNOWLEDGE ECONOMY? (2002); Richard M. Stallman, *The Right to Read* COMM. ACM 85 February 1997, http://www.gnu.org/philosophy/right-to-read.html; Martin Kretschmer, *Feudalism, Retreat or Revolution?, in* PROC. SYMPOSIUM ON A NEW FEUDALISM OF IDEAS (2001), http://www.cippm.org.uk/pdfs/martin.pdf (works emphasizing the "feudalistic" aspects of modern copyright). Stallman has also famously argued that we are likely to see a "War on Copying" reminiscent of the "War on Drugs"; *see* Richard M. Stallman, *Free Software and Beyond*, Presented at Wizards of OS: Operating Systems and Social Systems, Berlin, (1999), *at* http://mikro.org/Events/OS/ref-texte/stallman.html. Within the United States, information feudalist legislative proposals which have sparked a number of dystopian critiques include the SSSCA/CBDTPA (*see* Jeff Bowers, *The CBDTPA is Immune to (Conventional) Criticism*, (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 Jul. 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*, LawMeme, Jul. 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.,* Aaron Swartz, letter to Illinois State legislators (Apr. 21, 2003) http://www.aaronsw.com/weblog/000901.

[11]A few examples include Clarke's "fairshare" system; *see* Ian Clarke, *Fairshare - Rewarding artists without Copyright*, (2001), http://freenetproject.org/index.php?page=fairshare; variants of what Kelsey and Schneier call the "street performer protocol" (SPP); *see* Breyer, *supra* note **Error! Bookmark not defined.**, at 302–6; John Kelsey and Bruce Schneier, *The Street Performer Protocol and Digital Copyright* FIRST MONDAY Jun. 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 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* FIRST MONDAY Jun. 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://yoyo.cc.monash.edu.au/~pfh/rational.html; and gift economies (*see, e.g.,* Jim Carrico, *Potlatch Protocol draft proposal 0.1*, (2001), *at* http://www.potlatch.net/protocol.01.html), coupled with micropayment systems; *see, e.g.,* http://www.musiclink.com. *See also* http://www.infoanarchy.org (an information anarchist news site).

isolated successes.[12] But the models which information anarchists propose remain largely theoretical, and often assume that social norms can be harnessed to prevent free riding by information users.[13] Unless these models begin to achieve widespread bottom-up success, it is unlikely that information anarchism will be taken seriously by policymakers.

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 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 extent of file sharing. But it is not clear whether this trend can go further, or whether it is

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[12]One example is Stephen King, who collected over USD $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://www.stephenking.com/sk_120400_2.html. It was widely reported that his experiment had failed (*see* N.Y. TIMES *King Closure*, Editorial, Dec. 1, 2000, http://www.nytimes.com/2000/12/01/opinion/01FRI3.html), although King himself did not appear to take this point of view; *see* Stephen King, *The Plant: Getting a Little Goofy*, (2000), *at* http://www.stephenking.com/sk_120400_2.html. Other examples include the fundraising efforts of kuro5hin.org, a collaborative media site (*see* Rusty Foster, *The fundraiser ends, and the next stage begins*, KURO5HIN, Jun. 21, 2002, *at* http://www.kuro5hin.org/story/2002/6/21/10533/6651); Blender, a 3D modeling and animation package (*see* http://www.blender3d.org/Foundation/?sub=History (2003)), and Linux Weekly News; *see* http://www.lwn.net/Articles/5838/ (Jul. 26, 2003). 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* Google's "Google Answers" (http://answers.google.com) service, which is currently the largest operating example of a Wall Street Performer Protocol-like system.

[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 the modeling of strategies for Lindahl voting games in RICHARD CORNES AND TODD SANDLER, THE THEORY OF EXTERNALITIES, PUBLIC GOODS, AND CLUB GOODS 215–7 (second edition 1996). Despite such imperfections, the street performer protocol deserves much 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 AND PETER DRAHOS, GLOBAL BUSINESS REGULATION Chapter 7 (2000); Drahos & Braithwaite, *supra* note **Error! Bookmark not defined.**. *See also* James Boyle, *A Politics of Intellectual Property: Environmentalism for the Net?*, 47 DUKE L.J. 87 (1997), http://www.law.duke.edu/journals/dlj/articles/dlj47p87.htm (explaining why proprietarian interests have overwhelmed "public interest" perspectives in these contests). Despite the very substantial expansion of copyright in the 1990s, there have been some important limits to 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 31.

[15]In fact, serious questions remain as to whether secure DRM is a real possibility; *see infra* § III.C.2.

[16]*See* MGM v. Grokster http://www.eff.org/IP/P2P/MGM_v_Grokster/20040819_mgm_v_grokster_decision.pdf (9th Cir. 2004) (holding that the *Betamax* defense is applicable to decentralized file sharing networks).

even permanent[17] — and music sales are slowly declining.[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 is relatively safe; while the burning of DVDs might result in peripheral revenue reductions, the cinema is a secure institution, and the bandwidth requirements of sharing films will remain exorbitant for some time to come. But the supply of professionally-staffed and well-resourced web sites is certainly limited by the absence of robust, direct revenue sources. And at some point, the authors and publishers of books will face a crisis to make the current predicament of the major record labels look positively cozy.[21]

The *status quo*, if one can be said to exist, is a situation of instability. Whatever the real extent and urgency of the threat to the viability of "content industries", 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 be the cause of 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 to get there.

Against this backdrop, there have been many attempts to take an objective view of the copyright crisis, and to find ways out of the prevalent ideological impasse.[22] Often, the work in

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[17]*See* Alex Veiga, *Report: Illegal Music Downloading Climbs*, Associate Press, Jan. 15, 2004, *available 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 Register, Feb. 25, 2004, *at* http://www.theregister.co.uk/content/6/35777.html (reporting 5 million paid downloads for Roxio's Napster and 25 million for Apple's iTunes Music Store, to December 2003).

[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* nn 93–95 and accompanying text.

[22]For an early attempt in this direction, see THEODOR H. NELSON, LITERARY MACHINES (1982/1993) (introducing the concept of "transcopyright"). More recent examples include the US National Research Council's "digital dilemma" report; *see The Digital Dilemma: Intellectual Property in the Information Age*, (2000), http://books.nap.edu/html/digital_dilemma/ (attempting to take an objective view of the crisis); laudable but potentially impractical arguments for DRM systems which respect the flexibility and numerous exceptions of existing copyright systems; *see* Dan L. Burk and 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. INTELL. PROP. L. & POL'Y (2001); or claims that copyright laws and copyright norms can evolve to reach a sustainable, balanced equilibrium in digital environments *see, e.g.*, Christopher Jensen, *The More Things Change*,

this direction succeeds only in emphasizing the intractability of the problem. This seems to be particularly true of approaches which seek to find more balanced digital arrangements of those same kinds of exclusive rights which have traditionally constituted literary and artistic property.

B. Virtual Markets for Virtual Goods

It may be that in order to find coherent middle ground between information anarchism and information feudalism, it is necessary step away from the metaphor of property rights and 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 paper explores one such class of alternative compensation systems, 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 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, I adopt 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 "democratic"[25]— 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 — the use of taxation to solve the underlying free-rider problem; but 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 devolved to the end-users and cyber-citizenry who pay for and should benefit from the scheme.

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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]The terminology is Lessig's; *see* LAWRENCE LESSIG, THE FUTURE OF IDEAS 201 (2001), though he has no veto over the way I develop the idea here.

[24]The choice of the term "virtual" is discussed further below — *see infra* § II.B.

[25]Whether and how markets are actually democratic is a complicated question, and as much a matter of definition and context as a matter of fact. Clearly, there are differences in the way that these institutions aggregate preferences (*see, e.g.*, GEOFFREY BRENNAN AND ALAN HAMLIN, DEMOCRATIC DEVICES AND DESIRES 83–4, Theories of Institutional Design. (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.

The idea which this paper develops is not entirely unprecedented. Section II begins by discussing 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 which currently form a part of some countries' copyright systems — private copying levies,[28] and lending rights for public libraries.[29]

Historically, there have been many practical limitations on the operation of publicly funded remuneration mechanisms, stemming chiefly from the need to decide who gets how much from the system. Section II.B sets out how cheap and ubiquitous computing devices could be used to overcome this problem — to collect enough information, with enough fidelity, that it becomes possible to replace copyright marketplaces with reward-based "virtual" marketplaces.

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

Section IV surveys some of the issues which would arise if an attempt were made to implement a virtual market, both inevitably and as a result of interactions with existing laws. Section V concludes by addressing some common outstanding responses to the idea of virtual markets, commenting on the political circumstances that might make them plausible.

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[26] *See infra* note 49. The novel contributions which I have endeavored to add include an emphasis on technological solutions for *allocating* funding; the structure of an economic comparison between DRM and decentralized "alternative compensation system", and further examination the numerous requirements and implications of public funding as an alternative to exclusive rights.

[27] *See infra* § II.A.1.

[28] *See infra* nn 51–53 and accompanying text.

[29] *See infra* note 50 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 which 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 their (perhaps inadvertently) making libraries possible in the first place; the same principle is a key motivation for this article.

The methodology of this paper 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 which are as incremental as possible.

II. REWARD SYSTEMS

A. Rewards and Information Production

Copyright and patent laws, and related *sui generis* regimes, operate primarily on the basis of exclusive rights. These are privileges, granted by society to the creator of a work (or the corporation to whom they assign them), conveying 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 and universality,[30] its autonomous computers and sub-networks, has made the task of enforcing such privileges nearly impossible. When enforcement is possible, it requires costly infrastructure, and, as many observers have remarked, it requires direct enforcement of copyright law against the public at large, as opposed to enforcement against commercial "pirates".[31] 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 service they

[30]The term *universality* is used here in two senses. The more obvious is that the Internet provides a basis for near-ubiquitous standards of data exchange. The other sense is that of computational universality (also known as "Turing completeness"), the property of computers which means that they are all capable of performing the same kinds of operations. If any information is accessible to a general-purpose computer, then, time and space permitting, that computer will be capable of reproducing it.

[31]For discussions of the implications of this state of affairs, *see, e.g.*, Richard M. Stallman, *Reevaluating Copyright: The Public Must Prevail*, 75 OR. L. REV. (1996), http://www.gnu.org/philosophy/reevaluating-copyright.html; Litman, *supra* note **Error! Bookmark not defined.**; Jane C. Ginsburg, *Can Copyright Become User-Friendly? Review of Jessica Litman, Digital Copyright*, 25 COLUM.-VLA J.L. & ARTS 71 (2002), http://papers.ssrn.com/paper.taf?abstract_id=288240. The fact that mass copyright infringement is now performed as much by ordinary people as it is by professional "pirates", and 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* MGM v. Grokster http://www.eff.org/IP/P2P/MGM_v_Grokster/20040819_mgm_v_grokster_decision.pdf (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); Recording Industry Ass'n of Am., Inc. v. Verizon Internet Servs., Inc., Nos. 03-7015 & 03-7053, 2003 WL 22970995 (D.C. Cir. Dec. 19, 2003) http://pacer.cadc.uscourts.gov/docs/common/opinions/200312/03-7015a.pdf, *appeal filed* (holding that the "notice and takedown" provisions in 17 U.S.C. § 512 do not extend to requiring ISPs to disclose the identity of their subscribers in cases where they simply act as a conduit for end-to-end protocols).

have rendered to society. Such an idea might seem quaintly anachronistic to modern sensibility, but it may take on particular importance if we conclude 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.[32] In 1660, a utopian essay (probably written by the prominent scientist and patent skeptic Robert Hooke[33]) described in some detail a fantastic society which benefited enormously from organizing public rewards for valuable inventions.[34] The idea was not purely utopian; MacLeod gives examples of inventions for which retrospective rewards were provided,[35] while Wright points out two significant inventions which were prompted by "bounty" rewards.[36] Robert Macfie, a British MP and free trade advocate, agitated for an organized reward infrastructure during the mid-to-late 19th century,[37] but the schemes of Macfie and his fellow travelers were defeated by an inconstant zeitgeist.[38]

During the Second World War, Michael Polanvyi, who appears to have been 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.[39] Since then, economic analyses which address the question have periodically concluded that the case for the patent system is not clear, and that either publicly contracted research, or taxation-funded

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[32]*see* CHRISTINE MACLEOD, INVENTING THE INDUSTRIAL REVOLUTION: THE ENGLISH PATENT SYSTEM, 1660-1800 Chapter 10 (1988) (a historical treatment of ideas about both patents and reward-based alternatives in England before 1800).

[33]Robert Hooke (1635–1703) is remembered today for the 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, telescopy, clockwork, and mechanical engineering.

[34]The work is described by Macleod, MacLeod, *supra* note 32, at 191. It was constructed as an extension of Francis Bacon's earlier utopia, *New Atlantis*, and credited to "R. H. Esquire".

[35]*Id.*, at 191–3.

[36]*See* Brian D. Wright, *The Economics of Invention Incentives: Patents, Prizes and Research Contracts* 73 AM. ECO. REV. 691, note 15 (1983), and accompanying text. See also Michael Abramowitz, *Perfecting Patent Prizes*, 56 VAND. L. REV. 115, note 15 (2003), for further sources and commentary on the historical use of rewards.

[37]*See, e.g.,* ROBERT MACFIE, RECENT DISCUSSIONS ON THE ABOLITION OF PATENTS FOR INVENTIONS IN THE UNITED KINGDOM, FRANCE, GERMANY AND THE NETHERLANDS 84–7 (1869).

[38]Machlup & Penrose provided an excellent account of the historical context for Macfie's arguments; *see* Fritz Machlup and Edith Penrose, *The Patent Controversy in the Nineteenth Century*, 10 J. ECO. HIST. 1 (1950).

[39]Michael Polanvyi, *Patent Reform*, 11 REV. ECO. STUD. 61 (1944).

systems to reward inventors, might well be more efficient.[40]

The system of "inventors' certificates" employed by the former Soviet Union[41] was a notable example of a large-scale reward infrastructure. The example is hardly inspirational. But importantly, it seems that the problems of research and innovation in the U.S.S.R. were stemmed from much larger difficulties with industrial organization, rather than from the prevalence of rewards in place of patents.[42]

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, 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.[43]

Consequently, although the literature considering the real-world practicality of rewards for inventions appears inadequate,[44] it is probable that their greatest drawback is a lack of information revelation. Unless a government has sufficient information to tightly couple rewards to the social value of inventions, R&D incentives might turn out skewed and suboptimal. Therefore, any successful patent-replacing reward infrastructure must have a robust mechanism

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[40]*See* Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, *in* THE RATE AND DIRECTION OF INVENTIVE ACTIVITY. (1962) (discussing the desirability of governments employing contractors to perform research and development); Wright, *supra* note 36 (for a comparison of patents, rewards and contracts); Steve P. Calandrillo, *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 against both patents and copyright); Steven Shavell and Tanguy van Ypersele, *Rewards versus Intellectual Property Rights*, 44 J.L. & ECO. 525 (2001) (for a comparison of rewards, patents and a mixed regime); Michael Kremer, *Patent buyouts: a mechanism for encouraging innovation*, 113 Q. J. ECO. 1137 (1998) (for a more exotic scheme in which governments purchase patents for the public domain using an auction-based information revelation system); Abramowitz, *supra* note 36 (surveying, critiquing and synthesizing recent proposals).

