HELLO BARBIE: FIRST THEY WILL MONITOR YOU, THEN THEY WILL DISCRIMINATE AGAINST YOU. PERFECTLY.

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ABSTRACT

This Article argues that the evolution of software—and the looming age of the "Internet of Things"—will allow manufacturers to make use of consumer monitoring technologies and restrictive software licenses to price discriminate more perfectly. First, the increasing communication between software and its producers gives more opportunities to monitor consumer behavior and characteristics. Second, attaching restrictive copyright licenses to software—and to goods containing software—enables producers to restrict use and resale of their products. By combining monitoring and restrictive licensing, producers will have increasingly better ability and opportunities to price discriminate among their consumers.

This Article explains that increased monitoring and price discrimination will not always happen because, in some cases, it will be against the manufacturers' financial interests. But in other cases, manufacturers will indeed restrict use of products to facilitate price discrimination. The Article argues that the low marginal cost of distribution of software makes it more likely that price discrimination of software-enabled goods will be welfare enhancing and will result in cross-subsidization from rich to poor so that poor consumers can get more products for lower prices. The Article also demonstrates that the traditional policy reasons to disallow restraints on personal property do not apply to software-enabled devices. We conclude that rather than discouraging the use of restrictive software licenses, the law should adapt to better facilitate such licenses and the more perfect price discrimination that goes with them.

INTRODUCTION

Mattel, Inc. recently released the "Hello Barbie," a doll for our interconnected times, designed to have interactive conversations with the child to whom it belongs.[1] To accomplish this, the doll comes with built-in hardware and software that allows her to "listen" to the conversations around her, record them, and send them back to Mattel via a WiFi connection to the Internet.[2] Mattel says it analyzes these conversations to

1. *See* Katie Lobosco, *Talking Barbie is Too 'Creepy' for Some Parents*, CNNMONEY (Mar. 12, 2015, 4:11 PM), http://money.cnn.com/2015/03/11/news/companies/creepy-hello-barbie/; James Vlahos, *Barbie Wants to Get to Know Your Child*, N.Y. TIMES, Sept. 16, 2015, http://www.nytimes.com/2015/09/20/magazine/barbie-wants-to-get-to-know-your-child.html?_r=0.

2. *See id.* Hello Barbie is one of many technologically enabled items intended for use involving children. *See, e.g.*, Parija Kavilanz, *'Connected' Babies = More Sleep for You*, CNNMONEY (Apr. 17,

learn more about the doll's playmate over time so that it can provide better conversations and the doll can become the child's "best friend."[3]

Hello Barbie has provoked controversy. Some people worry about a doll that records everything around it and sends the recordings to a corporation for analysis.[4] They worry that Mattel will receive personal information never intended to be shared and use this information to create extensive data profiles of the household for advertising and other purposes. Others simply call the doll "creepy."[5]

2015, 6:52 AM), http://money.cnn.com/2015/04/16/smallbusiness/mimo-wearable-baby-monitor/index.html?iid=ob_homepage_tech_pool&iid=obnetwork (describing sleepwear for babies designed to help parents monitor their activities); Hope King, *Google Files Patent for Creepy Teddy Bear*, CNNMONEY (May 22, 2015, 6:37 PM), http://money.cnn.com/2015/05/22/technology/google-doll-toy-connected-device-patent/index.html?iid=ob_homepage_tech_pool&iid=obnetwork (discussing stuffed animal that tracks users and follows voice command prompts).

3. *See* Lobosco, *supra* note 1.

4. *See* Stephanie Mlot, *Hey Barbie, Are You Invading My Privacy?*, PC MAG. (Mar. 11, 2015, 3:36 PM), http://www.pcmag.com/article2/0,2817,2478159,00.asp. Similar issues came up when concerns arose that the Samsung SmartTV was reporting on watchers' behaviors. Shane Harris, *Your Samsung SmartTV Is Spying on You, Basically*, DAILY BEAST (Feb. 5, 2015, 7:35 PM), http://www.thedailybeast.com/articles/2015/02/05/your-samsung-smarttv-is-spying-on-you-basically.html. There was some question as to whether people understood the license terms in this context. *See* April Glaser, *Philip K. Dick Warned Us About the Internet of Things in 1969*, SLATE (Feb. 10, 2015, 5:27 PM), http://www.slate.com/blogs/future_tense/2015/02/10/philip_k_dick_s_1969_novel_ubik_on_the_internet_of_things.html. Recently, AT&T made news when it became public that the company was offering Internet service at a higher price for individuals who wished for a higher level of protection of their privacy. Jon Brodkin, *AT&T Charges $29 More for Gigabit Fiber That Doesn't Watch Your Web Browsing*, ARS TECHNICA (Feb. 16, 2015, 11:38 PM) http://arstechnica.com/business/2015/02/att-charges-29-more-for-gigabit-fiber-that-doesnt-watch-your-web-browsing/. Critics believed that consumers should not be put to this choice. Sophia Cope & Jeremy Gillula, *AT&T Is Putting a Price on Privacy. That Is Outrageous*, GUARDIAN (Feb. 20, 2015), http://www.theguardian.com/commentisfree/2015/feb/20/att-price-on-privacy?CMP. For a related discussion of individuals' worth to online advertisers, see Dave Jeffers, *The Internet of Things and the Currency of Privacy*, PCWORLD (Feb. 17, 2015, 10:05 AM), http://www.pcworld.com/article/2871482/ the-internet-of-things-and-the-currency-of-privacy.html [http://web.archive.org/web/20150324000822/http://www.pcworld.com/article/2871482/the-internet-of-things-and-the-currency-of-privacy.html]. Companies like Facebook are seeking to increase the facility with which developers can understand consumer behavior in these contexts. *See, e.g.*, Hope King, *7 Big Changes Coming to Facebook*, CNNMONEY (Mar. 25, 2015, 4:27 PM), http://money.cnn.com/2015/03/25/technology/facebook-f8-messenger/index.html (discussing a new dashboard function that will allow developers to see the identity and location of app users across devices). A different app called Sherbit focuses on giving individuals the ability to pool their data across devices for their personal use. *See* SHERBIT, https://www.sherbit.io/ (last visited Sept. 28, 2015). Some have called for a radical change of privacy practices related to such technologies. *See, e.g.*, Jacob Silverman, *Big Data's Big Libertarian Lie: Facebook, Google, and the Silicon Valley Ethical Overhaul We Need*, SALON (Apr. 26, 2015, 11:00 AM), http://www.salon.com/2015/04/26/big_datas_big_libertarian_lie_facebook_google_and_the_silicon_valley_ethical_overhaul_we_need/. *See generally* BRUCE SCHNEIER, DATA AND GOLIATH: THE HIDDEN BATTLES TO COLLECT YOUR DATA AND CONTROL YOUR WORLD 91–151 (2015) (explaining how the electronic collection of data threatens political liberty and justice, commercial fairness and equality, business competiveness, privacy, and security).

5. *See* Sarah Halzack, *Privacy Advocates Try to Keep 'Creepy,' 'Eavesdropping' Hello Barbie from Hitting Shelves*, WASH. POST (Mar. 11, 2015), https://www.washingtonpost.com/news/the-switch/wp/2015/03/11/privacy-advocates-try-to-keep-creepy-eavesdropping-hello-barbie-from-hitting-

Hello Barbie conforms to the image many people have of the way mundane objects will be able to monitor and report to their creators as we enter the age of the "Internet of Things."[6] We believe that the

shelves/. For a general discussion of intellectual property law issues that have arisen in the context of Barbie, see Rebecca Tushnet, *Make Me Walk, Make Me Talk, Do Whatever You Please: Barbie and Exceptions*, *in* INTELLECTUAL PROPERTY AT THE EDGE 405 (Rochelle Cooper Dreyfuss & Jane C. Ginsburg eds., 2014). The issue of undesired reporting of private individual activity has come up in a number of related contexts. *See, e.g.*, Spencer E. Ante & Lauren Weber, *Memo to Workers: The Boss Is Watching*, WALL ST. J. (Oct. 22, 2013), http://www.wsj.com/articles/SB10001424052702303672404579151440488919138 (describing technology-driven workplace tracking of employee behavior); Brett Hambright, *Woman Staged 'Rape' Scene with Knife, Vodka, Called 9-1-1, Police Say*, LANCASTERONLINE (June 19, 2015), http://lancasteronline.com/news/local/woman-staged-rape-scene-with-knife-vodka-called—/article_9295bdbe-167c-11e5-b6eb-07d1288cc937.html (describing how a woman's Fitbit activity data, which revealed that she was awake and walking around at a time she claimed to have been asleep, was used to show that she had staged a crime scene and made a false police report); Kashmir Hill, *Fitbit Moves Quickly After Users' Sex Stats Exposed*, FORBES (July 5, 2011, 7:58 AM), http://www.forbes.com/sites/kashmirhill/2011/07/05/fitbit-moves-quickly-after-users-sex-stats-exposed/ (discussing how users of the activity tracker Fitbit accidentally publicly disclosed the frequency and duration of sexual intercourse). This is an important issue in a world in which individuals track increasingly diverse and private data. *See, e.g.*, Sarah Perez, *Bellabeat Starts Shipping the Leaf, a Health Tracker Designed for Women*, TECHCRUNCH (May 27, 2015), http://techcrunch.com/2015/05/27/bellabeat-starts-shipping-the-leaf-a-health-tracker-designed-for-women/ (discussing a Fitbit-type device that monitors women's fertility). That said, in some legal contexts, personal tracking has allowed users to back up the truthfulness of their statements. *See, e.g.*, Parmy Olson, *Fitbit Data Now Being Used in the Courtroom*, FORBES, Nov. 16, 2014, http://www.forbes.com/sites/parmyolson/2014/11/16/fitbit-data-court-room-personal-injury-claim/ (showing how a personal injury case relied on Fitbit data that illustrated a victim's claims of a significant drop in activity levels before and after an accident).

6. This term refers to the near-future world in which many devices that were not formerly computerized and networked will be connected to the Internet and will communicate with other devices, as well as with device owners and manufacturers. *See, e.g.*, Scott R. Peppet, *Regulating the Internet of Things: First Steps Toward Managing Discrimination, Privacy, Security, and Consent*, 93 TEX. L. REV. 85, 87–89 (2014) (explaining the functioning of the Internet of Things). Some are concerned that the risks of monitoring as part of the Internet of Things will go up as devices increasingly interact with the human body. *See, e.g.*, *The Real-Life Matrix: MIT Researchers Reveal Interface That Can Allow a Computer to Plug into the Brain*, DAILYMAIL.COM, http://www.dailymail.co.uk/sciencetech/article-2927410/The-real-life-Matrix-MIT-researchers-reveal-interface-allow-computer-plug-brain.html (last visited Sept. 28, 2015); Bonnie Burton, *Swedish Office Gets Under Employees' Skin with RFID Microchips*, CNET (Feb. 3, 2015, 5:10 AM), http://www.cnet.com/news/swedish-office-gets-under-employees-skin-with-rfid-microchips/; Max Plenke, *Scientists Are Building a 3-D Printed Eyeball That Can Record Your Vision*, TECH.MIC (Apr. 23, 2015), http://mic.com/articles/116150/scientists-are-building-a-3-d-printed-eyeball-that-can-record-your-vision. Some others view these possibilities with cautious optimism. *See, e.g.*, Biz Carson, *They Hacked Her Pancreas and Found Love Along the Way*, BUSINESS INSIDER, Aug. 27, 2015, http://www.businessinsider.com/hacked-raspberry-pi-artificial-pancreas-2015-8 (describing an artificial pancreas in this context); John Dodge, *Study: Smart Phones Accurately Detect Depression*, CBS CHICAGO (July 16, 2015, 10:23 AM), http://chicago.cbslocal.com/2015/07/16/study-smart-phones-accurately-detect-depression/ (describing the use of smartphones to diagnose depression); Jillian Eugenios, *Ray Kurzweil: Humans Will Be Hybrids by 2030*, CNNMONEY (June 4, 2015, 12:26 PM), http://money.cnn.com/2015/06/03/technology/ray-kurzweil-predictions/index.html?iid=obnetwork (discussing how Google's director of engineering believes that human thinking will advance as a result of being able to connect directly to the cloud within the next fifteen years). Some are also developing apps to unleash the ability of the Internet of Things to increase personal security. *See, e.g.*, Mary-Ann Russon, *A New App that Lets Users' Friends 'Virtually Walk Them Home at Night' Is Exploding in Popularity*, BUSINESS INSIDER, Sept. 3, 2015, http://www.businessinsider.com/campanion-app-surging-

interconnection of consumer products and increased monitoring of users—while regrettable at times[7]—is almost inevitable, in large part because consumers so often are willing to trade being monitored for receiving products and applications that they like.[8] In addition, the coming ubiquity of software in consumer products will give manufacturers a unique opportunity to exert post-sale control of their products.[9] Because courts have accepted that software can be licensed rather than sold to consumers, owners of copyrights in software can place numerous post-sale restrictions on the use of the software.[10] Some worry that manufacturers of consumer products will adopt this methodology and try to restrict uses of consumer products via software licenses.[11] These skeptics believe that manufacturers will restrict consumers' use of, and ability to alienate, the products that consumers buy and formerly could do with as they pleased.[12]

To prevent the pervasive use of post-sale restrictions on software and consumer products, some commentators argue that common law restrictions on equitable servitudes on personal property should be revived and applied to the coming Internet of Things.[13] According to this theory, only by stopping companies from using software licenses to restrict use of consumer products can we protect consumers' traditional rights to do with their property what they like. This Article agrees that the evolution of software and the monitoring that will be possible in the looming Internet of

in-popularity-2015-9. For a critical take on some of these developments, see generally Brett M. Frischmann, *Human-Focused Turing Tests: A Framework for Judging and Techno-Social Engineering of Human Beings*, *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2499760.

7. *See, e.g.*, SCHNEIER, *supra* note 4, at 123–24 (discussing studies—albeit ones relying on self-report—suggesting that customers would spend more if they felt that their privacy was protected). *See generally* Joel R. Reidenberg, *Privacy Wrongs in Search of Remedies*, 54 HASTINGS L.J. 877 (2003); Joel R. Reidenberg et al., *Privacy Harms and the Effectiveness of the Notice and Choice Framework*, *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2418247.

8. *See, e.g.*, Jasmin Melvin, *'Do Not Track' Internet Spat Risks Legislative Crackdown*, REUTERS (July 23, 2012, 4:05 PM), http://www.reuters.com/article/2012/07/23/internet-tracking-idUSL2E8IN7YG20120723 (explaining the potential tradeoffs between privacy and access to free web content).

9. For example, to provide post-sale service and increase revenue, Amazon is launching a product called the Dash Button that consumers can attach to their pantries, washing machines, or refrigerators that will alert Amazon when consumers need refills or reorders. *See* Nathan Olivarez-Giles, *Amazon's Dash Button Is Not a Hoax, It's Phase One*, WALL ST. J. (Mar. 31, 2015, 4:11 PM), http://blogs.wsj.com/personal-technology/2015/03/31/amazons-dash-button-is-not-a-hoax-its-phase-one/. Another recent innovation seeks to help consumers regulate cooking temperature through the use of sensors. *See* Nick Wingfield, *With Meld, Another Step Toward the Internet of Tasty Things*, N.Y. TIMES BITS, (Apr. 7, 2015, 9:00 AM), http://bits.blogs.nytimes.com/2015/04/07/with-meld-another-step-toward-the-internet-of-tasty-things/?_r=0. Some of the technology used as part of the Internet of Things has been subverted for activities such as spam attacks. *See* Michelle Starr, *Fridge Caught Sending Spam Emails in Botnet Attack*, CNET (Jan. 19, 2014, 4:53 PM), http://www.cnet.com/news/fridge-caught-sending-spam-emails-in-botnet-attack/.

10. *See infra* Part II.

11. *See infra* Part II.

12. *See infra* Part IV.

13. *See infra* Part IV.

Things will allow producers of software and consumer products to restrict the use of software and products as never before. This Article takes a novel and contrarian view, however, and explains how this increased ability to restrict use will, in many cases, be beneficial.

For pure software products, the increased ability to monitor use will allow companies to better determine consumer reservation prices,[14] price discriminate, and prevent arbitrage. These companies increasingly will be able to perfect their price discrimination. This increasingly perfect price discrimination will allow companies to discount software prices for poorer consumers.[15] Richer software users will subsidize these low prices because they will be charged more by software companies utilizing price discrimination. This Article explains that it can be particularly beneficial to the economy and to poorer consumers for the law to facilitate more perfect price discrimination for products like software for which the marginal cost of distribution is extremely low.

This Article examines the coming Internet of Things and shows why most companies will not take advantage of their greater ability to restrict uses of their physical products because doing so would go against the companies' financial interests. The Article argues that, in some cases, companies will limit uses of their products to facilitate price discrimination. This price discrimination will also enhance cross-subsidization from rich to poor so that poor consumers can get more products for lower prices. The magnitude of the benefit will not be as large as it is for purely digital products—because the marginal cost of consumer products is greater than the marginal cost of digital products—but it will still likely increase total welfare in society.

The Article scrutinizes arguments for disallowing companies from using software licenses to restrict uses of their software and products. The traditional policy reasons that historically led courts not to enforce restraints on use and alienation of personal property were that the transaction and information costs of enforcement would have been too high. The Article demonstrates that these costs are becoming quite low when it comes to pure software and software-enabled products, and thus the policy reasons for which the courts did not enforce restrictions on personal property do not apply to software. The Article concludes with a warning against lawmaking and legal interpretations that disallow using

14. A consumer's reservation price is the highest price a consumer is willing to pay for a good. *See, e.g.*, Russell Korobkin, *Aspirations and Settlement*, 88 CORNELL L. REV. 1, 2 (2002).

15. *See generally* M. Todd Henderson, Letter to the Editor, *How Perks Help the Masses*, N.Y. TIMES (May 26, 2015), http://www.nytimes.com/2015/05/26/opinion/how-perks-help-the-masses.html ("The reason that businesses offer 'first-class lounges' is not that they like rich people better; it is that it allows them to charge rich people more, which in turn helps poorer people enjoy the services.").

software licenses to facilitate restraints on use and alienation. Instead, a legal regime that facilitates such restrictions to prevent arbitrage will allow more socially optimal price discrimination to the benefit of the economy and consumers. To the extent that some customers dislike the privacy implications of the monitoring tied to licensed software, they will have the same choices as parents do regarding Hello Barbie—which is to buy a specific product or not.

Part I describes the history of the limitations on equitable servitudes for personal property. Part II analyzes how courts have treated attempts to license software over time. Part III explains how software licensing enables price discrimination in ways that may ultimately benefit society. Part IV shows how restrictive software licensing can advance social welfare in the age of the Internet of Things. Part V concludes.