[41]The Soviet Union applied reward models to both inventions and writing. *See* J. W. BAXTER, WORLD PATENT LAW AND PRACTICE 14–21 (second edition 1973); M. M. BOGUSLAVSKY, COPYRIGHT IN INTERNATIONAL RELATIONS: INTERNATIONAL PROTECTION OF LITERARY AND SCIENTIFIC WORKS 130–5 (1979); 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), for descriptions of Soviet "intellectual property" systems.

[42]On the problems of Soviet industrial R&D, *see, e.g.*, Veronika Kabalina and Simon Clarke, *Innovation in Post-Soviet Industrial Enterprises*, *in* PROC. 6TH WORLD CONFERENCE OF THE ICCEES (2000), 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).

[43]*Cf.* Patrick Croskey, *Institutional Utilitarianism and Intellectual Property*, 68 CHI.-KENT L. REV. 631, 639–40 (1993) (criticizing Polanvyi's proposal on account of the informational difficulties it raises). *But cf.* Shavell & van Ypersele, *supra* note 40, 541–2 (expressing optimism that *ex post* sales information in the hands of a government could be as effective as the *ex ante* information possessed by inventors).

[44]It is possible that there is interesting material in Russian. 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.

for identifying the value of information.

2. Rewards for Writing and other Copyright Subject Matter

Suggestions that it might be desirable to replace patents with publicly funded alternatives have been relatively persistent, even in democratic capitalist societies. In contrast, copyright skeptics have historically been less enthusiastic in recommending that copyright be replaced with a system of public funding.[45]

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 are the functional nature of patentable inventions,[46] and the relative strength of patent rights.[47] Furthermore, the visible example of rewards for authors in communist states was intimately linked with a highly objectionable system of censorship, on one hand, and state patronage of ideologically acceptable writers on the other.[48]

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 the much of humanity's knowledge and culture has inspired a growing number of claims that government funding might become desirable.[49]

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[45]But see *infra* note 124 for two examples of 20th century discussion of the issue.

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

[47]Following the analysis of Drahos (*see* PETER DRAHOS, A PHILOSOPHY OF INTELLECTUAL PROPERTY Chapter 6 (1996), patent protection is "exclusive", prohibiting the re-implementation 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 the extent to which copyright directly inhibits creative activity.

[48]*See* Levitsky, *supra* note 41; Loeber, *supra* note 41.

[49]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* (chronologically): Richard M. Stallman, *The Right Way to Tax DAT*, WIRED MAG. Jul./Aug. 1992, 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, *Digital Music: Problems and Possibilities*, *in* PROC. "A FREE INFORMATION ECOLOGY IN THE DIGITAL ENVIRONMENT" CONF. § IV. 2 (2000), 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 Millenium Copyright Act*, 87 VA. L. REV. 813, 911–8 (2001); Raymond Shih Ray Ku, *The Creative Destruction of Copyright: Napster and the New Economics of Digital Technology*, 69 U. CHI. L. REV. 269, § VI (2002). Libraries, and public lending rights, have also been an inspiration; *see* David H. Rothman, *Information Access for All* COMPUTERWORLD Jul. 6 1992, http://www.teleread.org/computerworld.htm; Joshua H.

I noted above that rewards might constitute a general-purpose alternative to digital (exclusive) copyrights. I then observed that, at least in the pre-digital era, they were only really contemplated as completed alternative to a patent system. Public reward systems do in fact operate today in relation to copyright 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 co-incidental incentives provided by universities (including the prospect of progression in an academic career) or by the various literary awards that can provided a significant fraction of a writer's income. But it is 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 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".

Public lending rights 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 with jurisdiction.[50] Generally speaking, however, 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 for their writings.

Foley, *Enter the Library: Creating a Digital Lending Right*, 16 CONN. J. INT. L. 369 (2001). Not all of the proposals work from precedents in existing copyright systems; *see* Calandrillo, *supra* note 40 (advocating government funded rewards, funded by income taxation, as replacements for both copyright and patents); Stallman, *supra* note 46 (advocating a tax on computers, allocated by both users and government, to fund software production); Shavell & van Ypersele, *supra* note 40, at 541–2 (although Shavell and van Yperseles' modeling is focused on the patent system "for concreteness", they do mention 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), http://www.utexas.edu/law/faculty/nnetanel/null.pdf; William W. Fisher, *An Alternative Remuneration System*, Chapter 6 of PROMISES TO KEEP: TECHNOLOGY, LAW AND THE FUTURE OF ENTERTAINMENT (forthcoming), (2004), http://tfisher.org/PTK.htm; *cf.* Peter Eckersley, *Virtual Markets for Virtual Goods: An Alternative Conception of Digital Copyright*, Intellectual Property Research Institute of Australia Working Paper 02-03, v2 (May 2003) http://www.cs.mu.oz.au/~pde/writing/virtualmarkets.pdf. Comparative references are included at some of the relevant points in this paper.

[50] *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 which are included; 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.

Statutory licensing regimes primarily address the copying, in private, of music or video. Acknowledging the impracticalities (and in some countries, the unconstitutionality) of attempting to enforce copyright inside people's homes,[51] these systems compensate rights holders using the proceeds of levies raised on various devices and blank media. They were conceived as a way of addressing reproduction which simply could not be prevented, and in the light of DRM, the European Union — home to most of the world's private copying schemes — has been exploring plans to phase them out.[52] In the mean time, without legislative adjustments, it was expected that they could not apply to the semi-public acts of copying found on file sharing networks.[53]

It is likely that such localized reward systems have been adopted for writing more widely than they have 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 clearly suggest the possibility of creating general-purpose mechanisms to remunerate authors, artists and publishers in contexts where exclusive rights are inefficient, undesirable or impossible to enforce. And digital technology may provide the means for ensuring that the rewards from these systems are fairly distributed according to the social value of each work.

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[51] *See, e.g.*, GILLIAN DAVIES AND MICHELLE E. HUNG, MUSIC AND VIDEO PRIVATE COPYING: AN INTERNATIONAL SURVEY OF THE PROBLEM AND THE LAW (1993); Katerina Gaita and 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 04-04, May 2004, http://www.law.unimelb.edu.au/ipria/publications/workingpapers/IPRIA WP 04.04.pdf (discussing the nature, scope and origins of analogue private copying schemes).

[52] *See* P.BERNT HUGENHOLTZ ET AL., THE FUTURE OF LEVIES IN A DIGITAL ENVIRONMENT: FINAL REPORT Chapter 6 (1995), http://www.ivir.nl/publications/other/DRM≤vies-report.pdf. (an independent report commissioned by the Business Software Alliance; Chapter 6 addresses 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 perceive the limitations of collecting societies as problematic (particularly because they can only employ indirect estimates of which works are copied privately, users lack any input into the system, and underground/alternative markets may escape consideration). Unpopularity amongst users is further exacerbated because they see levies as a tax which goes directly to publishing companies (this may, partially, be a problem of perceptions)

[53] I*d.*, at 41. But the law in Canada appears to be following a different trajectory, at least temporarily; *see* Copyright Board of Canada, *Tariff of Levies to Be Collected by CPCC in 2003 and 2004 on the Sale, in Canada, of Blank Audio Recording Media*, CAN. GAZETTE PART I (SUPPLEMENT), 20–1 http://www.cb-cda.gc.ca/tariffs/certified/c13122003-b.pdf (Dec. 13 2003) [hereinafter Copyright Board of Canada] (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 Canada Inc. v. John Doe, 2004 FC 488 (Ottawa, Mar. 31 2004) http://www.fct-cf.gc.ca/bulletins/whatsnew/T-292-04.pdf 14–15 (dicta stating that, until Canada implements the WIPO Copyright Treaty, making files available on a P2P network would not attract secondary "authorization" liability).

B. Decentralized Compensation Systems: Constructing "Virtual Markets"

Let us consider how we might construct a reward mechanism specifically for digital information goods. Placing the standards of copyright aside, imagine a tax-paying Internet user — suppose her name is Alice[54] — who wishes to use digital music and writing[55] in an unrestricted fashion. How should Alice's society reward the creation of the works which Alice values?

One option would be to count how often different works are downloaded by Alice and others like her. The government could organize a basic server infrastructure,[56] and distribute rewards in proportion to the 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 which are downloaded directly, rather than distributed on home-recorded media.[57]

The relative merits of different works might be more accurately observed by asking the public to *vote* on the matter. By giving Alice a certain number of votes (say 100 per month, for the sake of example), 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 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. The disadvantage of regular voting is the effort it involves — continually rating numerous snippets of authorship and artistry could be a chore which many people were inclined to avoid.

But neither counting downloads, nor collecting votes, are particularly elegant solutions. 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

[54]Sincere apologies are due to both Lewis Caroll and the cryptographic research community (who have a fictitious Alice in the regular employ of their thought experiments).
[55]By "writing", I refer not only to linear texts which might be made available through the Internet, but websites which have significant informational or literary value and which require significant funding to stay afloat.
[56]The central authority would not necessarily need to serve the downloads themselves — just provide digital certificates for the content, and collect authentication information from the users.
[57]In the long term, high-bandwidth connectivity will make physical media increasingly redundant. In the short term, CDs and DVDs will continue to be important for distributing both legal and copyright-infringing information. To a large extent, the nature of this traffic will be inferable from download statistics and blank media sales.

to reduce the impact of non-participation.

To illustrate this idea, imagine that Alice is listening to some music, or perhaps intending to download a few new songs for her collection. Because she hasn't 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).[58] She could spend the time to vote explicitly, 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's picked out of her playlist, which e-books she's spent hours poring over, and so on. But rather than 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 with her mouse to precisely reward the particular musicians and writers who have been contributing to her life.[59]

If Alice's computer has a representative record of her relative usage of different works, we might ask why it does not automatically report that information to the virtual market. This architecture would certainly possible, though it would present a number of difficulties. Firstly, direct usage metering might not provide any better information than a voting system, because users who were determined to reward something other than that which they actually consumed, could (for example) easily leave a song playing, on repeat, with the volume turned down. Secondly, individuals who, for whatever reason, were uneasy with any form of monitoring, even pseudonymous monitoring, of their private actions, would have a clear motivation to interfere with the metering system. A system which treats Alice with respect, giving her the explicit choice between convenient automation and alternatives she could have achieved anyway, is more likely to earn her respect in return.

I have termed this mechanism a “virtual market” not because it is a “market” which happens to operate on the Internet. Instead, it is *virtual* in stronger senses of the word — a sort of “market through the looking-glass”.[60] Despite the involvement of public funding, the rewards

[58]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* § III.C.5.

[59]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.

[60]The *Shorter Oxford English Dictionary* provides the following definitions (amongst others) for the word `virtual':

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 these exchanges do not occur directly.[61] And while there is a centralized governmental authority which collects taxation and distributes royalties, the determination of which information goods should be produced remains a decentralized and emergent result of the 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 attack on client systems. If this were not the case, then worms, virii, trojan horses and direct computer security breaches which 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 be allowed.

The virtual market's security architecture is also responsible for preventing "ballot stuffing". No artist or any other individual should be able to skew the operation of the system by downloading thousands of copies of a song, or by voting over and over again for the same website. This is achieved by authenticating the identity of the user whenever a download or vote is made, and then normalizing the information recorded, so that no individual can 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 in cheap, digitally secure hardware.[62] A simple device[63] to perform this task might comprise:

"...so in essence or effect although not formally or actually", and the "apparent... image resulting from the effect of reflection... upon rays of light".

[61]The virtual market model may thus be able to evade the objection to publicly funded authorship on the grounds that it is not "market based", and so hands control of publishing to the state; *see, e.g.*, Shira Perlmutter, *Convergence and the Future of Copyright*, 24 COLUM.-VLA J.L. & ARTS, 167 (2001); GILLIAN DAVIES, COPYRIGHT AND THE PUBLIC INTEREST 149–55 (1994); *cf.* Wendy J. Gordon, *Asymmetric Market Failure and Prisoner's Dilemma in Intellectual Property*, 17 U. DAYTON L. REV. 853, § 4 (1992) (reaching a related conclusion on the advantages of market-based, over judicially administered licensing systems).

[62]Secure against remote interference, as opposed to physically secure against tampering. For simple functionality, achieving the former is relatively feasible. Security against physical tampering is an extremely difficult problem; *see infra* §III.C.2.

[63]One might be tempted to call it a "dongle"; it does have some properties in common with the gadgets commonly employed in the 1980s as software copy protection devices, although its purpose is, in a sense, the exact opposite; and it does not suffer from the same classes of categorical insecurity. Perhaps "antidongle" would be more appropriate.

- microcontroller with an embedded private key,[64] to create digital signatures
- A symmetric cipher implementation to provide a secure communications channel[65]
- A small LCD (liquid crystal display) to show the name of a creative work, and its author
- A "confirm" button
- A connection to a PC (this could be any standard data connection, such as a serial or USB (universal serial bus) 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.[66] The device could then sign the details, creating an unforgeable receipt to be passed into the virtual market.[67] The cost of producing such a device in volume would 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.

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[64] *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); *infra* note 248 and accompanying text.

[65] A *symmetric cipher* allows two parties who share a common secret "key" to send messages which only the other can read. If any 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 (*see* http://csrc.nist.gov/CryptoToolkit/aes/ (2003)), since it is efficient when used in minimalist hardware.

[66] The device thus defends against the class of attacks discussed in Howard Gobioff *et al.*, *Smart Cards in Hostile Environments*, *in* PROC. 2ND USENIX WORKSHOP ON ELECTRONIC COMMERCE, 1 (1996), http://www-2.cs.cmu.edu/~hgobioff/papers/usenix_ecommerce_96.ps.

[67] 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 Chapter 3 (2003) (on 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 mis-reportage of use to be corrected. While having to take such measures would be inconvenient, they would prevent the possibility of vote-stealing leading to widespread funding misallocation.

If a VMRS were implemented 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 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 in some way. 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.[68] 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 without necessarily compromising pseudonymity.[69] 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 can vote for Delilah only if many other people are also doing so, thereby indicating that she is actually an artist.

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

[68] I use the word "clique" here in its ordinary English (as opposed to mathematical) 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.