I. THE DEVELOPMENT OF EQUITABLE SERVITUDES FOR PERSONAL PROPERTY

This Part discusses the origins of the limitations on equitable servitudes for personal property that we see today. This allows us to lay the foundation for understanding the relationship between rights in "real" versus intellectual property and distinguishing the rules that apply to each.

The American and English property laws in place today date back to the Roman Empire and the Norman Conquest of 1066.[16] Anglo-Saxon laws of feudalism merged with the Roman laws of citizenship to create the foundation of real and personal property laws.[17] As populations grew and communities expanded, the finite resources of land became more precious.[18] Over time, occupants of the land fought for the freedom to pass the land to their heirs and to assign rights to occupy, farm, or use the land without the local lord's consent.[19] By the end of the thirteenth century, that interest was determined to be "freely alienable."[20] As a result, the landed gentry employed means to keep the land in their own families and out of the hands of its occupants.[21] Courts of chancery began recognizing restraints on land use, developing what would come to be known as the life

16. *See* JESSE DUKEMINIER ET AL., PROPERTY 185 (7th ed. 2010).

17. *See* Yun-chien Chang & Henry E. Smith, *An Economic Analysis of Civil Versus Common Law Property*, 88 NOTRE DAME L. REV. 1, 7–9 (2012).

18. *See id.*

19. *See* Chad J. Pomeroy, *The Shape of Property*, 44 SETON HALL L. REV. 797, 821–22 (2014).

20. DUKEMINIER ET AL., *supra* note 16, at 193; *see* Pomeroy, *supra* note 19, at 820–23.

21. *See* Pomeroy, *supra* note 19, at 820–23.

estate,[22] which allowed lords to give the right to certain persons to live and work on the land but prevented the occupants from transferring their usage rights to others.[23] The life estate allowed an occupancy interest to revert to the landowner's family upon the death of the occupant, effectively keeping the land in the family for centuries.[24] As discontent grew, courts recognized more ways in which the landowner could allow others to use his property without giving up possession. Easements and covenants, adopted from the Roman civil law system, began to emerge as means of granting or denying permission for temporary land use while maintaining ownership in the hands of the lords.[25] Even early colonial land and agricultural development systems were based upon the medieval *profits à prendre* system, wherein members of a community had rights to take from the land, but such takings required approval of the community.[26] While the (primarily) common law property system in America developed alongside, and as a result of, the English property system, certain variances between the two systems arose, due in part to the colonies' rejection of servitudes, which were perceived to be remnants of the monarchy.[27] As the common law slowly metamorphosed over the centuries, laws regarding the ownership of "things," or chattel, developed in tandem. With the right to use land came the right to use and possess items found on that land, such as wildlife, timber, and even treasure.[28] In a classic example of early American property law, the critical question of who owned the fox once it was hunted

22. The life estate concept may actually relate as far back as the Norman Conquest in the form of tenure. For a discussion on the possible origins of the English life estate and land tenure, see Frederick C. Bryan, *Origin of English Land Tenures*, 40 AM. L. REV. 9, 23–24 (1906).

23. *See* Percy Bordwell, *The Common Law Scheme of Estates*, 18 IOWA L. REV. 425, 428 (1933).

24. This common practice of keeping land from passing outside the family is what led, in part, to the rule against perpetuities in trusts and estates law. The first judicial rejection of a lord's attempt to tie up land for generations beyond those currently living, which set the stage for the rule against perpetuities, can be found in the Duke of Norfolk's Case, (1682) 22 Eng. Rep. 931, 3 Ch. Cas. 1. *See* Herbert Barry, *The Duke of Norfolk's Case*, 23 VA. L. REV. 538, 539 (1937). The rule against perpetuities is closely related to the rule against unreasonable restraint on alienation, both of which are beyond the scope of this Article.

25. For a discussion of the Roman influence on English easement common law, see BARRY NICHOLAS, AN INTRODUCTION TO ROMAN LAW 148 (H.L.A. Hart ed., 1962). *See generally* Jonathan Gaunt & Paul Morgan, GALE ON EASEMENTS (18th ed. 2012).

26. *See* 7 WILLIAM S. HOLDSWORTH, A HISTORY OF ENGLISH LAW 319–21 (1925); *see also* Robert C. Ellickson, *Property in Land*, 102 YALE L.J. 1315, 1389 (1993) (graphically depicting the typical land distribution in a *profits à prendre* system).

27. *See* Chang & Smith, *supra* note 17, at 39.

28. In fact, four separate and distinct types of property—lost, mislaid, treasure trove, and abandoned—challenge the famous adage "finders keepers" and can affect the determination of who is entitled to a treasure once it is "found." For a general discussion of types of property, see DUKEMINIER ET AL., *supra* note 16, at 108–15, and Donald J. Kochan, *The Property Platform in Anglo-American Law and the Primacy of the Property Concept*, 29 GA. ST. U. L. REV. 453, 466–67 (2013).

down on another's property would tie together the complex issues of right of acquisition by capture, implied easements, and trespass.[29]

As the Industrial Revolution began to alter the legal and social views of property use and possession,[30] land became more sought after while at the same time "things" became more prevalent (and fungible).[31] As legal doctrines surrounding restrictions on use of personal property and real property developed, a puzzling delineation emerged. While the "primary modern forms of servitudes—easements, real covenants, and equitable servitudes—[were] largely products of the nineteenth century,"[32] it is worth noting that these same restraints were not typically applied to personal property. The question is, *why* are certain alienations permitted on real property but not applicable to personal property? And in the few instances where alienation is permitted, such as in copyright and patent law, what is unique about intellectual property that should cause it to be treated more akin to real property than chattels?

Certain interests that can be conveyed in real property, such as future interests, reverters, and contingent remainders, are loosely applicable to personal property, but generally only as they relate to trusts, stocks, and future profits.[33] Other equitable interests, however, such as judicially created equitable servitudes,[34] do not typically apply to personal property.[35] The question remains unsettled as to whether life estates may attach to personal property.[36] While numerous articles address the fact that these

29. *See* Pierson v. Post, 3 Cai. 175 (N.Y. Sup. Ct. 1805).

30. For example, the effect of the Industrial Revolution on the law included the development of a relatively new subclass of tort law—nuisance law. *See generally* Joel Franklin Brenner, *Nuisance Law and the Industrial Revolution*, 3 J. LEGAL STUD. 403 (1974); John P.S. McLaren, *Nuisance Law and the Industrial Revolution—Some Lessons from Social History*, 3 OXFORD J. LEGAL STUD. 155 (1983).

31. *See* David A. Super, *A New New Property*, 113 COLUM. L. REV. 1773, 1776 (2013).

32. DUKEMINIER ET AL., *supra* note 16, at 766.

33. *See* John Chipman Gray, *Future Interests in Personal Property*, 14 HARV. L. REV. 397, 406–08, 419–20 (1901) (arguing that future interests can be created in personal property, primarily through will or deed).

34. *See* Thomas W. Merrill & Henry E. Smith, *Optimal Standardization in the Law of Property: The Numerus Clausus Principle*, 110 YALE L.J. 1, 16–17 (2000) ("[T]he English Court of Chancery, in *Tulk v. Moxhay* [(1848) 41 Eng. Rep. 1143; 2 Ph. 774], in effect created a new interest [on real property]—the equitable servitude.").

35. *See id*., at 18 ("[A]lthough the case law is rather thin, it . . . appears that one cannot create servitudes in personal property."). Shortly after the creation of the equitable servitude in land, the English Chancery court held explicitly that equitable servitudes would not apply to chattels. Taddy & Co. v. Sterious & Co. [1904] 1 Ch. 354 at 358 (holding conditions of sale imposed by the manufacturer of tobacco on the retailer were invalid because "[c]onditions of this kind do not run with goods, and cannot be imposed upon them. Subsequent purchasers, therefore, do not take subject to any condition which the court can enforce."). For a discussion of *Taddy*, see Zechariah Chafee, Jr., *Equitable Servitudes on Chattels*, 41 HARV. L. REV. 945, 977–80 (1928).

36. Merrill & Smith, *supra* note 34, at 17–18 ("[T]here are few if any cases that address the question of whether more exotic interests, such as defeasible fees and executory interests, can be created in personal property.").

differences exist,[37] few have advanced theories that definitively explain the reasons for such disparities.[38] Though it has been argued that "[t]he law has always been more suspicious of personal than real property servitudes,"[39] this suspicion alone is not enough to explain why courts and legislatures treat different types of property in such different fashion. If one is to adhere to the "bundle of sticks" concept and its associated rights of ownership, it would stand to reason that all types of property should be subjected to the same rights and restrictions.[40] Certain theorists have posited that the mobility, the fungibility, and the relatively small size of chattels account for the different treatments.[41] Others have theorized that the very portability of an item of personal property would support restraints on personal property due to the ease with which restraints could be applied and transferred from owner to owner.[42]

Additional theories regarding the courts' general rejections of servitudes on chattels range from "considerations of competition policy [rather than concerns of] notice,"[43] to the possibility of a complete lack of

37. *See, e.g.*, Chafee, *supra* note 35; Merrill & Smith, *supra* note 34; Glen O. Robinson, *Personal Property Servitudes*, 71 U. CHI. L. REV. 1449, 1455–57 (2004); Molly Shaffer Van Houweling, *The New Servitudes*, 96 GEO. L.J. 885, 906–10 (2008).