[69] *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 Enmities* J. ONLINE L. (1995), *at* http://www.wm.edu/law/publications/jol/95_96/froomkin.html), although if this privacy cannot be compromised, a case can be made for describing it as "anonymity with persistent nyms"; *see* Roger Clarke, *Identified, Anonymous and Pseudonymous Transactions: The Spectrum of Choice*, *in* PROC. USER IDENTIFICATION & PRIVACY PROTECTION CONFERENCE § 3.6 (1999), http://www.anu.edu.au/people/Roger.Clarke/DV/UIPP99.html.

of all parties, it will be almost impossible to detect. There may, however, 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.[70] 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.[71]

Another risk to consider is that Alice might consider selling her voting hardware. She will 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 discounted) value of her future votes, which would easily outweigh the small risk of being caught. But the balance could be shifted, if the card has 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 service;[72] if the costs associated with loosing this gadget are 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. Like, perhaps turning to art.

3. Funding Virtual Markets

The reader may by now be willing to believe in Alice, but I would not wish to stretch her credulity to the existence of Wonderland — it is relatively easy to give money away, but first,

[70]Accounting information, telling artists about the number of votes they have received, forms a channel in the sense of Shannon; *see* Claude E. Shannon, *A Mathematical Theory of Communication*, 27 BELL SYS. TECHNICAL J. 379 (1948), http://cm.bell-labs.com/cm/ms/what/shannonday/shannon1948.pdf. The problem of determining the verifiability of particular votes, as a 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. It is probable that there exist ways of making verifiability unprofitable, though there might be some tradeoffs against the ideal degree of specificity in the rewards which artists receive.

[71]If Alice was allowed to keep the hardware, she could take cash from the conspiracy, but simultaneously continue to reward her favorite artists.

[72]Although these proposals are inter-institutional, they may be beneficial to both parties, 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.

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 the total level of funding for the entire virtual market is set. The interaction between these two variables is itself variable: different flavors of taxation place different constraints on the level of funding for the entire VMRS.

There is a wide range of taxation models available for funding a virtualized copyright mechanism. One important criterion for choosing amongst them is that consumers should pay tax which is closely in proportion to the amount they would have spent on relevant information goods, had a non tax-based system been employed. The intuitive "fairness" of the system, to a large extent, depends on this proportionality. But there are other considerations which should also be given weight. Charging more from those with greater ability to pay, and adopting a tax formula which 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 which are directly complimentary with the consumption of digital culture. This is the approach used in existing private copying systems,[73] and has been advocated for use in alternative compensation schemes.[74] The obvious candidates for these levies include internet connectivity, bandwidth, blank storage media (recordable CDs and DVDs, and perhaps even hard disks), specialized devices for watching, listening to or reading digital culture; or even computers in general.[75]

The chief drawback with these sources of revenue is that they are only imperfect proxies for the underlying consumption (or otherwise) of the information goods in question. Taxing a whole class of activities or gadgets, some members of which did not implicate copyright in the first place, amounts to a cross-subsidy to those that do. Beyond a certain point, such cross-

[73] *See, e.g.*, Copyright Board of Canada, *supra* note 53 (setting levy rates on cassettes, recordable CDs, and memory in dedicated MP3 players); Australian Copyright Council, *Remuneration for private copying in Australia: A Discussion Paper*, (2001) 9–10, http://www.copyright.org.au/PDF/Articles/PrivCopDiscPprAV.pdf (tabulating the kinds of levies used in national private copying schemes).

[74] *See, e.g.*, Netanel, *supra* note 49, at 43–4.

[75] One immediate concern which could be raised about these levies is that the computer and consumer electronics industry firms whose products are affected, 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, *in toto*, increase sales on the levied items.

subsidization may be seen as unfair, and it may, even at small rates, also cause distortionary economic side effects.[76] To illustrate: taxing blank storage devices and media discourages backups.[77] 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 delay upgrading their machines, suffering with an old, slow computer on account of the tax.[78]

Alternately, virtual markets could be funded solely by general revenue sources, such as progressive income taxation.[79] Although there are distortionary effects involved in income taxation, these may be balanced by potential redistributive welfare improvements.[80]

One argument against the use of general revenue sources is that there is a redistribution of resources, from taxpayers who do not use the Internet for cultural consumption, to support the creation of digital culture. This will occur, although it is not necessarily problematic. Incentives to produce digital writing and music will (almost always) result in more and cheaper works in tangible forms; and if a progressive form of taxation is employed, the demographics which pay

[76]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 redistribute wealth in a way that decreases inequality.

[77]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.

[78]This would be a serious problem if those affected included business users of computers, because the particular information goods provided by the virtual market would not be of much use to businesses (*see infra* §II.B.5 for further explanation). It might or might not be possible to avoid charging levies on computers purchased by firms, depending on the ease with which individuals can avoid taxes by deeming themselves to be 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.

[79]Taxation is said to be *progressive* when the rate of incidence is higher on wealthier individuals. Fisher, for example, advocates this kind of revenue source; *see* Fisher, *supra* note 49, at 24–5 (settling on income taxation as the most desirable, if not the most politically feasible, way to raise revenue for an alternative compensation system).

[80]Shavell & van Ypersele recommend income taxation as the most efficient way of funding a reward system to replace patents; *see* Shavell & van Ypersele, *supra* note 40, note 45 and accompanying text. They also argue that the use of intellectual property privileges to fund the creation of information goods carries its own distortionary consequences (although I would add that these distortions will only occur in the strong monopoly case where information prices rise above average production costs), and cite the optimistic results of Kaplow on the efficiency of funding public good production through income taxation; *see* Louis Kaplow, *The optimal supply of public goods and the distortionary cost of taxation*, 49 NAT'L TAX J. 513 (1996).

disproportionate taxes are precisely those in which Internet usage is most pervasive.[81] But the point may 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, which 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,[82] although in the United States, it would be politically impractical for historical reasons.[83] 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, I 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, rather than just the ones with network connections.

Having chosen the form that taxation will take, it is then 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.[84]

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[81]*See, e.g.*, George Sciadas, *Unveiling the Digital Divide*, Statistics Canada, (2002), http://www.statcan.ca/english/research/56F0004MIE/56F0004MIE2002007.pdf; U.S. Department of Commerce, *A Nation Online: How Americans Are Expanding Their Use of the Internet*, (2002) 11, http://www.ntia.doc.gov/ntiahome/dn/anationonline2.pdf (statistics examining the correlation between income and Internet access).

[82]*See infra* note xxx. I would like to thank Jamie Love for suggesting this solution to the problem of distortions in labor supply.

[83]*See* U.S. CONST. art. 1, §§ 2, cl. 3 & 9, cl. 4. (requiring that direct federal taxes be apportioned among the states according to their populations); Jeffrey S. Kinsler, *Circuit-Specific Application of the Internal Revenue Code: An Unconstitutional Tax*, 81 DENV. U. L. REV. 113, § I.B (2003) (explaining the origins of the apportionment clause in Southern fears of a disproportionate burden from taxes on land and slaves, and the enduring constraints on the nature of federal property taxes).

[84]Liebowitz illustrates this point powerfully by graphing album revenues over time (*see* Stan J. Liebowitz, *Alternative Copyright Systems: The Problems with a Compulsory License*, (2003) at 16, *at* http://www.utdallas.edu/~liebowit/intprop/complpff.pdf), although it would be helpful if his graph included a y-

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.[85] 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 long-run guidance.[86]

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 interests groups will end up agreeing on a compromise which is fairly good. 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 experience 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.[87] 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, which I believe 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.[88] They are asked hypothetical questions, such as "at what level would a reduction in

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intercept and compared this market with likely correlates, such as the health of the U.S. economy or sales of complimentary goods.

[85]Fisher, *supra* note 49, at 14.

[86]Liebowitz, *supra* note 84, at 15.

[87]*See infra* nn 195–199 and accompanying text.

[88]*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. ECO. REV. 111 (1972); David J. Brennan,

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.[89]

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 willingness to pay values reported by consumers in CV surveys are *not* approximately proportional to the votes those consumers actually made, then it is possible to infer that there are systematic flaws or inconsistencies in the voting process.[90]

The taxation options that could be used to support virtual markets present a spectrum; different choices will hold different implications in terms of wealth distribution and subsidy effects for various industries. Section III.C.4 examines them a little further in an attempt to identify some of their economic consequences. The commentary here should simply convince the reader that there is 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?

And 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 taxpayer/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) determine a reward for each of the artists she likes, rewards whose size is independent of the amount of tax she herself paid. This is a "one

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Fair price and public goods: a theory of value applied to retransmission, 22 INT. REV. L. & ECO. 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 ECO. 173 (2001), http://econ.ucsd.edu/~rcarson/cvconfinal.pdf.

[89] *Id.*, § III.

[90] 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.

user, one vote" system. But under some circumstances, it may be possible to use Alice's preference to allocate precisely the same amount of cash that she had contributed through taxation.[91] This "one dollar, one vote" approach 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 goods[92] or by indirect means, such as whether individuals make the choice to vote.

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

Throughout this paper, I am pursuing 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, as I will argue, 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 the paper examines digital copyright in a broad range of works, I predict 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 will in time be much more intense for books than it is for music or cinematographic material. To begin with, writers rely far more completely on copyright royalties than do musicians (who can perform live) or film producers (who are likely to be able to maintain cinema revenues even in the face of intense

[91] I would like to thank Alan Toner for pointing out this possibility and its similarity to 100% tax credits on voluntary donations to media organizations.

[92] Although 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 213–215.

"napsterization").[93] Furthermore, the likelihood that DRM will ever work for writing seems much lower than for more complicated information goods.[94]

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.[95] The case for virtual markets may be too weak to overcome the inertia of copyright in musical and cinematic works. But once it is possible to curl up in bed with a leather-bound book filled with re-writeable digital paper, the need for alternative compensation systems may rapidly become unavoidable.[96]

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 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 Section II.B.6 about

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[93]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 from books.

[94]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 OCR (Optical Character Recognition). 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 **Error! Bookmark not defined.**), 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* M. Schaefer, ed., PROC. NEW SECURITY PARADIGM WORKSHOP, 51 (2000), http://omni.cc.purdue.edu/~vraskin/NSPW-2000.pdf; Mikhail J. Atallah *et al.*, *Natural Language Watermarking and Tamperproofing*, *in* PROC. 5TH INTERNATIONAL WORKSHOP ON INFORMATION HIDING (2002), http://omni.cc.purdue.edu/~vraskin/IHW-2002.pdf (constructing a textual watermark with any degree of durability requires systematic alteration of words and phrases in the document).

[95]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* FIRST MONDAY Jun. 2001, *at* http://www.firstmonday.dk/issues/issue6_6/lynch/.

[96]Significant progress has already been made towards the development of these technologies; *see* Ruth Wilson, *Digital Paper, Digital Ink*, U.K. Universities' Joint Information Systems Committee Technology and Standards Watch Report TSW 03-01, (2003), http://www.jisc.ac.uk/uploaded_documents/tsw_03_01.pdf (surveying existing and forecasted "digital paper" technologies).

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 which 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 which VMRS provides about the value of goods and increases the system's economic efficiency.[97]

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. The importance of these properties is that they make the task of allocating credit generally feasible.[98]

Information goods which are not monolithic — such as software — can present intractable problems for VMRS because the task of rewarding authors collides with issues of industrial organization.[99] To see why this might occur, imagine Alice attempting to choose which software has been of great use to her (so that she can vote for it). Perhaps she has found her brand-new 3-dimensional web browser to be particularly helpful, so she gives it lots of votes. But it may turn out that the 3D 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 3D 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

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[97] *See infra* § III.C.5.c.

[98] 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 PLR should be split.

[99] 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 (2003), http://www.benkler.org/CoasesPenguin.PDF.

I would like to thank the members of the informal intellectual property & 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 gedanken experiments, that arbitrary cultures of peer production are not easily combined with effective virtual market reward structures.

should go.

In a marketplace of proprietary software,[100] 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. Unfortunately, it is not at all clear that the proprietary software market is an efficient way to create software in all (or even most) situations.[101] The problem of credit allocation goes to the heart of the creation of intellectual property privileges in software,[102] and a consumer-oriented policy proposal like VMRS is insufficient for addressing it.

It is true that there are some forms of digital music and writing which are non-monolithic and where similar credit allocation problems may arise. Consider, for example, the development of general reference works, textbooks, collage art, or the compilation of sample libraries from which others produce music. But these cases are the exception rather than the rule,[103] and pale by comparison with trying to reward the authors of a large, heterogeneous software project.[104]

6. The Role of Social Norms

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

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[100] *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.

[101] For critiques of the proprietary software production model, which are widely cited amongst programmers, *see* Richard M. Stallman, *Why Software Should Be Free*, Free Software Foundation, (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), 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 99.

[102] For a serious normative treatment of these questions, see Pamela Samuelson *et al., A Manifesto Concerning the Legal Protection of Computer Programs*, 94 COLUM. L. REV. 2308 (1994).

[103] 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. I leave the question of whether the inclusion of software in the scope of copyright poses any such problems, for the consideration of the reader.

[104] The Linux kernel (*available at* http://www.kernel.org) is a paradigmatic example here; as of version 2.4.17, there were 408 significant contributors listed in the kernel's CREDITS file. Deciding the value of their relative contributions fairly, and without interfering in the culture of Free Software development, is prohibitively complicated.

Firstly, note that it is important to ensure that participation is easy — that downloads or usage can be tracked automatically, and that voting is not labor intensive. Previous sections addressed these design problems.[105]

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 them votes for their troubles, then it is less likely that the author will write another book; even if they do publish again, it is likely to take longer, because they will have to support themselves by other means. Enthusiastic following and support for authors and artists is widespread, even in the absence of direct incentives.

There would none the less 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.[106] 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.[107] Whilst self-interest might dictate that many consumers should avoid technologies which prevent them from copying files between computers, there are no serious reasons for individuals to avoid participating in virtual markets.

[105] *See supra* text accompanying notes 58–66.

[106] Many similar problems have been faced in the field of *contingent valuation* (CV), where surveys are employed to value public (usually environmental) goods. Although there are a number of 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 has shown 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 88.

[107] There have been regular claims that education will be critical to the success of technologically enforced copyright; *see, e.g.*, INFORMATION INFRASTRUCTURE TASK FORCE, INTELLECTUAL PROPERTY AND THE NATIONAL INFORMATION INFRASTRUCTURE: THE REPORT OF THE WORKING GROUP ON INTELLECTUAL PROPERTY RIGHTS Part III (1995), 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) (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).

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

Having proposed, in something approaching detail, an alternative to copyright enforced by technology, a question follows naturally — "is a virtual market really a good idea?"

This section is an attempt to answer that question, to compare 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 of their own. Indeed, this section can only reach the minimum depth necessary to genuinely address the matter, and any analytic approach must at this point be limited by the absence of experience from real-world attempts to build an alternative compensation system. But, pending practical experimentation or more extensive research, and with some important caveats, I conclude that the weight of probabilities lies in favor of a public funding scheme.

Section III.A makes some general observations on the economic nature of information goods such as digital music and writing. Section 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 shed some light on the problem, it seems that there is no simple economic model which can be elegantly constructed and yet shed substantial light on the desirability of virtual markets — there are simply to many facets to the problem.[108] Instead, Section III.C provides a structured argument from utilitarian ethics[109] 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.

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[108]Although Section 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.

[109]By *utilitarian*, I refer 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 correctly 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, and for example, I am not following 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 AND POLITICAL THEORY OF PROPERTY. (S. Munzer, ed.2000), http://www.law.harvard.edu/Academic_Affairs/coursepages/tfisher/iptheory.html. 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 I would not personally consider myself to be a utilitarian. However, no other form of ethics has established the same degree of legitimacy when examining the public policy questions faced by democratic societies.

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 which each member of the community can enjoy, without detracting from the enjoyment of others. Orthogonally, once a non-excludable good has been created, everyone benefits automatically. A public good is said to be *pure* when it possesses these properties unambiguously. Impure public goods, which are slightly rivalrous, or only excludable with difficulty, are much more common than pure public goods.

Historically, writing and music have been rather impure public goods. More specifically, the authorship of writing and music creates a pure public good, but the physical objects (books, records, etc) which have embodied them are composite entities. A book in the hands of a reader contains a public information good (the authorship) and a private physical good — the paper, ink and distribution. As the digital forms of music and writing become increasingly practical, the "impurity" of physical structure is removed, and the economic properties of copyright change, moving closer to those 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 equilibrium[110] individuals will be "free riding" on the public goods created by the rest of society.[111] Even though everyone might be better off with a greater level of the public good, there is no way to simultaneously persuade them all 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 finding a means by which governments can identify the desirable levels of different public goods, and a suitable taxation system to collect the funds to pay for them.

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.

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[110]*Nash equilibrium* is a state in which all actors are pursuing their own self-interest, in the face of similar strategies from others.

[111]Or, more accurately, "easy riding", because Nash equilibrium contributions are often low but non-zero; *see* Richard Cornes and Todd Sandler, *Easy Riders, Joint Production, and Public Goods*, 94 ECO. J. 580 (1984).

2. Measuring the Economic Efficiency of Copyright Law

There are two main costs associated with attempting to solve the free rider problem by recreating excludability. These costs are central to the economics of copyright; I will outline them briefly here:

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 — court cases, copyright management and the creation of collecting societies, for example — but these costs were probably small compared to the overall value of information goods to society. As I argue below, however, the pure public good nature of digital information means that these costs will be much higher in a DRM system.[112]

The second cost is the indirect cost of exclusion, which results from giving producers a monopoly on access to the public goods they have created. Economists term this a *deadweight loss*[113] — in this case, the loss to society because some people who could be given the good at the marginal cost of provision,[114] but cannot or will not pay the copyright/monopoly price,[115] are denied it.

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 duration and scope.

Influential historical contributions to this literature include the work of Plant,[116] Hurt & Schuchman,[117] and Breyer.[118] These works critiqued justifications of copyright cast in terms of natural rights, and argued forcefully for a utilitarian evaluation of intellectual property privileges.

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[112] *See infra* §III.C.2.

[113] 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 I have described here appears in the literature on monopolies, and hence, in the literature on copyright and patent law. To prevent confusion, I use the term solely in this sense.

[114] Which, for digital information goods, is almost zero.

[115] Which 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. See *infra* note 152 for further explanation on this point.

[116] Arnold Plant, *The Economic Aspects of Copyright in Books*, 1 ECONOMICA 167 (1934), http://www.compilerpress.atfreeweb.com/Anno Plant Copyright.htm.

[117] Robert M. Hurt and Robert M. Schuchman, *The Economic Rationale of Copyright*, 51 AM. ECO. REV. 421 (1966), http://www.compilerpress.atfreeweb.com/Anno Hurt & Schuchman Econ Rationale Copyright.htm.

[118] *See* Breyer, *supra* note **Error! Bookmark not defined.**. Breyer's conclusions, in particular, were sufficiently striking to provoke a response; *see* Barry W. Tyerman, *The Economic Rationale for Copyright Protection for Published Books: A Reply to Professor Breyer*, 18 UCLA L. REV. 1100 (1971); *but see* Stephen Breyer, *Copyright: A Rejoinder*, 20 UCLA L. REV. 75 (1972).

Their conclusion was generally that the case for copyright was particularly marginal, and that, even if copyright should be maintained, its extent should be prudently constrained.[119] Stallman has provided a modern extension of these perspectives to the context of digital copyright.[120] 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.

It was only relatively recently that economists began constructing formal mathematical models to evaluate the desirability of copyright laws. Although there was some earlier work attempting to model the effects of piracy, the article by Landes & Posner has generally been acknowledged as laying the foundations of a justification for copyright in terms of neoclassical economics.[121] Other authors, such as Koboldt[122] and Watt[123] have extended the approach taken by Landes and Posner.

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. This conclusion is not really surprising, since only the most enthusiastic critics 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).

What this strand of the literature has not achieved, is to contrast the enforced-exclusion model, with the alternative of publicly funded provision.[124] The more recent post-digital literature is only beginning to address the issue. Watt's treatise on the economics of copyright, for example, considers levies briefly, in the context of private copying,[125] but rules public funding out on account of distortionary effects of taxation, without considering any possible benefits. Nadel, in the course of an economic critique of digital exclusive rights, points out that

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[119] *See, e.g.*, Breyer, *supra* note **Error! Bookmark not defined.**, at 322, citing and concurring with Machlup's earlier conclusion on the patent system, that whilst it would be foolish to abolish these systems, if they did not exist, it would be foolish to create them; *see* Fritz Machlup, *An Economic Review of the Patent System*, US Senate Judiciary Committee, Subcommittee on Patents, Trademarks and Copyright, Study no 15., (1958).

[120] Stallman, *supra* note 31.

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

[122] Christian Koboldt, *Intellectual Property and Optimal Copyright Protection*, 19 J. CULTURAL ECO. 131 (1995).

[123] RICHARD WATT, COPYRIGHT AND ECONOMIC THEORY (2000).

[124] Historically, scholars of copyright have occasionally mentioned the possibility of publicly funded provision, even with approval; *see, e.g.*, Hurt & Schuchman, *supra* note 118, 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 **Error! Bookmark not defined.**, note 104.

[125] *See* Watt, *supra* note 123, at 132–4.

public lending rights are an important alternative.[126]

A rigorous comparison between copyright and the alternatives may in a sense be more difficult than evaluating copyright on its own, because it requires the weighting of overlapping strengths and weaknesses in both sets of institutions.

Relevant recent discussions can be found in articles by Calandrillo[127] and Ku.[128] Calandrillo provides a broad comparison of *ex post* income-tax funded rewards against both the copyright and patent systems.[129] His paper identifies many of the important issues involved in comparing copyright to rewards (to which I will return in Section III.C), but does not attempt to construct a framework within which to weigh them. The article only briefly examines some the more subtle potential weaknesses of rewards, such as the accuracy of the statistics the government can collect; and although the article mentions distortions due to taxation,[130] their actual nature and peculiarities are not considered. To a significant extent, these limitations are an inevitable result of attempting to consider patents and copyright in the same inquiry.

Ku argues that the primary purpose of the copyright system has been to provide incentives for *publication*, rather than artistry, and that because of the structure of the music industry, it is live performance and merchandising, rather than royalties, that reward artists.[131] In this picture, the recorded music industry offers artists publicity, but only in extreme cases does it pay them money. Ku thus concludes that, if the Internet takes care of distribution, copyright contributes nothing to artists. Furthermore, if musicians are still perceived to have insufficient incentive for their work, they can be paid from a levy-based statutory license.

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, *at present*, in the music industry, copyright serves principally as an incentive for publishers. In order to draw watertight conclusions, it is necessary to compare public funding to a realistic DRM system in which *disintermediation* (artists selling directly to the public) is to some extent possible.

In the remainder of this section, I will present a structured argument that, *in the context of digital consumer information goods*, where the comparison is between DRM and VMRS, it is

[126]*See* Nadel, *supra* note **Error! Bookmark not defined.**, at 29–30.
[127]Calandrillo, *supra* note 40.
[128]Ku, *supra* note 49.
[129]Calandrillo, *supra* note 40, at 326–341.
[130]*Id.*, § II. B. 2.
[131]Ku, *supra* note 49, Part V.

clearly possible for virtual markets to operate more efficiently.

B. Models to Compare DRM and Rewards?

1. Microeconomic Models with Asymmetrical Information

In some cases it is possible to construct simple economic models which tease out the distinction between the operation of publicly funded reward systems and the use of exclusion mechanisms as incentives. Examples include the work of Wright,[132] or Shavell & van Ypersele,[133] who compare patents and rewards as incentives for invention. A central property of these analyses is that they model the information asymmetry[134] between potential inventors and government; they can then compare the relative inefficiencies of imperfect information (in the reward case) and deadweight loss (in the exclusion case).

It is not clear, however, that the same asymmetry of information applies in a virtual market; if a culture of enthusiastic user participation arises, then VMRS should have no significant, systematic, informational imperfections. If, on the other hand, technological or sociological factors limit the degree of participation, informational inefficiencies will result, but it is unlikely that they would have the same structure as those found in markets for inventions.

If we were to construct a single-information-good, microeconomic model of a virtual market, we would observe that even if there is imperfection in the VMRS information collection system, then to first order, this increases the risk of devoting resources to authorship and artistry, but does not decrease 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 unambiguously cultural,[136] and it is unlikely that information-asymmetrical microeconomic models will shed much light on the issue.

But 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

[132]*See* Wright, *supra* note 36.
[133]*See* Shavell & van Ypersele, *supra* note 40.
[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.
[135]Abramowitz reaches the same conclusion about patent prizes; *see* Abramowitz, *supra* note 36, at 123.
[136]One could also imagine incentive-compatibility failures in VMRS voting, but as I argued in Section II.B.2, these can be addressed in the design of the system.

in the VMRS, what effect will this have on 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?

On some of these levels, the comparative economics of virtual markets and exclusive rights is deeply tied to the particular distribution of wealth and preferences in particular societies; one cannot employ the standard microeconomic technique of de-coupling these issues from questions of resource allocation.[137] In other cases, the analysis needs to consider explicitly technical factors which are not normally included in economic models.

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; the term used for the field is *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, which consumers can pass 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] — such as whether they are *Pareto optimal*,[139] 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), or 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

[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. The real-world applicability of these results is quite narrow, however; *see* JOSEPH E. STIGLITZ, WHITHER SOCIALISM (1994); MICHAEL ALBERT AND ROBERT HAHNEL, A QUIET REVOLUTION IN WELFARE ECONOMICS (1990).

[138]For surveys of this literature, see DONALD E. CAMPBELL, RESOURCE ALLOCATION MECHANISMS (1987); Cornes & Sandler, *supra* note **Error! Bookmark not defined.**, Chapter 7.

[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 **Error! Bookmark not defined.**, at 220.

properties,[140] and as a result, there are no one-size-fits-all approaches to solving public good allocation problems. It is thus not possible to simply invoke the mechanism design literature to tell us whether virtual markets will perform better than DRM. Nevertheless, I will consider some mechanism design results while examining aspects of the comparison more closely in Section 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*, commonly abbreviated as ACE. Rather than employing analytical mathematics to prove general results from assumptions about general economic systems, ACE uses computers to simulate the behavior of instantiated 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 which 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 different public policies on particular markets.

ACE may be relevant to problems in mechanism design, and particularly the comparison of DRM with alternatives, because it provides tools for untangling the coupling between the efficiency of resource allocation for production and the distribution of wealth and preferences.

We 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 admittedly dependent upon the particular society about which the claim is made. ACE approaches would allow us to hypothesize a large number of different distributions for wealth and preferences, and to collect statistics about the robustness of our claims.

Furthermore, if this data is cross-referenced against real-world data, we can identify a degree of certainty that our claims apply, not only to most hypothetical societies, but to actual ones.

In order to construct an ACE model which elucidates the issues involved in comparing virtual markets to DRM, we would need a number of components. Firstly, a hypothetical

[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 Donald J. Roberts, *Incentives in planning procedures for the provision of public goods*, 46 REV. ECO. STUD. 283 (1979).

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

population of individuals would be required; these individuals have varying amounts of personal wealth.[142] Their tastes for private goods, and for information goods generally, could also be produced statistically.[143]

The aspect of information markets which is much harder to model is the relative value of different hypothetical information goods, and the fact that demand for these goods is collectively endogenous.[144] To illustrate this, imagine a textbook on advanced quantum field theory. What is the value of this good to particular consumers? The answer, of course, depends on whether they have previously studied books on mathematics and introductory quantum mechanics. Although the example may seem contrived, 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 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, for example, a reasonable model might categorize works along broad lines of originality, dependency of ideas, and cultural relevance. An ACE analysis would depend heavily on results which were stable across a wide range of these models. This modeling would probably form the core of a successful application of computational economics to the comparison of VMRS and DRM (The other important component being the collection and application of econometric data to guide and verify the simulation parameters).

Any use of Agent-based Computational Economics is beyond the scope of this article. But the technique seems to present a promising approach to difficult multi-dimensional problems in the economics of copyright — and is perhaps deserving of further attention amongst researchers seeking to obtain simultaneously nuanced and concrete evaluations of the impact of intellectual property policy choices.

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[142]Which can be created by a simple statistical model and cross-referenced against real data on the distribution of wealth.

[143]Here, the issue of correction against econometric data is more complicated. Private/information good preferences, 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, it means that notional demand for a good depends on previous consumption of that good.

[145]*See* David Throsby, *Production and Consumption of the Arts: A View of Cultural Economics*, 32 J. ECO. LITERATURE 1 (1994) § II. For a review of the psychological literature on the basis of music preferences, see Alexandra Uitdenbogerd and Ron van Schyndel, *A Review of Factors Affecting Music Recommender Services*, *in* PROC. 3RD INTERNATIONAL CONFERENCE ON MUSIC INFORMATION RETRIEVAL (2002), http://goanna.cs.rmit.edu.au/~ronvs/papers/ISMIR02.PDF. For an empirical study illustrating the endogeneity of music preferences in particular, see Morris B. Holbrook and Robert M. Schindler, *Some Exploratory Findings on the Development of Music Tastes*, 16 J. CONSUMER RES. 119 (1989).

C. Economic Factors Affecting the Desirability of Virtual Markets

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 must be counted as including: the role of actual wealth and preference distributions 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 who votes, and how, in a virtual market.

Nevertheless, it should be possible to say a great deal about the question. This section will investigate the relative economic efficiency of virtual markets and DRM, while avoiding the difficulty of explicitly coupling all of these issues together. I start by identifying the prominent and distinct factors which could favor either set of institutions, and examining each in turn. After analyzing the role of these effects, we will be in a stronger position to evaluate the truth, magnitude and certainty of the claim that virtual markets present an advantageous policy position.