38. The most convincing piece of which we are aware that has analyzed the differences is Christina M. Mulligan, *The Cost of Personal Property Servitudes: Lessons for the Internet of Things*, 50 GA. L. REV. (forthcoming), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2465651 (arguing that information costs are higher for chattels and software-embedded goods and that this should lead to suspiciousness of licenses or servitudes on them). On rare occasions, which are typically held to be one-off exceptions to the rule, courts have seen fit to recognize certain servitudes on chattels. *See, e.g.*, Zechariah Chafee, Jr., Commentary, *The Music Goes Round and Round: Equitable Servitudes and Chattels*, 69 HARV. L. REV. 1250, 1255 (1956) (noting that despite one unusual case which allowed a servitude on jukeboxes, Pratte v. Balatsos, 113 A.2d 492 (N.H. 1955), between 1928 and 1956, only three of seven attempts to bind personal property were successful); Merrill & Smith, *supra* note 34, at 18–19; Robinson, *supra* note 37, at 1455 (declaring that the author "ha[d] discovered only a few cases decided since 1956 involving attempts to create common law servitudes").

39. Henry E. Smith, *Institutions and Indirectness in Intellectual Property*, 157 U. PA. L. REV. 2083, 2122 (2009).

40. *See* Robinson, *supra* note 37, at 1453 ("To the extent [particular] restraints [on usage] are valid for real property, they should be valid, *pari passu*, for personal property.").

41. *See, e.g.*, Mulligan, *supra* note 38 (manuscript at 16) ("Even many unique items, such as gemstones and naturally-grown items, are difficult to distinguish among without learned expertise and detailed record keeping about defects and size, or the presence of unique identifiers like serial numbers."); *id.* (manuscript at 18) ("Although it is conceivably possible to place unique identifiers on many chattels, identifiers can be removed, and some objects are too small to easily place a visible serial number on."); Matt Corriel, Comment, *Up for Grabs: A Workable System for the Unilateral Acquisition of Chattels*, 161 U. PA. L. REV. 807, 839 (2013) ("Fungible chattels, or interchangeable chattels, make up the vast majority of objects in modern American life.").

42. *See* Van Houweling, *supra* note 37, at 907 ("[I]t is relatively easy for an item of personal property to travel with its terms attached directly to it . . . . [T]he availability of this type of express notice might justify applying the logic of *Tulk* [*v. Moxhay* (1848) 41 Eng. Rep. 1143; 2 Ph. 774, which created equitable servitudes] to personal property, enforcing running restrictions upon a finding of actual notice.").

43. Henry Hansmann & Reinier Kraakman, *Property, Contract, and Verification: The* Numerus Clausus *Problem and the Divisibility of Rights*, 31 J. LEGAL STUD. S373, S417 (2002).

demand for chattels that are encumbered with restrictions.[44] Further hypotheses include the ideas that servitudes would prevent quick and efficient transfers of personal property[45] and that attaching any time limit or termination to the encumbrance would not only be impractical but virtually impossible.[46] What is more, it has been argued that the most practical reason for rejecting encumbrances on property rights is the cost-prohibitive nature of investigating the nature and history of the restraints on a single piece of personal property.[47] The so-called informational cost of what would be comparable to a land title search on a pocket watch purchased at a flea market is, by its very nature, too costly to justify the purchase.[48] Regardless of the practicality of encumbrances, courts generally tend to reject servitudes on chattel by finding them to be undue restraints of trade.[49]

II. THE HISTORY OF SOFTWARE ALIENABILITY

Despite a general refusal of courts to impose servitudes on personal chattels,[50] there has always been a particular carveout allowing additional protections for owners of copyrighted, trademarked, and patented materials.[51] Over the last thirty years, as technology has advanced and the line between intellectual and personal property has been blurred, judges have permitted downstream restrictions of goods that contain copyrighted components, focusing on those items as intellectual property rather than as chattels.[52] Such restrictions have allowed manufacturers to limit use of their

44. Robinson, *supra* note 37, at 1486 ("But property law has neither the purpose nor the power to create a market for idiosyncratic property interests.").

45. Chafee, *supra* note 35, at 985 ("Land . . . is transferred after an elaborate investigation of the title, whereas chattels are ordinarily sold with rapidity, [therefore] possible interferences with quick transfers are undesirable.").

46. *Id.* (comparing the eventual lapse of land restrictions to chattels, to which there would be "no possibility of affixing a reasonable termination to the life of the restriction [on a chattel] coëxtensive with the realization of [its] purpose").

47. *See generally* Merrill & Smith, *supra* note 34 (discussing the "numerus clausus principle").

48. *Id.*; *see also* Mulligan, *supra* note 38 (manuscript at 13).

49. *See, e.g.*, Kirtsaeng v. John Wiley & Sons, Inc., 133 S. Ct. 1351, 1363 (2013).

50. *See* Molly Shaffer Van Houweling, *Touching and Concerning Copyright: Real Property Reasoning in* MDY Industries, Inc. v. Blizzard Entertainment, Inc., 51 SANTA CLARA L. REV. 1063, 1068 (2011) ("While courts have increasingly accommodated land servitudes, the conventional wisdom under Anglo-American law has long been that the types of servitudes that can be attached to land cannot be attached to chattels.").

51. U.S. CONST. art. 1, § 8, cl. 8.

52. Lothar Determann & Aaron Xavier Fellmeth, *Don't Judge a Sale by Its License: Software Transfers Under the First Sale Doctrine in the United States and the European Community*, 36 U.S.F. L. REV. 1, 106 (2001).

products to specific time constraints,[53] as well as prevent resale of certain goods.[54]

Historically, the "first sale doctrine" has prohibited manufacturers and retailers from restricting the purchaser's rights for use and resale of personal property in the downstream marketplace.[55] The theory essentially stems from the idea that once a purchaser pays for the use of the property, thereby becoming its owner, it is within the new owner's rights to do as he pleases with the property.[56] If there is a market for a used or previously owned good, then he may sell it at the price a buyer is willing to pay. Likewise, if he wishes to give it away to others, his freedom to gift his personal property permits such an act. Prohibiting restrictions on subsequent uses greatly decreases information costs associated with transfers of property, whether intellectual or personal, because there is no burdensome title or restraint search for the purchaser to perform. In the context of patent law, the first sale doctrine, also known as the doctrine of exhaustion, remains a rule of the common law, and is therefore not found in any patent statute.[57] In contrast, the first sale doctrine as it relates to copyright was initially articulated by the Supreme Court in *Bobbs-Merrill v. Straus*,[58] but the doctrine was shortly thereafter codified in the 1909 Copyright Act.[59] While the doctrine still holds today in both patent and copyright, the courts have eroded the doctrine and begun to permit downstream control of goods, especially when the purchaser has notice of the restrictions.[60]

In particular, courts have allowed copyrighted software to be subject to downstream restrictions on continuing use and transfer of the property, effectively eliminating the first sale doctrine for software licenses. In *MAI*

53. *See generally* Bowman v. Monsanto Co., 133 S. Ct. 1761 (2013).

54. *See* David Kravets & Roberto Baldwin, *Google Is Forbidding Users from Reselling, Loaning Glass Eyewear*, WIRED MAG. (Apr. 17, 2013, 3:00 PM), http://www.wired.com/gadgetlab/2013/04/google-glass-resales/.

55. For a discussion on the early restraints under the first sale doctrine, see Herbert Hovenkamp, *Post-Sale Restraints and Competitive Harm: The First Sale Doctrine in Perspective*, 66 N.Y.U. ANN. SURV. AM. L. 487, 495–503 (2011).

56. Chang & Smith, *supra* note 17, at 21–26.

57. *See* Hovenkamp, *supra* note 55, at 511; *see also* Adams v. Burke, 84 U.S. (17 Wall.) 453 (1873).

58. Bobbs-Merrill Co. v. Straus, 210 U.S. 339 (1908) (holding that books containing copyrighted works could not be subject to a requirement that they be resold at a particular price).

59. The Copyright Act of 1909 § 41 provided, "[N]othing in this Act shall be deemed to forbid, prevent, or restrict the transfer of any copy of a copyrighted work the possession of which has been lawfully obtained." Pub. L. No. 60-349, 35 Stat. 1075, 1084 (1909). *See also* 17 U.S.C. § 109 (2012) (codifying the first sale doctrine for phonorecords).

60. *See generally* Kurtis A. Kemper, Annotation, *Construction and Application of "First Sale Doctrine" in Copyright Law*, 75 A.L.R. Fed. 2d 387 (2013).

Systems Corp. v. Peak Computer Inc.,[61] the Ninth Circuit allowed restrictions on the use of software by focusing on the manner in which the software operates on a computer, attaching particular significance to the physical integration between the two.[62] The court held that running a software program that automatically created a temporary copy of itself in a computer's Random Access Memory (RAM) constituted prima facie copying of the software and thus was copyright infringement when done without permission.[63] The Ninth Circuit distinguished 17 U.S.C. § 117(a)(1),[64] which allows "owners" of a copy of a computer program to copy the program for certain limited uses. The court held that this statute does not apply to licensees, as opposed to owners.[65]

The Ninth Circuit's decision in *MAI* indicates that, based upon the way computers function, no one can ever use software without technically copying the program. Thus, use outside the scope of the software license infringes the software copyright.[66] Courts applying *MAI* have held that when a copyrighted image is viewed on the World Wide Web without permission, the resulting copy created in the viewer's computer's RAM constitutes infringement.[67] As a result, most software programs now

61. MAI Sys. Corp. v. Peak Computer, Inc., 991 F.2d 511 (9th Cir. 1993).

62. *Id.* at 518–19.

63. *Id.*

64. The statute says, in pertinent part, that

> it is not an infringement for the *owner* of a copy of a computer program to make . . . another copy . . . of that computer program provided . . . that such a new copy . . . is created as an essential step in the utilization of the computer program in conjunction with a machine and that it is used in no other manner . . . .

17 U.S.C. § 117(a)(1) (2006) (emphasis added).

65. *MAI*, 991 F.2d at 518–19. After the Ninth Circuit decision, Congress amended the statute to explicitly allow the temporary copying of programs in connection with computer repair and maintenance. But interestingly, Congress did not change the word "owner" in the statute. 17 U.S.C. § 117(a)(1) (2012).

66. Academic criticism of the decision has been voluminous and sharp. *See, e.g.*, Bradley J. Nicholson, *Ghost in the Machine:* MAI Systems Corp. v. Peak Computer, Inc. *and the Problem of Copying in RAM*, 10 HIGH TECH. L.J. 147, 167 (1995) ("*MAI* achieves this unprecedented level of protection . . . . [by creating] a copyright violation out of merely reading and using information."); Gretchen McCord Hoffmann, Note, *Arguments for the Need for Statutory Solutions to the Copyright Problem Presented by RAM Copies Made During Web Browsing*, 9 TEX. INTELL. PROP. L.J. 97, 104 (2000) ("Some have argued that the decision is a valid interpretation of the Copyright Act, but that its results are 'inequitable, impractical, and nonsensical' . . . ." (citing Jule L. Sigall, Comment, *Copyright Infringement Was Never This Easy: RAM Copies and Their Impact on the Scope of Copyright Protection for Computer Programs*, 45 CATH. U. L. REV. 181, 182 (1995))); *id.* at n.19 (listing other articles criticizing the *MAI* decision); Pamela Samuelson, *The NII Intellectual Property Report*, COMMUNICATIONS OF THE ACM, Dec. 1994, at 21, 23 (claiming that a copy placed on a computer's RAM is no more a fixed copy than the reflected image of a book in a mirror).

67. Intellectual Reserve, Inc. v. Utah Lighthouse Ministry, Inc., 75 F. Supp. 2d 1290, 1294 (D. Utah 1999) (citing MAI, 991 F.2d at 518). *But see* CoStar Grp, Inc. v. LoopNet Inc., 373 F.3d 544, 551 (4th Cir. 2004) (holding that "copies" made from web pages to a computer's RAM "would appear not to be 'fixed' in the sense that they are [not] 'of more than transitory duration'").

employ "terms of use" or "end-user license agreements" that allow the copying of the program into RAM for only specified uses.[68] These end-user agreements have been routinely enforced even though they are notoriously cumbersome and go unread by the majority of users,[69] including some judges.[70]

As further evidence of the erosion of the end user's rights and the extension of encumbrances on software programs, we need look no further than 17 U.S.C. § 106(3). Section 106(3) grants copyright holders the exclusive right "to distribute copies or phonorecords of the copyrighted work to the public by sale or other transfer of ownership, or by rental, lease, or lending."[71] Although objects bearing copyrighted content are physically more akin to chattels—CDs are "things"—allowing the copyright owner to determine how he will transfer his copyrighted property seems to be more in line with the way we treat traditional encumbrances of real property. Some theorists have posited that § 106(3) should be read such that an authorized distribution of a copyrighted work, including software, either transfers ownership of the copy itself, or simply transfers temporary usage rights.[72] Perzanowski and Schultz, for instance, argue that uninterrupted possession without continued, subscription-style payments should be classified as a sale, not a license.[73] Yet, given *MAI* and its

68. *See, e.g.*, *Product Licenses and Terms of Use*, ADOBE, http://www.adobe.com/legal/licenses-terms.html (last visited Sept. 28, 2015) (providing the terms of use for all Adobe programs).

69. In a uniquely candid decision in 2002, a Massachusetts District Court judge led off his decision with the following statement, supporting the generalization that virtually nobody reads terms of service or software licenses:

> Has this happened to you? You plunk down a pretty penny for the latest and greatest software, speed back to your computer, tear open the box, shove the CD–ROM into the computer, click on "install" and, after scrolling past a license agreement which would take at least fifteen minutes to read, find yourself staring at the following dialog box: "I agree." Do you click on the box? You probably do not agree in your heart of hearts, but you click anyway, not about to let some pesky legalese delay the moment for which you've been waiting. Is that "clickwrap" license agreement enforceable? Yes, at least in the case described below.

i.Lan Sys., Inc. v. Netscout Serv. Level Corp., 183 F. Supp. 2d 328, 329 (D. Mass. 2002). *See also* Daniel B. Ravicher, *Facilitating Collaborative Software Development: The Enforceability of Mass-Market Public Software Licenses*, VA. J.L. & TECH., Fall 2000, at 2 (describing a typical software license as including user assent to "abide by all the terms and conditions of the following agreement (that everybody is expected to read but nobody ever does)"); Garry L. Founds, Note, *Shrinkwrap and Clickwrap Agreements: 2B or Not 2B?*, 52 FED. COMM. L.J. 99, 100 (1999).

70. Chief Justice of the Supreme Court John G. Roberts, Jr. himself admitted that he does not read user agreements required to visit some websites. *See* Debra Cassens Weiss, *Chief Justice Roberts Admits He Doesn't Read the Computer Fine Print*, ABA J. (Oct. 20, 2010, 12:17 PM), http://www.abajournal.com/news/article/chief_justice_roberts_admits_he_doesnt_read_the_computer_fine_print/.

71. 17 U.S.C. § 106(3) (2012).

72. Aaron Perzanowski & Jason Schultz, *Reconciling Intellectual and Personal Property*, 90 NOTRE DAME L. REV. 1211, 1253–60 (2015).

73. *See id.*

progeny, it appears that courts are content to let software copyright holders decide whether their transfers of software programs to users are to be classified as sales or leases.

More recently, the Ninth Circuit examined the use of the first sale doctrine in two similar cases involving copyrighted works, but with opposite results. First, *UMG Recordings v. Augusto* involved unapproved resale of promotional music CDs.[74] The CDs in question had been sent to music critics and radio stations in an effort to promote new releases, a common practice in the industry.[75] Each CD included an explicit notice indicating that the CD was to be used for promotional purposes only, and that the license was non-transferable.[76] The defendant acquired the CDs without UMG's permission and resold them on eBay.[77] UMG sued, arguing that the CDs had been licensed, not sold, to the stations and individual critics, and therefore the defendant had neither personal rights to use the CDs nor any rights to transfer to others.[78] The Ninth Circuit held that UMG failed to create a binding licensing agreement, despite the affixed notice, in part because the recipients had not explicitly agreed to the terms of the license.[79] The court held that UMG, in mailing the discs, effectively transferred ownership in them, and therefore the discs were subject to the first sale doctrine, meaning that the recipients acquired title to them and could therefore dispose of them as they pleased.[80]

On the day that *UMG* was decided, the same panel of judges came to the opposite conclusion in *Vernor v. Autodesk*.[81] With facts similar to those in *Augusto*, the defendant resold software that had allegedly already been licensed to other users.[82] The court applied the Ninth Circuit's three-part first sale doctrine test to determine whether the software in question had been licensed or sold; specifically, it examined (1) "whether the copyright

74. UMG Recordings Inc. v. Augusto, 628 F.3d 1175, 1177 (9th Cir. 2011).

75. *Id*.

76. Several of the CDs bore the following label:

> This CD is the property of the record company and is licensed to the intended recipient for personal use only. Acceptance of this CD shall constitute an agreement to comply with the terms of the license. Resale or transfer of possession is not allowed and may be punishable under federal and state laws.

Id. at 1177–78. Others in the lot that the defendant sold contained a shorter warning, "Promotional Use Only—Not for Sale." *Id*. at 1178.

77. *Id*. at 1178.

78. *Id.* at 1179.

79. *Id.* at 1180.

80. *Id.* at 1179 ("Notwithstanding its distinctive name, the [first sale] doctrine applies not only when a copy is first sold, but when a copy is given away or title is otherwise transferred without the accouterments of a sale.").

81. Vernor v. Autodesk, Inc., 621 F.3d 1102 (9th Cir. 2010).

82. *Id.* at 1105.

owner specifies that a user is granted a license"; (2) "whether the copyright owner significantly restricts the user's ability to transfer the software"; and (3) "whether the copyright owner imposes notable use restrictions" on the work.[83] The court held that, unlike in *UMG*, the plaintiff in *Vernor* had established that the specific licenses were consented to by the defendant, and thus restricted the defendant from reselling the software.[84] In addition, the court stated in these cases that software licensing is entitled to unique treatment that other types of personal property are not. The court in *Vernor* explicitly applied a test that is specific to software licensing,[85] and in *UMG*, the court noted that "*[p]articularly with regard to computer software*, we have recognized that copyright owners may create licensing arrangements."[86] The fact that there was no explicit consent to the license in *UMG*, but there was in *Vernor*, indicates that the first sale doctrine requires both parties to consent to the limitations on the end-user's rights for the encumbrances to be valid.[87] Acceptance of encumbrances to one's property rights through silence, however, does not appear to be enough.