The considerations which I identify as being the central aspects of the economic comparison between the two alternative systems, are as follows:[149]

- The cost of 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 distortionary effects of VMRS taxes or levies upon the work and consumption choices of taxpayers.

[146] *See infra* text accompanying nn 158–160.
[147] *See infra* nn 151–152.
[148] *See infra* §III.C.2.
[149] This arrangement of distinct economic factors cannot claim to be canonical. When attempting to compare sets of hypothetical alternative institutions, which differ in myriad intricate ways, there are inevitably divergent formulae for decomposing the important distinctions between them. Cases could probably be made for rearranging some of the specific matters I discuss in the following sections, but such changes are unlikely to affect the nature of the argument.

- 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.

I devote a section to discussing each of these sets of issues.

1. The Cost of Artificial Scarcity

Once a copyright work has been created, there is a group of people who would value 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 called a *deadweight loss*.[150] It is the principal cost of enforcing scarcity in a good which is otherwise available in abundance. Alternative compensation systems are able to avoid this downside of exclusive rights. But how substantial is 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 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 writing creates huge costs, particularly in developing nations.[154]

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[150] *See supra* note 113 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 deserving of further empirical research; *see, e.g.,* Julie E. Cohen, *Lochner in Cyberspace: The New Economic Orthodoxy of "Rights Management"*, 97 MICH. L. REV. 462, 520–2 (1998), http://www.law.georgetown.edu/faculty/jec/Lochner.pdf. 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. ECO. REV. 845, 847–8 (1981).

[152] This is quite 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.
The monopoly effects created directly by copyright are thus distinct from other consequences of market power in entertainment industries (*see, e.g.,* In Re: Compact Disc Minimum Advertised Price Antitrust Litigation, MDL Docket No. 1361 (D. Maine) http://www.musiccdsettlement.com/english/finaljudgmentorder.pdf), which can limit competition between substitutes. 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* nn 162–165 and accompanying text.

[154] *See, e.g.,* Alan Story, *Study on Intellectual Property Rights, the Internet, and Copyright*, U.K. Commission on

Many advocates of strong copyright rules argue that deadweight losses are overcome by price discrimination,[155] or, in extreme cases, 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 appropriate the extra demand at the bottom end of the market. The price discrimination theory is thoroughly critiqued elsewhere,[157] but I provide 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.

But there is a more subtle and important problem with depending on price discrimination to minimize or prevent deadweight 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 the fact that the area beneath the demand curve does not capture the true utilitarian scope of deadweight loss, particularly in situations of intra-national or international inequity.

This 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 wealthy consumers. 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

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Intellectual Property Rights, Study Paper no. 5, (2002) § 4, 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 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, for example Easterbrook, *supra* note **Error! Bookmark not defined.**, at 112. Justice Easterbrook seems to claim that because information is sometimes distributed freely, we might conclude that "when free distribution is socially optimal, people will not enforce their property right to withhold publication or demand fees". 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* Cohen, *supra* note 151; James Boyle, *Cruel, Mean or Lavish? Economic Analysis, Price Discrimination and Digital Intellectual Property*, 53 VAND. L. REV. 2007 (2000), http://www.vanderbilt.edu/Law/lawreview/vol536/boyle.pdf.

[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 record industry executives and shareholders; alternately, 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.

segment", even with price discrimination.

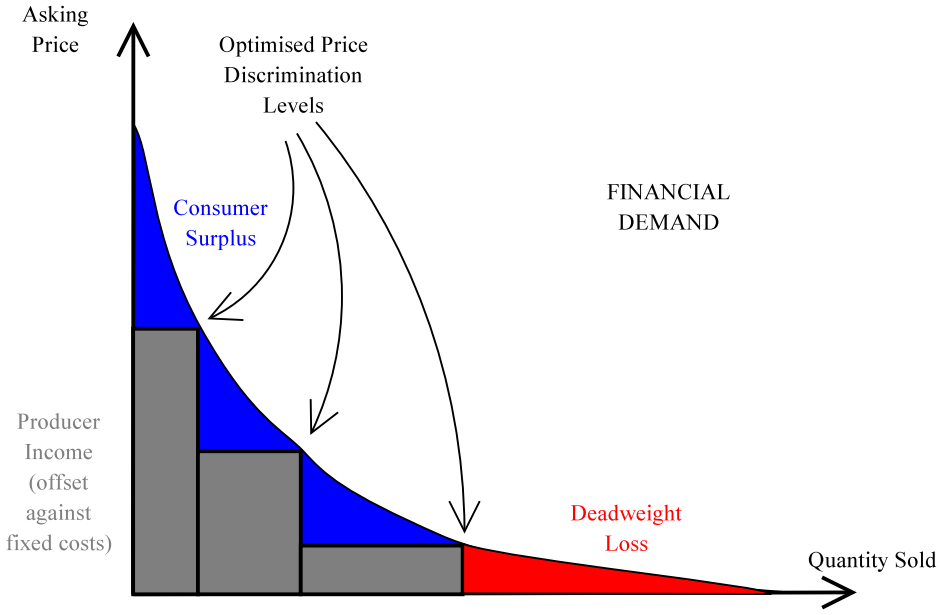

Figure 1: Financial Deadweight Loss

The situation is illustrated in the contrast between Figure 1, which shows financial deadweight loss[159] 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 market. Exemplary instances are abundant: there is little direct incentive for a textbook publisher to distribute cost-price textbooks 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 cost-price distribution of drugs to impoverished nations.

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. But in practice, because this tends not to occur, employing exclusive institutions to finance information production will exacerbate the problem.[160]

[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.

[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* Braithwaite & Drahos, *supra* note **Error! Bookmark not defined.**, chapter 7), it did not consider combining this with aid packages to correct the billions of dollars of inequitable wealth redistribution that TRIPs might cause.

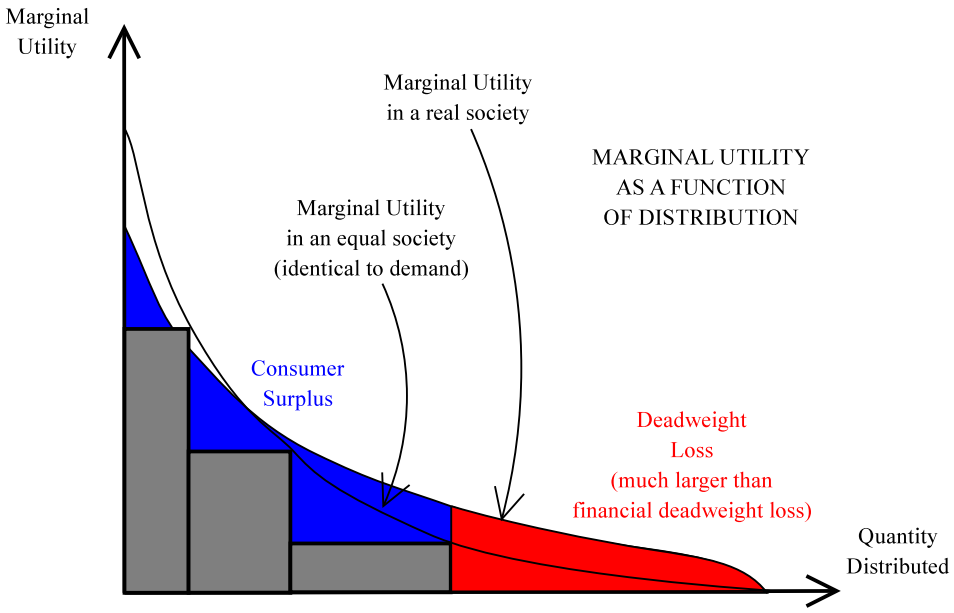

Figure 2: Utilitarian Deadweight Loss

Such structural considerations give us reason to believe that the costs of artificial scarcity are likely to be large, and weigh heavily in favor of alternative compensation systems. But how large is large? Two examples may serve to illustrate the scope for deadweight loss in copyright markets: one is the retail price of CDs, which provides some information about the scale of price discrimination employed by rights holders; another is the ratio of pirated music files to licensed music sales, 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 we cannot calculate the financial, let alone utilitarian, implications of these lost opportunities[161] — but they do allow us to glimpse the order of magnitude of the bottom line.

Consider the case of compact disc sales. Although 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 is trimming at the edges of artificial scarcity, it is leaving the core of

[161] *Cf.* Richard Watt, *The Past and Future of the Economics of Copyright*, 1 REV. ECO. RES. ON COPYRIGHT ISSUES 151, § 3.1 (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.

deadweight loss intact.

Volumetric data on piracy give us some insight into the amount of distribution which may be encompassed by deadweight loss. Since the CD prices discussed above were observed in Australia, I 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, approximately 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] So in this market, piracy now accounts for more than 50% of music distribution.[165]

The connection between these piracy levels and deadweight losses is not entirely straightforward. Firstly, for the present normative comparison of VMRS and DRM, I will make the simplifying assumption that an effective DRM system will prevent the great majority of pirate 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, excepting that many consumers do not make copies because it is illegal or inconvenient due to illegality. 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 tell us, precisely, the relative *value* of these two sets of copies. It

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[163]These figures come from a study commissioned by the Australian Record Industry Association (ARIA); *see* Quantum Market Research, *Understanding CD Burning and Internet File Sharing and its Impact on the Australian Music Industry, at* http://www.aria.com.au/documents/AriaIllegalMusicResearchReport_Summary.pdf. 11% usage amongst 16.6 million Australians aged 10+: 1.83 million downloaders × 19.6 average files per month × 12 months = 430 million songs downloaded. 40% of 16.6 million people received copied CDs: 6.64 million CD recipients × 3.9 average CDs per year × 13 songs per CD = 337 million songs on copied CDs.

[164]From ARIA's 2003 sales figures (http://www.aria.com.au/news/stats2000.htm): 50.6 million albums × 13 songs per CD + 9.5 million singles × 2 songs per CD = 677 million songs sold on CD. There were no licensed music download services operating in Australia at the time.

[165]53%, according to these approximate figures.

[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 I am going to place it aside for the time being.

[167]On the size of this switch, *see* Felix Oberholzer and Koleman Strumpf, *The Effect of File Sharing on Record Sales: An Empirical Analysis*, Draft working paper, Mar. 2004, *at* http://www.unc.edu/~cigar/papers/FileSharing_March2004.pdf (suggesting that it might negligible or even negative); Eric Boorstin, *Music Sales in the Age of File Sharing*, Senior Thesis, Princeton Univ., (2004), *available at* http://www.princeton.edu/~eboorsti/thesis/Music_Sales_in_the_Age_of_File_Sharing.pdf; *but see* Stan J. Liebowitz, *Pitfalls in Measuring the Impact of File Sharing*, (2004), *at* http://www.utdallas.edu/~liebowit/intprop/pitfalls.pdf (surveying and critiquing empirical studies on the effect of file sharing on music sales, including those by Oberholzer & Strumpf and Boorstin, and concluding that at this stage, we should still expect that file sharing is at least partly responsible for the recent decline in U.S. record sales).

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 valued works even at higher prices, though there are effects relating to both inequality[168] and imperfect information[169] which mitigate against this pattern of organization. We can, however, employ a conservative assumption to obtain a lower bound on financial deadweight loss, which is, that consumer valuations are uniformly distributed beneath the lowest available price.[170] In that case, an estimate of deadweight loss in Australia, under effective DRM, would be 75 Australian cents,[171] 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, both roughly and conservatively, $AUD 500 million ($350–375 million) per year. Per GDP, the equivalent cost in the United States would be a little over 7 billion dollars per year.[172] These costs are of course rough estimates,[173] and they only cover music, and not other forms of copyright subject matter.

I have argued 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 Costs

Both the VMRS and DRM models for information markets require computational infrastructure. For a virtual market, it is the voting system, and a means to pass rewards on 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),[174] as well as cryptographic channels to ensure that copies cannot be captured *en route*

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[168] *See supra* nn 158–160 and accompanying text.
[169] *See infra* § 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 — ½ × AUD $20 being $10, per album or about AU 75 cents per track. This rate is more or less equivalent to the "lowest available price" for most songs being U.S. $1, the amount charged by iTunes.
[172] According to the CIA WORLD FACTBOOK (2004), the U.S. GDP is 10.98 trillion dollars, while Australia's is 570 billion.
[173] See especially *supra* note 167 and accompanying text (causes for both uncertainty and conservatism in the estimate).
[174] On the necessary role of trusted systems in making DRM an economic possibility, see, for example, Stefik, *supra* note **Error! Bookmark not defined.**; Stuart E. Schechter *et al., Trusted Computing Peer-To-Peer Distribution, and the Economics of Pirated Entertainment, in* PROC. 2ND ANNUAL WORKSHOP ON ECONOMICS AND INFORMATION SECURITY, §1–2 http://www.eecs.harvard.edu/~stuart/papers/eis03.pdf (2003); Ryan Roemer, *Locking Down Loose*

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.[175] The relative cost of these two alternative infrastructures is an important factor in determining which policy scheme is more desirable.

The cost of a VMRS infrastructure is significant, including the secure hardware to certify downloads or votes,[176] the development of software to administer the system and possibly the maintenance of servers to ensure that cultural material is openly accessible. 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, because they are likely to remain quite symmetrical across the two alternative systems, their normative consequences are limited.

But 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 these systems so as to be secure. Kelsey & Schneier, amongst others, have emphasized that any digital trusted system must have analogue outputs;[177] even if the digital links are secure, high-quality digitizations (of music, at any rate) will be easy to obtain.[178] But, as I will explain, even the "digital" part of a 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,

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Bits: Trusted Computing, Digital Rights Management and the Fight for Copyright Control on Your Computer, 8 UCLA J.L. TECH. §II, *at* http://www.lawtechjournal.com/articles/2003/08_040223_roemer.php (2003).

[175]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), but considerable research efforts are 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 content 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.

[176] *See supra* §II.B.1 .

[177]Kelsey & Schneier, *supra* note **Error! Bookmark not defined.**.

[178]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, *Motion Picture Association of America, Content Protection Status Report*, Filed with the US Senate Judiciary Committee, (2002), *at* http://judiciary.senate.gov/special/content_protection.pdf. 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 is deserving of serious cost and feasibility studies.

millions of consumer devices need to be virtually tamper-proof.[179] This degree of security is a costly proposition, to say the least; but just *how* costly is difficult to say without having achieved it.[180] Informally, many security professionals have claimed 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 U.S. $20–$150 per consumer device.[181]

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. I tried this, and it resulted in a remarkably coincidental figure — $150 per device.[182] These rough estimates of the

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[179]Designing consumer devices which are literally tamper proof is almost certainly impractical, if not impossible; *see* Ross Anderson and Markus Kuhn, *Tamper Resistance - a Cautionary Note*, *in* PROC. 2ND USENIX WORKSHOP ON ELECTRONIC COMMERCE (1996), 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 & Kuhn went on to demonstrate, even this will be very challenging. *See* Ross Anderson and Markus Kuhn, *Low-cost attacks on Tamper Resistant Devices*, *in* PROC. 5TH INTERNATIONAL WORKSHOP IN SECURITY PROTOCOLS, 125 (1997), 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.

[180]*See* BRUCE SCHNEIER, SECRETS & LIES: DIGITAL SECURITY IN A NETWORKED WORLD Chapter 14 (2000).

[181]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 and Steve Weingart, *Building a High-Performance, Programmable Secure Coprocessor*, 31 COMPUTER NETWORKS 831 (1999), 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 and Mike Bond, *Experience Using a Low-Cost FPGA Design to Crack DES Keys*, *in* PROC. WORKSHOP ON CRYPTOGRAPHIC HARDWARE AND EMBEDDED SYSTEMS. (2002), http://www.cl.cam.ac.uk/~rnc1/descrack/DEScracker.html. The 4758 currently sells for around USD $4000 in a relatively small market; there are only about 300,000 ATMs in the United States, for example (*see 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 USD $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 was required in all consumer media devices.

[182]A recent survey of 503 organizations' experience in dealing with computer crime indicated that a total of USD $375.6 million was 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 SECURITY ISSUES & TRENDS, at 10–1 (2002), http://www.gocsi.com/press/20020407.html (this excludes losses from "insider abuse of Net access", laptop theft and denial-of-service attacks). 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.

Conservatively (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/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 5000 (from the table in Power, *id.*, at 3; assuming median numbers for each interval, and 15,000 employees for

price of effective copyright protection are, of course, very rough. 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-in at a few unknown but crucial points, extreme precautions must be taken everywhere. This is a fundamental problem of digital copyright, which I have attempted to illustrated in Figure 3.

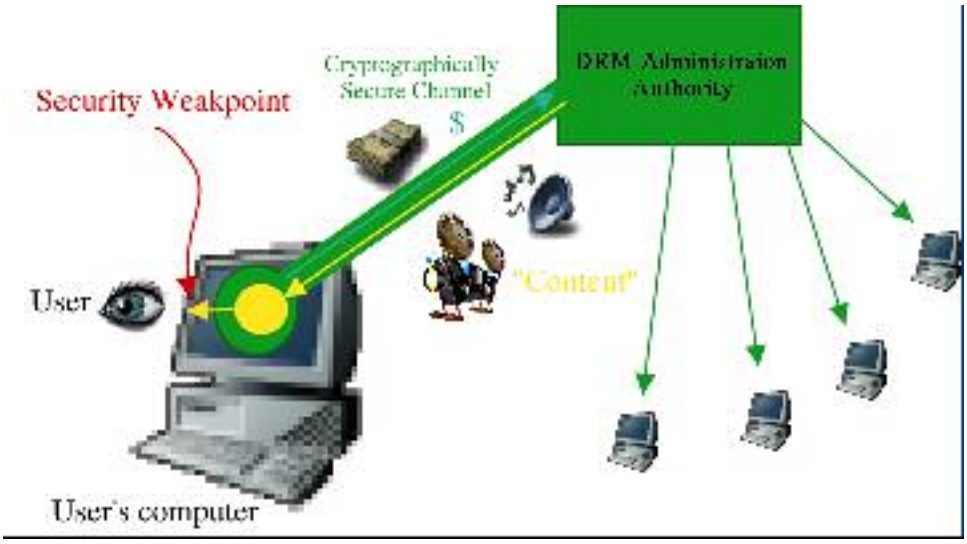

Figure 3: Information flows in a DRM system

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 3). In a virtual market, the only security-critical systems are the handful of government-run computers which allocate the rewards (as shown in Figure 4). Consumers participate in VMRS voluntarily, because it is overwhelmingly in their interest, and no actions taken by a small group of conspirators can threaten the network as a whole.

There may be another fundamental reason why the costs of security in DRM are much greater than in VMRS. 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

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organizations in the 10,000+ category). Hence, if we divide the minimum organizational cost of close-to-bulletproof security ($750,000), by the number of employees per organization (5000), we obtain a ballpark conservative prediction of effective security costs for an embedded consumer device: $150.

standards for communication. Even a small proportion of defecting nodes which attempt to subvert this arrangement can cause serious network problems.[183]

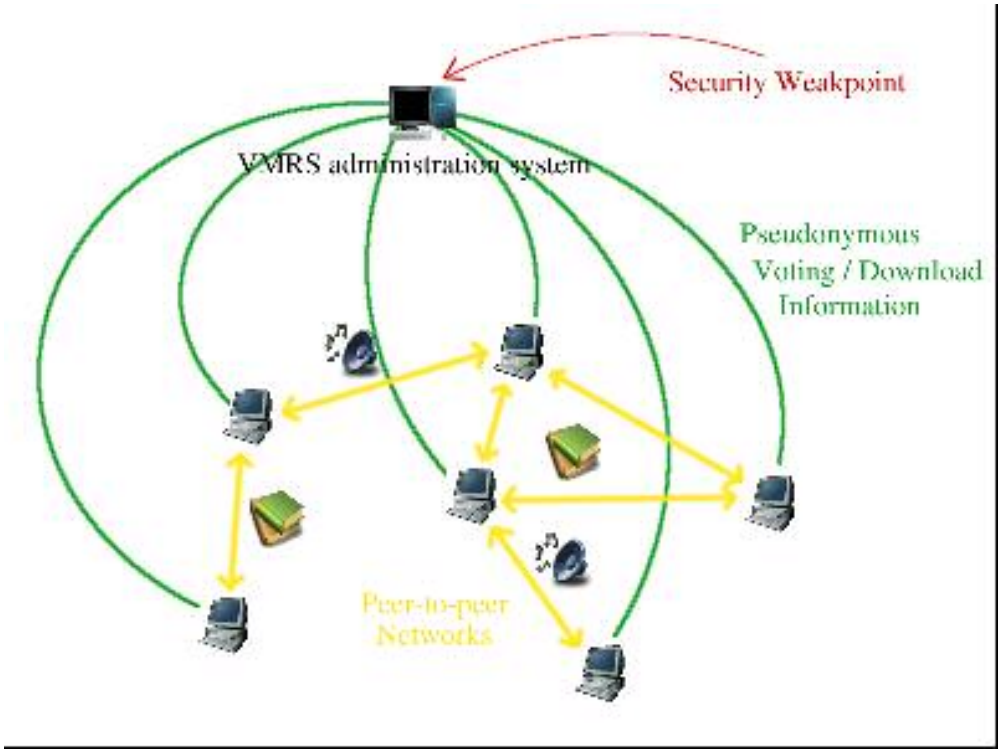

Figure 4: Information flows in a virtual market

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. Whilst 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 whilst most of its participants attempt to cause its downfall is a problematic and expensive proposition.

As a result of the very high costs of DRM security, it is safe to conclude that the infrastructure costs involved in enforcing digital copyright will be much higher than those associated with virtual markets.

[183]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 question of enforcing participation in an intrinsically unpopular protocol. *See* Noam Nisan and Amir Ronen, *Algorithmic Mechanism Design*, *in* PROC. 31ST ACM SYMPOSIUM ON THE THEORY OF COMPUTING, 129 (1999), citeseer.nj.nec.com/nisan99algorithmic.html.

3. Rights Clearance Transaction Costs

A virtual market allows open access to a huge body of works by default, and then 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 which parties must expend in order 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.[184] A majority of users will fit neatly into one of a few categories; their terms of access can easily be codified, and licensing occurs automatically with each purchase.

There, are however, a number of use cases for which rights clearance is inherently a major problem. Particularly, these relate to indexing, search, and analysis tools which 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 problem — perhaps the two most noteworthy examples are Google™,[185] and CiteSeer/ResearchIndex.[186] The majority of humanity's art, culture and wisdom is not on the web, however, and so does not fall within the scope of this peculiar 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 copyright,[187] or by collective licensing. But solutions based in fair use 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

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[184]Distribution-side rights clearance is of course very different to production-side rights clearance. Identifying exactly who owns the various rights applicable to a particular work, in order for them to be paid for a performance or derivative work (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.

[185]http://google.com; *see*also Sergey Brin and Lawrence Page, *The anatomy of a large-scale hypertextual Web search engine*, 30 COMPUTER NETWORKS & ISDN SYSTEMS 107 (1998), http://www-db.stanford.edu/pub/papers/google.pdf.

[186]CiteSeer was originally developed in NEC's research laboratories, though it is now operated by Pennsylvania State University; *see* http://citeseer.ist.psu.edu; *see*also C. Lee Giles *et al.*, *CiteSeer: An Automatic Citation Indexing System*, *in* Ian Witten *et al.*, eds., 3RD ACM CONFERENCE ON DIGITAL LIBRARIES, 89 (1998), http://citeseer.nj.nec.com/giles98citeseer.html.

[187]*See, e.g.*, Kelly v. Arriba Soft 280 F.3d 934 (9th Cir. 2002) (holding that making cached "thumbnail" copies of images, in order to provide them as search results, constituted fair use)

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.[188] 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) often go well beyond those of proprietary databases that index copyrighted research material,[189] 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[190]; 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.[191]

The indexing, search and analysis cases in which rights clearance is a problem for digital copyright appear to be an instance of the "tragedy of the anticommons",[192] 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.[193] This problem for DRM systems is not insurmountable, but

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[188]See *infra* n 191 for an example of the consequences of this concern.

[189]Such as 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 performance 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 #5,265,065; #5,794,236; #6,285,999 and #6,289,342), and the significant amount of human labor involved in some of these databases (the *Web of Knowledge* includes manually indexed citations, while *Westlaw*'s *KeyCite*™depends upon manual categorization of legal material).

[190]*See* Gary Wolf, *The Great Library of Amazonia*, 11.12 WIRED MAG. (2003), http://www.wired.com/wired/archive/11.12/amazon_pr.html; Stephanie Olsen, *Google tests book search*, CNet News, Dec. 17, 2003, *at* http://news.com.com/2100-1038_3-5128515.html.

[191]*See, e.g.*, The Authors Guild, *Amazon's New Database Likely to Help Sales of Some Works, May Undermine Others*, email to members (Oct. 24, 2003) *available 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, Nov. 5, 2003, *at* http://news.com.com/2100-1032_3-5102917.html.

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

[193]*See, e.g.*, Michael A. Heller and Rebecca S. Eiseneberg, *Can Patents Deter Innovation? The Anticommons in*

neither is it insignificant. Virtual markets and similar alternative compensation systems do not suffer from it, and so we have reason to believe that 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 expressed as "why should I pay taxes for music I don't listen to (or writing I don't read)"; another, inverse, objection is "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 dislike information goods of all sorts, who will be 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 raised.

Nevertheless, there may be some advantage to the DRM model because it guarantees that people are paying precisely for the things they want. They have significant control over the magnitude, and some control over the allocation,[194] 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 goods.

Bowen showed that if majority voting[195] is employed to decide the level of taxation-funded provision of a single public good, then, under strict but not implausible assumptions, the

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Biomedical Research, 280 SCIENCE 698 (1998); Jerome H. Reichman, *Of Green Tulips and Legal Kudzuu: 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).

[194]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.

[195]*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. ECO. 27 (1943).

result will be Pareto optimal.[196] 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 VMRS as a single public good which should 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.[197]

Bucovetsky's result seems to guarantee that a virtual market could not be optimal, because it will inevitably face a population with highly heterogeneous and complicated tastes. There is, however, cause for optimism if we move away from a majority-voting model and replace it with an incremental approach.

De Trenqualye has shown that if cost sharing (tax) rules are fixed in advance, then an incremental voting system, which adjusts the budget allocations to many different public goods in a continuous fashion, will reach a Pareto-optimal equilibrium.[198] This model has some significant similarities to the virtual market proposal.[199]

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[196]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 **Error! Bookmark not defined.**, at 205–10, where it is shown that majority voting can be Pareto optimal whenever *individual variation* in preferences for the public good are 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.

[197]Sam Bucovetsky, *Choosing Tax Rates and Expenditure Levels Using Majority Rule*, 46 J. PUB. ECO. 113 (1991).

[198]*See* Pierre de Trenquayle, *An extension of Bowen's dynamic voting rule to many dimensions*, 15 SOC. CHOICE & WELFARE 141 (1997). De Trenqualye's model assumes voters make decisions based on their immediate preferences; Pareto optimality at equilibrium and local incentive compatibility depend on convex preferences; the existence and inevitability of equilibrium depends on Euclidean preferences.

[199]The largest difference is that De Trenqualye'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

This very encouraging result is not quite the end of the story, though. The problem lies within the assumption of fixed tax-sharing rules. It is true that, for any given tax formula, VMRS will work well, and may approach Pareto optimality. But we are, at the same time, returned to the question of whether there is a tax formula which is as good as the DRM-based copyright marketplace.

Any tax formula used to fund public goods can be decomposed into a component which is "benefit offsetting" (citizens are left indifferent after the introduction of the tax and the creation of the public good), and a component which is both distortionary and redistributive.[200] An ideal tax system must both fund public goods which pass a cost-benefit test, and perform redistribution which is "socially desirable", although this objective is inevitably subjective.

Some plausible funding schemes for VMRS were introduced in Section II.B.3. Each is likely to entail some redistributionary and some distortionary effects. The significance of those effects, however, depends both upon the choice of social welfare function, and on 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/redistributive consequences where publishers of information goods possess market power.[201]

Virtual markets will have redistributive/distortionary effects determined largely by the chosen taxation model.[202] So, for example, using income taxation to fund artistic and literary production will have side-effects unless the incidence of that particular tax offsets the benefits. Also, because valuations of information goods will not be homogeneous within each tax bracket,

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cultural works might be more accurately modelled with exponential decay than with constant value.
We can interpret the ratio of each user's votes (for different works) as defining a line in ^{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 Trenqualye'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.

[200] *See* Kaplow, *supra* note 80 for a discussion of this decomposition.

[201] *See supra* note 152.

[202] *See supra* nn 73–83 and accompanying text.

there will be transfers of wealth from low-valuers to high-valuers;[203] this will cause labor supply changes amongst some of these taxpayers. Note also that where such effects are present, they may be particularly strong, because many information goods are likely to be complements to leisure.[204]

Levy-based taxation systems can be expected to produce quite different redistributive 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 take backups if there is a significant levy charged to support artists. A tax on internet connections may discourage marginal "email 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 which combine basic indicators of technology use with a progressive revenue source may turn out to 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. Whilst there will inevitably be "corner case" redistributions, these may prove to be quite marginal.

I would conclude that, if it is believed that an existing taxation system represents an optimal balance, then the distortionary effects of higher taxes are an unambiguous factor in favor of using technology to enforce exclusive rights. But claiming that the political processes which govern welfare and taxation systems actually produce *optimal* social welfare outcomes is, realistically, rather unrealistic.[205] In practice, tying the solution to one economic problem (how to finance the work of authors and artists) to another — decreasing wealth inequality — may have unique advantages. The utilitarian implications of using taxation to power the information economy are uncertain, but it is entirely possible that they are beneficial. 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

[203]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.