Most recently, in *Capitol Records, LLC v. ReDigi Inc.*,[88] the U.S. District Court for the Southern District of New York held that the first sale doctrine was applicable only to the physical copies of copyrighted musical works,[89] further advancing the judicial trend of affording special treatment to digital property. The court stated:

> [T]he first sale defense is limited to material items, like records, that the copyright owner put into the stream of commerce. Here, [defendant] is not distributing such material items; rather, it is distributing *reproductions* of the copyrighted code embedded in new material objects . . . . The first sale defense does not cover this any more than it covered the sale of cassette recordings of vinyl records in a bygone era.[90]

The court went on to state that

83. *Id*. at 1107–11.

84. *Id.* at 1111–12.

85. *Id*. at 1107–09.

86. UMG Recordings Inc. v. Augusto, 628 F.3d 1175, 1180 (9th Cir. 2011) (emphasis added).

87. *Id.* ("Our conclusion that the recipients acquired ownership of the CDs is based largely on the nature of UMG's distribution."). *See also* ProCD, Inc. v. Zeidenberg, 86 F.3d 1447 (7th Cir. 1996); Specht v. Netscape Commc'ns Corp., 150 F. Supp. 2d 585 (S.D.N.Y. 2001), *aff'd*, 306 F.3d 17 (2d Cir. 2002).

88. Capitol Records, LLC v. ReDigi Inc., 934 F. Supp. 2d 640 (S.D.N.Y. 2013).

89. *Id.* at 648–51.

90. *Id.* at 655.

> Section 109(a) [of the Copyright Act] still protects a lawful owner's sale of her "particular" phonorecord, be it a computer hard disk, iPod, or other memory device onto which the file was originally downloaded. While this limitation clearly presents obstacles to resale that are different from, and perhaps even more onerous than, those involved in the resale of CDs and cassettes, the limitation is hardly absurd . . . .[91]

In declining to apply the first sale doctrine, the court said that "here, the Court cannot of its own accord condone the wholesale application of the first sale defense to the digital sphere, particularly when Congress itself has declined to take that step."[92] This is another example of a court allowing encumbrances on digital property, making the legal treatment of digital property in some ways more similar to real property than to chattel property.

Courts have also restricted applications of the first sale doctrine in the area of patent law, where it remains a common law rule referred to as "patent exhaustion."[93] Much like the first sale doctrine, under the patent exhaustion doctrine, selling a patented good in and of itself generally terminates the patent owner's rights to control the future fate of that particular item.[94] The patent holder, while owning the right to prevent infringement and unauthorized reproduction of a patented good, usually may not impose servitudes on the particular good itself.[95] In *Mallinckrodt v. MediPart Inc.*, however, the Federal Circuit allowed a manufacturer to impose certain usage restrictions on its patented goods, holding that because a patent holder had a right to deny *all* rights to a purchaser, it was therefore entitled to grant or deny any *combination of rights* it wished, including whole or partial rights.[96] The court also held that while the doctrine of exhaustion might eventually eliminate the patent holder's rights downstream, the patent holder was entitled to prevent reuse and subsequent

91. *Id.* at 656.

92. *Id*. at 660.

93. Quanta Computer, Inc. v. LG Elec., Inc., 553 U.S. 617, 625 (2008) ("The longstanding doctrine of patent exhaustion provides that the initial authorized sale of a patented item terminates all patent rights to that item.").

94. *Id*. at 626 (noting that under the patent exhaustion doctrine "the right to vend is exhausted by a single, unconditional sale, the article sold being thereby carried outside the monopoly of the patent law and rendered free of every restriction which the vendor may attempt to put upon it." (quoting Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502, 516 (1917))).

95. *See id.*

96. *See* Mallinckrodt, Inc. v. MediPart, Inc., 976 F.2d 700, 703 (Fed. Cir. 1992) ("The enforceability of restrictions on the use of patented goods derives from the patent grant, which is in classical terms of property: the right to exclude. . . . This right to exclude may be waived in whole or in part.").

licenses of a patented device by labeling it for a single use only.[97] The Federal Circuit went even further in *B. Braun Medical, Inc. v. Abbott Laboratories*, permitting restrictions on patented goods if the purchaser received notice of the restrictions, those restrictions were within the scope of the patent, and the patent rights had not yet been exhausted.[98] The end result has permitted patent holders to place restrictions on chattels that would not typically be allowed if there were no intellectual property components attached.[99]

III. TWO CHEERS FOR SOFTWARE PRICE DISCRIMINATION

In this Part, we discuss the use of price discrimination in the distribution of software and how changes in technology are facilitating more perfect price discrimination. We show that there are downsides to price discrimination for those who can pay more, and sometimes for the entire economy. But we give software price discrimination two cheers overall because a special characteristic of software means that as price discrimination comes closer to perfect, it will lead to greater distribution of software to more people and will increase total welfare. Because the marginal cost of distributing an additional copy of software is near zero, facilitating increasing price discrimination will allow the provision of software to greater numbers of individuals who were formerly priced out of the market. This will increase total market welfare and also disproportionately help the poor.

A. Price Discrimination

We explain price discrimination only briefly in this Section, given that there is a large and well-defined body of literature on price discrimination

97. *Id.* at 708–09.

98. B. Braun Med., Inc. v. Abbott Labs., 124 F.3d 1419, 1426 (Fed. Cir. 1997) (holding that patent exhaustion "does not apply to an expressly conditional sale or license"); *see also Mallinckrodt*, 976 F.2d at 709.

99. *But see* Quanta Computer, Inc. v. LG Elec., Inc., 553 U.S. 617, 625 (2008) (holding that when a patent holder licensed a component manufacturer to manufacture and sell components "substantially embodying" the patents at issue, the patent exhaustion doctrine prevented the patent holder from asserting patent infringement against the buyer of the components who then used the components in a way that fulfilled the elements of the patent claims). *See generally* Sarah Rajec, *Evaluating Flexibility in International Patent Law*, 65 HASTINGS L.J. 153 (2013); Editorial Board, *Patent Law Shouldn't Block the Sale of Used Tech Products*, N.Y. TIMES, Sept. 7, 2015, http://www.nytimes.com/2015/09/07/opinion/patent-law-shouldnt-block-the-sale-of-used-tech-products.html?action=click&pgtype=Homepage&version=Moth-Visible&module=inside-nyt-region&region=inside-nyt-region&WT.nav=inside-nyt-region.

in both economics and law.[100] The basics of price discrimination are well known and undisputed.[101] At its most fundamental level, price discrimination consists of charging different buyers different prices for the same product when the variance in price does not reflect variance in cost to the seller.[102] Examples of price discrimination generally involve sellers who have market power and thus can sell their products at prices above the price that would be charged in a state of perfect competition.[103] Sellers who do not have market power cannot engage in consumer-welfare-decreasing price discrimination because they cannot sell above market price.[104]

Sellers engage in price discrimination in an attempt to increase their profitability by varying their prices according to buyers' willingness to pay.[105] Economists divide price discrimination into three degrees. First-degree price discrimination takes place when a seller knows the exact price that each consumer is willing to pay and charges each consumer that price.[106] This is also called perfect price discrimination and is generally thought to be impossible to achieve.[107] Accordingly, in second- and third-

100. *See, e.g.*, THE ECONOMICS OF PRICE DISCRIMINATION (George Norman ed., 1999); LOUIS PHLIPS, THE ECONOMICS OF PRICE DISCRIMINATION (1983); RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW (7th ed. 2007); John P. Conley & Christopher S. Yoo, *Nonrivalry and Price Discrimination in Copyright Economics*, 157 U. PA. L. REV. 1801, 1814–16, 1820 (2009); William W. Fisher III, *When Should We Permit Differential Pricing of Information?*, 55 UCLA L. REV. 1 (2007); Hovenkamp, *supra* note 55, at 532–38; Louis Kaplow, *The Patent-Antitrust Intersection: A Reappraisal*, 97 HARV. L. REV 1813, 1873–82 (1984); Glynn S. Lunney, Jr., *Copyright's Price Discrimination Panacea*, 21 HARV. J.L. & TECH. 387 (2008); Michael J. Meurer, *Copyright Law and Price Discrimination*, 23 CARDOZO L. REV. 55 (2001) [hereinafter Meurer, *Copyright Law*]; Michael J. Meurer, *Price Discrimination, Personal Use and Piracy: Copyright Protection of Digital Works*, 45 BUFF. L. REV. 845, 869–74 (1997) [hereinafter Meurer, *Personal Use*]; Christina Mulligan, *A Numerus Clausus Principle for Intellectual Property*, 80 TENN. L. REV. 235, 285–89 (2013); Guy A. Rub, *Rebalancing Copyright Exhaustion*, 64 EMORY L.J. 741, 771 (2015).

101. *See* THE ECONOMICS OF PRICE DISCRIMINATION, *supra* note 100; PHLIPS, *supra* note 100; POSNER, *supra* note 100, at 291.

102. Fisher, *supra* note 100, at 21–22; Hovenkamp, *supra* note 55, at 532; Meurer, *Copyright Law*, *supra* note 100, at 67–68; Meurer, *Personal Use*, *supra* note 100, at 869.

103. Conley & Yoo, *supra* note 100, at 1816 ("[I]n the best of all possible worlds, where identification is feasible, price discrimination would result in the highest possible social welfare."); Meurer, *Personal Use*, *supra* note 100, at 870 (using the case of ProCD, Inc. v. Zeidenberg, 86 F.3d 1447, 1450 (7th Cir. 1996), as a running example, and also citing to JEAN TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION 133–52 (1988) for the general prospect that successful price discrimination models depend upon market power); Mulligan, *supra* note 100, at 286–89 (utilizing Microsoft software products as examples).