[204]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.

[205]*See, e.g.*, David Brooks, *The Triumph of Hope Over Self-Interest*, N.Y. TIMES Jan. 12, 2003 (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).

weigh in favor of the DRM alternative, but we should also be mindful of the positive side effects which 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 (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,[206] but, all other things being equal, information economies should be lead towards the public's tastes and not away from them.

In a DRM system, valuation information is revealed through the act of payment, by users, 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. But 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 distorted. 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, with a view to determining whether they might provide grounds for preferring one system over the other.

a. Transparency

A profound problem with information revelation under DRM relates to the inherently *non-transparent* nature of many information goods: Alice can't really tell what they are, until she has "consumed" them.[207] So, if consumers have to pay for a piece of writing before they read it, for example, then they will be signaling their anticipated valuation, rather than an actual

[206] *See supra* nn 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.

[207] *See* J. Bradford DeLong and A. Michael Froomkin, *Speculative Microeconomics for Tomorrow's Economy* FIRST MONDAY Feb. 2000, *at* http://www.firstmonday.dk/issues/issue5_2/delong/ (emphasizing the importance of transparency in modern information economies); Arrow, *supra* note 40, at 615 (highlighting similar problems in markets for industrial information); Lisa N. Takeyama, *Piracy, Asymmetrical Information, and Product Quality Revelation*, Society for Economic Research on Copyright Issues, June 2002, http://www.serci.org/2002/takeyama.pdf (arguing that these effects should be counted against strict copyright systems in economic analyses). A similar concept is captured by Nelson's distinction between "experience" and "search" goods; *see* Phillip Nelson, *Information and Consumer Behaviour*, 78 J. POL. ECO. 311 (1970).

valuation.

To some extent, lack-of-transparency problems are attenuated by providing sample chapters of books, trailers for films, or by allowing music purchasers to listen to 30 second clips before they buy songs. Depending on the particular medium, there are various transaction costs and limitations associated with these strategies. 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 decide if they like things *after* they have experienced them, it is capable of providing incentives which are more closely attuned to consumer's 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, we can be relatively certain that a DRM-based marketplace is, up to a point, reporting the public's preferences accurately.[208] A virtual market based on usage metering and votes, in contrast, does not require Alice to "put her money where her mouth is", as it were. One must wonder what implications this could have for the preferences so revealed.

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, however, 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.[209]

A second possible cause of inaccurate preference revelation in a virtual market — conscious misrepresentation of preferences in votes — is more complicated. As I argued in Section II.B.6, in the absence of clear incentives to do otherwise, a combination of self-interest[210]

[208] 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. And conversely, no doubt, one could find examples of people paying for things which they do not really want.

[209] The notable exception to this would be subcultures which 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* §IV.C), it is difficult to see why they would bother doing this.

[210] *Cf.* de Trenquayle, *supra* note 198 (establishing theoretical conditions under which it is rational for consumers to disclose their preferences honestly).

and cultural factors should make accurate voting a default behavior.[211] 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.[212]

One should also acknowledge a subtle interaction between the artist and the audience which 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 which disadvantages artists who are either unable or unwilling to guide their audiences in this manner. While this argument is certainly valid, it appears that 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, at any rate — perform this particular task optimally. This constitutes a reason, albeit a rather marginal one, for preferring the latter system.

c. One-user-one-vote effects

A DRM based marketplace is a "one dollar, one vote" system. As discussed above,[213] it might be possible to weight votes in a virtual market in order to create something similar. Similar, though not entirely the same — because the amount of tax one pays in a virtual market is not a direct function of the number of works one consumes. To first order, this is unlikely affect the information extracted from the system; while some (in statistical terms) 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.[214] It is only if there is a very strong correlation between certain tastes and a willingness to pay significantly more than the tax rate, that inefficiencies become an issue.

Under certain circumstances, where the range of consumer preferences is highly skewed,

[211]This depends significantly on the absence of any financial incentives to the contrary; Section II.B.2 discusses where these incentives might come from and how they can be removed.
[212] See *supra* note 135 and accompanying text.
[213]*See supra* § II.B.4.
[214]Compare with the results cited *supra* at nn 196–196, where optimality in public goods production mechanisms is linked with to symmetry in the distribution of preferences.

the lack of a true "democracy of dollars" might undermine the ability of users to support the production of high-value, small-market works. The DRM model could avoid these limitations, and in general, this might be a serious drawback which should be counted against alternative compensation systems. I 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 consumer, as opposed to commercial, uses of information.[215]

First, let us consider the case in which a high value, niche work might be produced and funded by large payments from a few wealthy contributors. Certainly, we can find examples of these works — valuable paintings, sculptures and prints; operatic and theatrical performances; detailed market research and business intelligence documents. Amongst artistic works, it would appear that a high-value nature is consistently associated with a high-quality "authentic" item or experience, 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 I would term the "phenomenon of near constant prices".[216] These goods could fit elegantly 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.[217]

d. Network effects and contests over the definition of "cultural space"

Mark Nadel has argued that the role of advertising for copyright works, in defining and manipulating something that I would term "cultural space" — the *lingua franca* of those interactions between individuals and amongst social groups which are mediated by culture — may result in a wasteful dissipation of resources.[218] This might be a significant cause of market failure, in which case it would be relevant to know whether alternative compensation systems could avoid such problems.

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[215] *See supra* § II.B.5.

[216] At this point, it is interesting to note 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. xxx cut + paste cites from SERCI

[217] Barlow, *supra* note **Error! Bookmark not defined.**, for example, argues that patronage should play an important role in the support of artists working in a digital environment. In general, it appears quite problematic to depend on patronage, at least in the old fashioned sense, for any important kinds of cultural production. It is perhaps less drastic in the context of unusual, niche market works.

[218] *See* Nadel, *supra* note **Error! Bookmark not defined.**.

It seems that 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 our perspectives on the word are unavoidably colored by the art and entertainment we consume. Many adults read *Harry Potter* novels, rather than other works of fantasy, so that they can follow dinner party conversations, and 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. So, 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 capturing the human psyche, but only a few of them will top the charts.[219]

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.[220] There is no general solution to this problem unless the institutions which provide financial incentives can somehow obtain and respond to comparative information about all of the players competing for each niche in cultural space.[221]

On one level, exclusionary copyright and publicly funded rewards appear to suffer equally from races to define cultural space. Because virtual markets mimic real market returns, there will be an excess of investment in marketing a few costly cultural products, while society would be better off with more diverse investment in cultural creation — a level playing field of more works, the best of which evolve to define "cultural space". "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.

But while a formulaic solution to the problem is impractical, it could conceivably be mitigated by social processes made possible by a virtual market. If users reward works according to both their subjective quality, and the fact that they are not supported by strong

[219] *Cf.* Moshe Adler, *Stardom and Talent*, 75 AM. ECO. REV. 208 (1985) (modeling a similar same phenomenon, but using imperfect information, rather than preference-altering externalities *per se*). Adler only identified "luck" as the tie breaker in these contests, while I find Nadel's nomination of advertising more persuasive.

[220] *See, e.g.*, Wright, *supra* note 36, at 691, 693 (describing this effect, and surveying relevant comments in the literature).

[221] *Cf.* Wright, *supra* note 36, 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 market.

marketing, then resource dissipation through races will decrease. This is a behavior that some people would be inclined to engage in naturally ("I'll vote for independent bands as a matter of principle"), 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. But it is apparent that the option given to people by virtual markets, to allocate remuneration that is not in strict proportion to consumption, is advantageous.

e. Information about the size of the market

The preceding discussions have addressed the role of information about 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, and I discussed above some of the methods by which this could be achieved, settling on contingent valuation surveys as the most practical and effective method measuring total demand.[222] But even if these surveys were producing excellent data, 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 which are the subject of political decision making — including as the duration of rights, thresholds of originality, or 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 certain circumstances, excessive rights can lead to overproduction.[223]

Because of the possibility of imperfections in the size of an alternative compensation system, market size information probably gives us 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. And 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

[222] *See supra* nn 84–90 and accompanying text.
[223] *See* Cornes & Sandler, *supra* note **Error! Bookmark not defined.**, at p. xxx.

information should be counted in favor of DRM.

f. Information revelation as a whole

Having examined the comparative informational properties of virtual markets and DRM-based copyright, it is apparent that there are a number of fairly subtle effects superimposed on each other when these systems determine 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. But at the same time, the damping of contests over cultural space, and avoidance of the need to "buy before you try", might go some way to 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. I would be reluctant to conclude that this aspect of the comparison could be anything other than ambiguous.

D. Economic Conclusions

Section 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. There were two factors where one model had a small efficiency lead (the distortionary costs of taxation, for DRM, and transaction costs, for VMRS). Finally, there were two areas where virtual markets were clearly greatly superior — deadweight loss, and infrastructure costs.

Table 1: Summary of economic comparison between DRM and virtual markets

FACTOR (AND SUB-FACTORS)	IMMEDIATE EFFECT FAVORS	AMELIORATING POINTS	CONCLUSION
Artificial scarcity (§ III.C.1)	VMRS		Very 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 prevent poverty	Amplifies cost of scarcity; limits price discrimination
Computer security & infrastructure costs (§III.C.2)	VMRS		Very substantial advantage for VMRS
Rights clearance transaction costs (§III.C.3)	VMRS	Fair use & collective licensing	Clear advantage for VMRS
Distortionary taxation (§III.C.4)	DRM	Use of taxes on complimentary goods	Likely to favor DRM
Redistribution effects may decrease inequality	VMRS		Clear benefit of VMRS
Information revelation (§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

After canceling terms, there are two major economic factors which 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. And 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.

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 and 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,[224] and relevant neighboring rights, covering only copies made by individual citizens, for non-commercial purposes, within the operation of a VMRS, and where remuneration is being provided by the virtual market. Other exclusive rights, such as the rights of publication or derivation, and rights for commercial uses of works, would be unaffected.[225]

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

[224] As required by Article 8 of the 1996 World Intellectual Property Organization (WIPO) Copyright Treaty.

[225] 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. So, for example, Fisher proposes 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; *see* Fisher, *supra* note 49, at 10,39–42. Netanel, in contrast, suggests 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; *see* Netanel, *supra* note 49, § V.A.1.c. While these proposals have some attractive features, it seems that the question of derivative works remains to some degree independent to the central problem of reproduction.

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 would choose to participate voluntarily. But, in the context of a nation experimenting with the creation of a virtual market, 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 (or otherwise) for universal coverage.

2. International Treaty Obligations

In the area of intellectual property, perhaps more than in any other so consequential 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, the World Trade Organization (WTO) Agreement on Trade-Related aspects of Intellectual Property rights (TRIPs) (which incorporates most of the Berne convention), and the 1996 WIPO Copyright Treaty (WCT) and Performances and Phonograms Treaty (WPPT), 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;[226] although there are other avenues for exceptions to some particular rights, none are sufficiently broad to address file sharing, for example. The three-step test was devised during the 1960s as a measure 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,[227] 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:

[226]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).

[227]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 which is slightly *more* constraining than TRIPs alone.

> 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.

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,[228] and there has been one WTO panel ruling dealing with the legality of United States secondary broadcast performance exemptions under Article 13.[229] There has also been one WTO panel ruling on TRIPs Article 30, which is a derivative application of the three-step test to patents.

It would not be productive to reproduce here the voluminous reasoning available in these sources. Instead, I will attempt to highlight the aspects of the test which interact with proposals for alternative compensation systems, and to identify the points of jurisprudence which 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.[230] It would cover many works for many users. Although this is true, it ignores a crucial aspect of the issue. Of all the myriad ways and contexts in

[228] *See* SAM RICKETSON, THE BERNE CONVENTION FOR THE PROTECTION OF LITERARY AND ARTISTIC WORKS: 1886-1986 482–9 (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), http://papers.ssrn.com/paper.taf?abstract_id=253867; 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).

[229] *See* WTO Dispute Settlement Panel, *Report on Section 110(5) of the United States Copyright Act*, (2000), http://www.wto.org/english/tratop_e/dispu_e/1234da.pdf [hereinafter 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 "home style" stereo or television (and was allowed by the WTO). The other exempted 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 lead 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).

[230] The W.T.O. dispute settlement panel has stated that the word "special" should be interpreted as meaning "narrow"; *see* Panel, *id.*, ¶6.109. Dictionaries are more likely to suggest partial synonyms such as "peculiar", "exceptional", "distinctive" or "limited" (drawn from the *Shorter Oxford English Dictionary* and the GNU *Collaborative International Dictionary of English*). The panel report itself cites the *Oxford English Dictionary* as providing "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". It seems to this author, at least, that the word "narrow" adds 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".

which rights of reproduction could be infringed, downloads which are part of a specifically organized public reward mechanism are peculiar, limited, and are, literally, a special case.

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 (descriptive) measure of how works are used, and a normative (prescriptive) statement of how they should be usable.[231] The WTO panel has stated that it should measure both.[232]

   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.".[233]

   It is thus likely that, if the blanket license which enabled VMRS curtailed forms of exploitation of considerable economic importance, then 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 conflicting with, the normal use of the work.[234]

3. Blanket licenses must not *unreasonably prejudice the legitimate interests of the right holder*. The dispute settlement panel has indicated that a significant part of this step involves

[231]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 Internationeaux Reunis pour la Protection de la Propriete Intellectuelle* (BIRPI, the predecessor of WIPO), the original proposal which 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" (Study Group report, page 42, cited Panel, *supra* note 229, at ¶¶ 6.179–180). Although the form of Berne Article 9(2) changed through political debate at the Stockholm conference (*see* Ficsor, *supra* note 228, §§ II.1–3), casting ambiguity on its enactors' intentions, returning to the original Study Group documents for interpretation of the test is would seem to be allowed by Article 32 of the Vienna Convention on the Law of Treaties.

[232]*See* Panel, *supra* note 229, ¶6.166.

[233]*See* Panel, *supra* note 229, ¶6.183.

[234]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 229, at 16 (emphasis added).

evaluating the economic harm suffered by copyright owners.[235]

Although the panel left the open the possibility of considering normative factors other than economic value when identifying "unreasonable prejudice" to rights holders' "legitimate interests", it is worth noting that such factors are to a large extent the subject of the "normal exploitation" step of the test.[236]

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 (normal) means of rewarding authors for digital distribution of their works, then, properly funded and fairly administered, they would be unable to unreasonably prejudice those authors' legitimate interests.

With its extremely high minimum levels for exclusive rights, TRIPs poses a formidable barrier to constructive reform of (or 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, anywhere, objected strenuously.[237] Should a nation decide to try deploying a virtual market reward system, it would be useful to 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 appeared.