104. *See* N. GREGORY MANKIW, PRINCIPLES OF MICROECONOMICS 314–17 (6th ed. 2012).

105. POSNER, *supra* note 100, at 291; Fisher, *supra* note 100, at 27; Meurer, *Copyright Law*, *supra* note 100, at 139.

106. *See* R. GLENN HUBBARD & ANTHONY PATRICK O'BRIEN, MICROECONOMICS, 515–16 (2nd ed. 2008); *Price Discrimination*, ECONOMICS ONLINE, http://www.economicsonline.co.uk/Business_economics/Price_discrimination.html (last visited Sept. 28, 2015).

107. *See* HUBBARD & O'BRIEN, *supra* note 106, at 515–16; *Price Discrimination*, *supra* note 106.

degree price discrimination, sellers divide buyers into separate groups and sell at different prices to each group.[108]

Second-degree price discrimination occurs when a seller cannot determine consumers' reservation prices and therefore alters characteristics and prices of the good being sold in the hope that this will roughly sort consumers by willingness to pay. Examples of this include discounting movie ticket prices during the weekday,[109] offering special prices at restaurants during non-peak hours,[110] and offering only higher-priced hardcover editions of a new book for a period of time before selling less expensive paperback editions.[111] In these examples, the seller of each item assumes that the differing characteristics of the item being offered correspond to different consumer reservation prices, and the seller sets prices accordingly. Thus, in the examples just mentioned, sellers assume that the consumers who want to buy evening movie tickets or eat at peak hours (most working adults), or those who purchase hardcover books (those most eager to read new books), will be willing to pay more than more price-sensitive consumers.[112]

Third-degree price discrimination takes place when a seller divides consumers into different pricing groups based on characteristics of the consumers rather than of the good. A simple example is giving student or senior citizen discounts while charging non-student adults more based on the assumption that students and the elderly generally have smaller

108. *See, e.g.*, POSNER, *supra* note 100, at 291 ("Usually the best the discriminating monopolist can do is divide his customers into a few groups and set a single (although different) price for each group."); Fisher, *supra* note 100, at 12 (explaining how third-degree price discrimination does not tend to upset people and that "[n]o one protests, for example, when students or senior citizens are admitted to museums for less money than other visitors. And the practice . . . of providing heavy discounts to academic consumers of software is not controversial.").

109. Rachel Zarrell, *Big Screen, Small Bucks*, BOSTON.COM (2009), http://www.boston.com/ae/movies/packages/spendingsmartmovies/ (compiling senior discounts at Boston-area movie theaters).

110. Viviane Eng, *OffPeak Aims to Be Resource for On-Campus Food*, DAILY TROJAN (Oct. 14, 2014), http://dailytrojan.com/2014/10/14/offpeak-aims-to-be-resource-for-on-campus-food/ (discussing a new app that began on campus but now helps students find discounted eating-out opportunities off campus). Some waitstaff go further and actually conduct online searches on individual customers in advance of visits. *See* Jessica Sidman, *How D.C. Servers Are Secretly Profiling Diners*, WASH. CITY PAPER (July 15, 2015, 9:03 PM) http://www.washingtoncitypaper.com/blogs/youngandhungry/2015/07/15/how-d-c-servers-are-secretly-profiling-diners/. Criticizing some more intrusive forms of price discrimination in restaurants, one author described how "[h]igh-end restaurants are starting to Google their customers, to better personalize their dining experiences. They can't give people menus with different prices, but they can certainly hand them the wine list with either the cheaper side up or the more expensive side up." SCHNEIER, *supra* note 4, at 112.

111. *See* C.C., *Why Books Come out in Hardback Before Paperback*, ECONOMIST (Oct. 15, 2014, 11:50 PM), http://www.economist.com/blogs/economist-explains/2014/10/economist-explains-15.

112. Similarly, some consumers are willing to pay more for higher music file quality than others. James Cook, *Tech Companies Want You to Buy Your Music All Over Again at Higher Prices*, BUSINESS INSIDER (Jan. 13, 2015, 9:46 AM), http://uk.businessinsider.com/high-resolution-music-prices-2015-1.

discretionary funds and therefore are unwilling to pay as much as others for products and services.[113]

On the high end of price discrimination, sellers use branding, luxury status, exclusivity, small aesthetic changes, and geographic pricing schemes, among other things, to price discriminate to get more money from buyers who either value the product more highly or are simply willing to pay more because they are richer.[114] Sellers engaged in this form of second-degree price discrimination charge higher prices to buyers who are willing to pay more for something that is perceived as exclusive or luxurious.[115] An example of this occurred when Apple at one point offered otherwise identical MacBook computers for a $150 price difference based on whether the computer was housed in a white case or a black one.[116] This color

113. For data on the relative lower expenditures of youth and the elderly, see BUREAU OF LABOR STATISTICS, U.S. DEP'T OF LABOR, *Consumer Expenditure Survey, Table 1300 Age of Reference Person: Shares of Annual Aggregate Expenditures and Sources of Income* (2013), http://www.bls.gov/cex/2013/aggregate/age.pdf. To be sure, some students and elderly persons are quite rich and may have very high reservation prices, so this sort of price discrimination is far from perfect. But as a method of roughly dividing people into groups based on willingness to pay, it works well enough to make it worthwhile. *See, e.g.*, SENIORDISCOUNTS.COM, http://www.seniordiscounts.com (last visited Sept. 28, 2015) (claiming to offer over 250,000 discount opportunities for citizens over fifty years old); STUDENT ADVANTAGE, LLC, http://www.studentadvantage.com/content/?id=762 (last visited Sept. 28, 2015) (claiming to offer thousands of student discounts). Psychology research suggests that price discrimination is more palatable to consumers when it is based on some types of special status, such as being a senior citizen or a particularly loyal customer. *See* Lan Xia & Kent B. Monroe, *Is A Good Deal Always Fair? Examining the Concepts of Transaction Value and Price Fairness*, 31 J. ECON. PSYCHOL. 884, 893 (2010). *See also* Julia Angwin et al., *The Tiger Mom Tax: Asians Nearly Twice as Likely to Get Higher Price from Princeton Review*, HUFFINGTON POST, Sept. 1, 2015, http://www.huffingtonpost.com/entry/the-tiger-mom-tax-asians-nearly-twice-as-likely-to-get-higher-price-from-princeton-review_55e5ddd8e4b0b7a9633a5fde; David Goldman, *Amazon Says New Prime Program Will Make More Free-Shipping Items Available*, CNNMONEY, Sept. 1, 2015, http://money.cnn.com/2015/09/01/technology/amazon-prime-ship-by-region/index.html?iid=ob_homepage_tech_pool&iid=obnetwork.

114. *See, e.g.*, Fisher, *supra* note 100, at 3–4 (citing airline frequent flyer programs and university pricing differentials); Meurer, *Copyright Law*, *supra* note 100, at 67–68 (using differential pricing in movie theaters, including geographic discrimination, as example); Meurer, *Personal Use*, *supra* note 100, at 869 ("In the ideal case of perfect price discrimination, every customer is charged her maximum willingness to pay for the items she purchases."). *See generally* Asher Wolinsky, *Brand Names and Price Discrimination*, 35 J. INDUS. ECON. 255 (1987) (arguing that marketing branded and off-label products by the same company is a form of price discrimination).

115. Fisher, *supra* note 100, at 9 ("Even in the fashion industry, one finds price discrimination [wherein] major fashion houses often produce clothes in two (or more) forms—a premium line (Armani), and a cheaper, 'bridge' line (Emporio Armani). . . . [T]he substantial price difference between the two versions cannot be explained by differences in manufacturing costs. Rather, it enables the manufacturer to charge a great deal for the premium items without forfeiting less wealthy or eager customers."); Wolinsky, *supra* note 114, at 256 ("[B]uyers who strongly prefer a particular brand may be willing to pay a higher price for a labeled brand, while others may rather buy a cheaper unlabeled brand whose identity is uncertain.").

116. Robert H. Frank, *How Much Is that Laptop? It Depends on the Color of the Case. And That's Fair.*, N.Y. TIMES (July 6, 2006), http://www.nytimes.com/2006/07/06/business/06scene.html?_r=0.

difference in the computer case allowed the manufacturer to charge a larger amount of money to those who wanted a more exclusive product, or who just really liked black computers.

Price discrimination decreases the consumer welfare of those buyers who pay more under a price discrimination scheme than they would if the product were offered for a single price.[117] But price discrimination can also facilitate lower pricing for some consumers, which enhances those consumers' welfare.[118] Price discrimination can also increase total market welfare if allocative efficiency is increased.[119] For example, price discrimination can enable a manufacturer to make up the costs of production in a way that allows it to charge relatively poorer people less and still make a profit from charging relatively richer people more. Thus, in some circumstances, price discrimination facilitates the subsidization of poorer users by richer ones.[120]

It is not always the low-value consumer who is poor, nor the high-value consumer who is rich.[121] It depends on the market and goods being sold. For instance, wealthy people generally value check-cashing services very little while poor people without banking accounts value such services much more.[122] Accordingly, we could expect that if a check-cashing service provider were to discriminate between the two groups, it would charge the poor people more and the rich less. This is exactly what we see happen. Poorer people generally pay substantially more to have their checks cashed

117. *See* Hovenkamp, *supra* note 55, at 532; *see also* Julie E. Cohen, *Copyright and the Perfect Curve*, 53 VAND. L. REV. 1799, 1806–07 (2000) (citing Julie E. Cohen, Lochner *in Cyberspace: The New Economic Orthodoxy of "Rights Management"*, 97 MICH. L. REV. 462, 498–99, 542–51 (1998) (discussing difference between private and social welfare, both generally and in the particular context of information markets)).