The empirical condition depends on the fact that DRM — technologically mediated copyright — must be failing to deliver satisfactory mass-markets for information goods. Peer-to-peer file sharing would have to be prevailing in its 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 be appearing before the a dispute settlement panel equipped with significant evidence of the practical shortcomings of DRM.

One legal question relates to the determination of the panel to read the first part of Article

[235] *See* Panel, *supra* note 229, ¶¶ 6.227, 6.229.
[236] *Cf.* Ginsburg, *supra* note 228, at 16 (arguing that private copying exceptions are in danger from the second step).
[237] 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* the Consumer Project on Technology's resources on parallel importation and access to essential medicines, http://www.cptech.org/ip/wto/p6/.

13 as a very 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. If, on the other hand, "certain special cases" is read in English, then these kinds of blanket licenses should be admissible.

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 which might complicate 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, that "user pays" enforcement will prove insufficient to make DRM work. Digital exclusive rights might require large taxpayer expenditure on the policing of copyright; indirect public expense, by requiring ISPs to take a proactive role in copyright enforcement; or the enactment of specific laws that curtail file sharing.[238] 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 it 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. It is improbable that an alternative compensation camel could be squeezed through the Article 13 eye of the TRIPs needle. Nonetheless, because the test is based on descriptive principles and constructed with English words, it might just prove itself flexible to allow some limited experimentation with virtual markets. If such experiments proved successful, then TRIPs would, no doubt, become a less substantial obstacle to alternative compensation systems.

B. National versus International Virtual Markets

Whilst 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

[238]Such as those whose proposal sparked the debates cited *supra* at note **Error! Bookmark not defined.**.

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 plethora of file sharing and digitization encouraged by the virtual market of the hypothetical Republic of Freedonia[239] 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, is yes. Such transfers would not be legal on either side of the border,[240] but it must be admitted that they would occur. If the DRM systems deployed in Copyrightland were watertight, it could also be said that cross-border piracy of this sort would pose a distinctive threat to the sustainability of Copyrightland's policies; but, as I have argued, watertight DRM is likely to be prohibitively expensive.[241] As it stands, any copyright system which hopes to be sustainable will have to be sustainable in competition with file sharing which is suppressed more by the use of enforcement to successfully "compete with free", than by a constricted supply of raw material. And, under these circumstances, the same enforcement mechanisms are available to rights holders in both Freedonia and Copyrightland. It transpires, I believe, that Freedonia need not pose a greater threat to copyright elsewhere, than digital technology does in the first place.

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 directly to foreign publishing companies, authors and artists. Taxpayers might inevitably 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.[242]

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

[239]With apologies to both the Marx Brothers and RMS.
[240]*See supra* § IV.A.1.
[241]*See supra* § III.C.2.
[242]*See, e.g.,* MICHAEL RUSHTON, *Economic Impact of WIPO Ratification on Private Copying Regime*, (a report prepared for Candian Heritage Department's Copyright Policy Branch), (2002), http://www.pch.gc.ca/progs/ac-ca/progs/pda-cpb/pubs/ompi-wapo/wapo.pdf.

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 the 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". This approach is, however, all but precluded by the national treatment principle embodied in international treaties on intellectual property.[243] 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 would be to emphasize that the responsibility for these transfers lies with taxpayers themselves. This would be precisely the case if each VMRS participant had control of exactly their own tax contribution,[244] 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 general — Freedonia's dollars are moving offshore precisely when Freedonia's taxpayers are sending them there. It is then up to each individual to weight 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 the existing copyright system.

C. Privacy Implications

Would an alternative compensation system result in massive violations of the public's privacy?[245] In the long run, a virtual market would contain a database of the cultural and informational preferences of an entire society. It goes without saying that there are uses to which such data should not be put. Private information about intellectual consumption should be shielded, not only by administrative regulations preventing the use of information pertaining to

[243]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.

[244]*See supra* § II.B.4.

[245] It is, of course, not only alternative compensation systems which have troubling privacy implications. The difficulty of protecting personal information under DRM is, if anything, even greater; *see, e.g.* Julie E. Cohen, *DRM and Privacy*, xxx BERKELEY TECH. L.J. xxx (2003).

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,[246] so that at a first inspection, it would be possible to tell that some participating citizen had registered a particular set of votes, but it would not be possible to identify them 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".[247] In that case, the government would be able to tell that they have authorized a particular pseudonym, but are unable to then determine which of their authorized users is employing it.

In a weak scheme, identities would be certified by a so-called "fair blind signature",[248] 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 allowing indiscriminate use would be inappropriate. It would be necessary for pseudonymity-compromising information to be stored offline. It would also be wise to split the TTP role between several different organizations,[249] all of which would have to cooperate in order to reveal a VMRS participant's identity.

Even if the very strong steps I have suggested were not taken, virtual markets would do little to decrease online privacy. Law enforcement agencies already have access to much more revealing information through sources such as "Carnivore" devices at ISPs,[250] or through the monitoring of email traffic at the Internet backbone. Carnivore, for example, gives the U.S. government knowledge about when individual Americans browse the web, what they have read and what they have searched for. Resourceful crackers are perfectly capable of turning computers that they control into their own privatized equivalents of Carnivore.

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[246]On pseudonymity, *see supra* note 69.

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

[248]*See* Markus Stadler *et al.*, *Fair Blind Signatures*, *in* PROC. EUROCRYPT '95, 209 (1995), http://www.ubilab.org/publications/print_versions/pdf/sta95.pdf. An alternative signature scheme would be "magic ink" signatures; *see* Markus Jakobsson and Moti Yung, *Distributed Magic Ink DSS Signatures*, *in* PROC. EUROCRYPT '97, 450 (1997), http://rsasecurity.com/rsalabs/staff/bios/mjakobsson/hint/hint.pdf. In that case, the role of a TTP is replaced by a quorum of signing servers.

[249]Possibly including NGOs as well as public sector institutions.

[250]Carnivore, also known as "Magic Lantern", appears to comprise a filtering packet sniffer and post-collection analysis software. For further information on it, see the Electronic Privacy Information Center's Carnivore page, http://www.epic.org/privacy/carnivore/.

It is true that knowledgeable Internet users can find ways around online surveillance — software such as GnuPG[251] or PGP[252], and services such as Hushmail[253], can provide secure email systems; anonymizing proxies allow (limited) browsing privacy.[254] But maintaining one's digital privacy is a difficult activity which few people are motivated to pursue; it is only those who already do so who stand to be substantially affected by either DRM on VMRS — and it is precisely these individuals who possess the technical wherewithal to continue obtaining information goods through unlicensed (underground or offline) channels.

D. Impacts upon Existing Structures of Cultural Production & Distribution

Some readers may suspect that virtual market models, if influential, would cause the role of the publisher to gradually shrink and disappear. One could also argue that explicit encouragement of the use of digital works at zero marginal cost would 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 the many corners of the entertainment industry. The prospect of cannibalization also undermines the possibility of incremental introduction of alternative compensation systems which only replace those revenues lost to rights holders from file sharing.[255]

Fortunately the extent of these effects is not quite as disruptive as might at first be imagined, especially when we discount the changes in information production which are in any case accompanying the transition from a marketplace based on physically embodied information goods, to one based on files on hard disks. Consider the role of publishing companies. Publishers often make indispensable contributions which assist authors, for example, in producing written works. They organize 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 in advance. All of these roles close or identical equivalents in other cultural industries — and all of them continue to be relevant and necessary in a virtual market.

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[251]The "GNU Privacy Guard"; *see* http://www.gnupg.org.
[252]"Pretty Good Privacy"; *see* http://www.pgp.com/.
[253]*See* http://www.hushmail.com.
[254]Traffic analysis and pattern recognition attacks render all but the most extravagant of anonymization efforts transparent. For a survey of research in this area, *see* Larry Korba and Ronggong Song, *Review of Network-based Approaches for Privacy*, *in* PROC. 14TH CANADIAN INFORMATION TECHNOLOGY SECURITY SYMPOSIUM (2002), http://citeseer.nj.nec.com/song02review.html.
[255]*See* Liebowitz, *supra* note 84, at 6.

The one significant task which publishing companies lose under VMRS is that of a clearing-house for digital rights to the works they have published. This may in the longer term have an impact on some publishing organizations, especially where returns on market power have resulted in particularly concentrated ownership of copyrights; however, it is difficult to argue that dissolution of this kind of market power would be a disadvantageous feature of virtual markets in the medium to long term.

Other organizations that might 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 record and book stores, for example, might charge that VMRS represented a cross-subsidy to digital media, one that would place them at a significant disadvantage. Of course, in the long term, as technologies for purely digital distribution improve, these effects are likely to occur anyway, but it is correct that if VMRS applies only to works distributed on the Internet, then it does amount to a cross-subsidy.

The answer to this problem may be to codify ways in which virtual market votes could also apply to non-digital works.[256] 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 which they do not have in stock. If these applications of virtual markets approximately succeed in reducing the cost of books and CDs by the rate of royalties paid, then any distortionary cross-subsidy effects are removed. Under such a regime, consumers are free to choose whichever distribution medium they prefer, at prices which reflect the underlying costs of those media.

E. The Prospect of Censorship

If artists are to depend on VMRS for their incomes, then a government which decides to engage in censorship will be able to prevent them from earning rewards from the virtual market. Opponents of censorship might regard this as a disadvantage of VMRS.

It is not genuinely clear, however, 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 works access to digital infrastructure, they could do so just as easily under ordinary

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

copyright law.[257]

Artists attempting to distribute censored material have found, and will continue to find, the Internet to be a very 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 possibility that an alternative compensation system would facilitate censorship, is the possibility that it would make censorship more probable in a political sense. The problem here is the involvement of taxpayers' money; those who pay tax whilst 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.[258]

[257]Lynch, *supra* note 95, argues that DRM may in fact be a particularly useful tool for facilitating censorship. I am inclined to suspect that DRM will not have much effect, in cases where authors want to distribute their banned material anyway.

[258]*See supra See supra* § II.B.4. The observation that this can be used to address the political problems of pornography under reward systems is due to Eugene Volokh.

V. CONCLUSIONS AND COMMENTS

A. Outstanding Objections

The argument presented in this paper — that VMRS systems might well produce better outcomes for society, in a utilitarian sense, than DRM-enforced copyright — is reasonably robust. But it is useful to examine some of the more common outstanding objections which people raise against virtual markets.

The government simply has no role to play in information markets — this is common ideological objection to VMRS. It is however, somewhat inconsistent as a defense of DRM, because the government must create and police a costly (and abusable) infrastructure of exclusive rights, anti-circumvention laws, and possibly standards,[259] in order for DRM to work. Therefore, rather than representing a choice between regulation and free markets, DRM and VMRS embody two different forms of regulatory infrastructure.[260]

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 variants[261] to either virtual markets *or* exclusive rights.

Artists would be in a terrible position if they depended on a 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

[259] At this point, it is unclear to what extent governments will become seriously involved in setting DRM standards; *see* Drew Clark and Bara Vaida, *Digital Divide* NAT'L J. TECH. DAILY Sep. 6, 2002, 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).

[260] *Cf.* Thomas Babington Macaulay, *A speech delivered to the House of Commons*, Feb. 5, 1841, http://www.kuro5hin.org/story/2002/4/25/1345/03329 (famously observing that "copyright is a tax on readers for the purpose of giving a bounty to writers").

[261] *See supra* nn. **Error! Bookmark not defined.**–**Error! Bookmark not defined.** and accompanying text.

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

A virtual market would just be one more step towards an Orwellian state in which all of our actions are monitored and controlled — as it turns out, this is not really a particular problem of VMRS. Even if the very strong steps I suggested above[262] were not taken, virtual markets would do little to decrease online privacy. Law enforcement agencies already have access to much more revealing information through sources such as "Carnivore" devices at ISPs,[263] or through the monitoring of email traffic at the Internet backbone. Carnivore, for example, gives the U.S. government knowledge about when individual Americans browse the web, what they have read and what they have searched for. Resourceful crackers are perfectly capable of turning computers that they control into their own privatized equivalents of Carnivore.

It is true that knowledgeable Internet users can find ways around online surveillance — software such as GnuPG[264] or PGP[265], and services such as Hushmail[266], can provide secure email systems; anonymizing proxies allow (limited) browsing privacy.[267] But maintaining one's digital privacy is a difficult activity which few people are motivated to pursue. These are the only individuals who would be threatened with privacy invasion by VMRS.

It is also important to realize that any information disclosed through a VMRS must be given away willingly — if, for whatever reason, one does not wish to have one's tastes known, one could use alternative (underground or offline) channels to obtain content.

The reason for choosing to use the virtual market is that it actually provides something extra — an income for the authors and artists one appreciates, and thus, more works to be enjoyed. VMRS is in a sense a very anti-Orwellian application of technology, because it allows

[262] *See supra* §IV.C.

[263] Carnivore, also known as "Magic Lantern", appears to comprise a filtering packet sniffer and post-collection analysis software. For further information on it, see the Electronic Privacy Information Center's Carnivore page, http://www.epic.org/privacy/carnivore/.

[264] The "GNU Privacy Guard"; *see* http://www.gnupg.org.

[265] "Pretty Good Privacy"; *see* http://www.pgp.com/.

[266] *See* http://www.hushmail.com.

[267] Traffic analysis and pattern recognition attacks render all but the most extravagant of anonymization efforts transparent. For a survey of research in this area, *see* Larry Korba and Ronggong Song, *Review of Network-based Approaches for Privacy*, *in* PROC. 14TH CANADIAN INFORMATION TECHNOLOGY SECURITY SYMPOSIUM (2002), http://citeseer.nj.nec.com/song02review.html.

ordinary people more say in the world around them, rather than less.

VMRS reduces the number of choices creators have for the distribution of their work — this is a valid concern which 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,[268] 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, of course, to give the author 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 bootstrapping of a virtual market, where an expansive catalogue would be necessary to encourage public participation, and skepticism amongst publishing interests would be highest. But 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 they regarded a virtual market as problematic for some reason.

B. Epilogue: Towards Information Democracy?

"What to do about digital copyright" can — without exaggeration — be characterized as the most important policy question ensuing for the advent of networked digital computers.

As this article has endeavored to demonstrate, there are real alternatives to the present course of attempting to implant copyright into the digital world. Communications and computation gadgetry surrounds us, now, but we have only begun to learn how to use it as individuals. It is entirely possible that, applied correctly, these technologies could make new forms of economic organization both feasible and 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 forward, it seems that wise societies should be searching for ways to ensure that technology grants their citizens greater 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" which lies between the extremes of "information anarchism" and "feudalism".

The challenge is one of inertia. The metaphor of physical property, in its application to

[268] Assuming, of course, that they are willing to make their own peace with piracy.

books, sheet music, vinyl records and video tapes, may have done us more good than harm. But 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 will define the relationship of their authors, artists and publishers with 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.