118. Fisher, *supra* note 100, at 25 (arguing that price discrimination generally results in "redistribution of wealth 'downward' [that] will increase social welfare").

119. *See id.* at 22; Meurer, *Personal Use*, *supra* note 100, at 845 n.263. "Allocative efficiency" refers to goods and services being allocated to their highest uses, or in other words, resources being allocated efficiently to where they are most valuable in the economy. Harold Demsetz, *The Private Production of Public Goods*, 13 J.L. & ECON. 293, 299 (1970).

120. *See, e.g.*, Fisher, *supra* note 100, at 9 (arguing that price discrimination in the sale of drugs helps the poor). *See also* Taos Turner, *There Are Ways TV-Loving Expats Can Get Around the Dreaded 'Geo-Block'*, WALL ST. J. (Apr. 14, 2015, 12:01 AM), http://blogs.wsj.com/expat/2015/04/14/firms-circumvent-geo-blocking-helping-expats-watch-favorite-shows-abroad/ (discussing how some individuals try to circumvent geo-blocking, whose purpose can stem from a seller's desire to engage in price discrimination).

121. In economics, the terms "high-value" and "low-value" consumers refer not to the value of the consumer, but to how much the consumer subjectively values the good or service at issue. *See* J. Shahar Dillbary, *Predatory Bundling and the Exclusionary Standard*, 67 WASH. & LEE L. REV. 1231, 1237 (2010).

122. *See, e.g.*, Michael S. Barr, *Banking the Poor*, 21 YALE J. ON REG. 121, 142–44 (2004) (explaining the mechanics of the check-cashing industry and identifying its customers as generally low income).

than do wealthy people.[123] Credit card fees are another example where richer people generally pay less and poorer people pay more.[124] Here again, poor people often have less access to credit and therefore are willing to pay more for it, while richer people have more options and therefore benefit from competition among companies that want their business.[125]

Price discrimination can increase total market welfare in some cases, especially in comparison to monopoly pricing; it also can decrease total market welfare if the pricing is done in such a way as to decrease allocative efficiency.[126] There is some dispute as to how often price discrimination as conducted in the real world is helpful or harmful to total market welfare.[127] Generally, however, price discrimination that is successful in significantly increasing a seller's profitability will also increase allocative efficiency compared to pricing at a single monopoly price because—in addition to entailing charging more to those who are willing to pay more—successful price discrimination generally involves discounting the product to buyers who are not willing to pay the monopoly price.[128] Indeed, many of the classic examples of price discrimination involve discounting prices for certain groups, rather than simply increasing prices. Air travel is an example. Airlines charge lower prices for Saturday stays in an attempt to separate leisure travelers from business travelers, the latter of whom generally want to be home for the weekend. The airlines thus charge more to business travelers in economy class, and even more for business and first class tickets, but they charge significantly less to leisure travelers.[129] If

123. *Id.* at 146–48 (discussing the costs of check cashing for the poor).

124. *See generally* Oren Bar-Gill, *Seduction by Plastic*, 98 NW. U. L. REV. 1373 (2004).

125. *See id.*

126. *See* Michael E. Levine, *Price Discrimination Without Market Power*, 19 YALE J. ON REG. 1, 23 (2002). As Judge Richard Posner explained:

> Suppose the profit-maximizing single monopoly price [of a product] is $10, but rather than charging that price, the monopolist classifies buyers into two groups and charges $5 to members of one and $20 to members of the other. He gains sales—to those in the first group who will not pay $10 but are willing to pay $5. But he also loses sales—to those in the second group who are willing to pay $10 but refuse to pay $20. The lost sales may outnumber the sales gained. His output may be lower although his profits will be higher.

POSNER, *supra* note 100, at 291.

127. *See generally* Einer Elhauge, *Tying, Bundled Discounts, and the Death of the Single Monopoly Profit Theory*, 123 HARV. L. REV. 397 (2009); Erik Hovenkamp & Herbert Hovenkamp, *Tying Arrangements and Antitrust Harm*, 52 ARIZ. L. REV. 925 (2010); David S. Olson, *First Amendment Based Copyright Misuse*, 52 WM. & MARY L. REV. 537 (2010).

128. *See generally* Demsetz, *supra* note 119 (making the general normative point that price discrimination typically increases profit and allocative efficiency). *But see* Meurer, *Copyright Law*, *supra* note 100, at 99 nn.182–83 (giving theoretical examples of how a seller could increase profits using price discrimination while decreasing total welfare).

129. For a discussion of the economics of plane ticket pricing, see Sherwin Rosen & Andrew M. Rosenfield, *Ticket Pricing*, 40 J.L. & ECON. 351 (1997).

airlines were forced to charge a single price to all travelers, leisure travelers would probably have to pay more and travel less.[130]

130. Airline ticket pricing is actually very complex. Ticket prices change regularly and seemingly randomly. Many of these pricing methods are aimed at achieving additional price discrimination. For example, increasing prices within two weeks of a flight allows the airline to charge more to someone who appears to need to travel on a certain date, and is thus likely to be willing to pay more. Discounting prices for tickets purchased far in advance allows leisure travelers with flexible schedules to pay less. Thus, the airlines can sell to purchasers who might not otherwise fly at higher price points. Likewise, charging different prices based on routes and connections sometimes has to do with costs, and sometimes has to do with price discrimination based on what other options travelers have. There are many more ways in which airline pricing is tremendously complex, of course, but it is enough to say that price discrimination occurs in the industry to the detriment of some consumers and the benefit of others. *See generally id.* For critical discussions of price discrimination in the travel context, see John Hutchinson, *Are You REALLY Getting the Best Deal? Research Reveals Online Customers Are Victims of 'Price Discrimination' When Booking Their Holidays*, DAILYMAIL.COM (Oct. 29, 2014, 8:08 PM), http://www.dailymail.co.uk/travel/travel_news/article-2810744/Are-REALLY-getting-best-deal-Research-reveals-online-customers-victims-price-discrimination-booking-holidays.html; Tim Winship, *Lawmakers to Airlines: 'Enough Already!'*, FREQUENTFLIER.COM (June 16, 2015), http://www.frequentflier.com/blog/lawmakers-to-airlines-enough-already/ (quoting New York Senator Chuck Schumer as stating on the subject of a proposed new luggage size standard: "Enough already. The airlines already charge more for checked baggage, pillows, peanuts and head phones. It's got to stop somewhere."); Tim Wu, *Why Airlines Want to Make You Suffer*, THE NEW YORKER (Dec. 26, 2014), http://www.newyorker.com/business/currency/airlines-want-you-to-suffer; *see also* Patrick Gillespie, *Judge Throws out United Airlines Lawsuit Against 22-Year-Old*, CNNMONEY (May 1, 2015, 1:04 PM), http://money.cnn.com/2015/05/01/investing/united-airlines-lawsuit-skiplagged/index.html (discussing the dismissal of a lawsuit against the website Skiplagged.com, which seeks to provide customers with cheaper airline tickets through searches of "hidden city" fares). Meanwhile, European airline Ryanair hopes to offer in a few years transatlantic flights that would start at $15 plus taxes. *See* Virginia Harrison, *Low-Cost Airline Plans $15 Flight to Europe*, CNNMONEY (Mar. 17, 2015, 11:46 AM), http://money.cnn.com/2015/03/17/news/companies/ryanair-transatlantic-flights/index.html. *See also* Kathryn Vasel, *Want a Seat Assignment on Delta? It Could Cost You*, CNNMoney, Aug. 19, 2015, http://money.cnn.com/2015/08/19/pf/delta-basic-economy-tickets/index.html?sr=cnnmoneybin082215delta0930story (discussing bare-bones pricing for airline tickets). One reason that some airlines can offer low base fares is that they make money from having customers customize other elements of travel, such as whether their flights will include certain types of food or WiFi service. *See, e.g.*, Kerry Sheridan, *Airlines Struggle to Please the Modern Passenger*, YAHOO! NEWS (June 10, 2015, 5:25 AM), http://news.yahoo.com/ airlines-struggle-please-modern-passenger-092523494.html. In rare cases, specific events raise or lower airline ticket prices, such as when fares between New York City and Washington, D.C. increased after an Amtrak accident hampered train travel for several days. *See* Bill Hutchinson, *Airfares Between New York City, Washington Soar in Wake of Amtrak Crash*, N.Y. DAILY NEWS (May 15, 2015), http://www.nydailynews.com/new-york/nyc-washington-airfares-soar-wake-deadly-amtrak-crash-article-1.2223221. While these instances generally exemplify legal behavior, the Department of Justice is currently investigating several major airlines for the possibility that they collectively engaged in unlawful price fixing. *See* Evan Perez, *DOJ Subpoenas Airlines over Keeping Ticket Prices High*, CNN, July 2, 2015, http://www.cnn.com/2015/07/01/politics/doj-subpoenas-airlines-unlawful-coordination/index.html?iid=EL. Last, some airlines specifically opt *not* to engage in price discrimination as a way to differentiate themselves in the market. *See* Hugo Martin, *Southwest Airlines Will Keep Its 'Bags Fly Free' Policy*, L.A. TIMES, July 28, 2015, http://www.latimes.com/business/la-fi-southwest-airlines-free-checked-bags-20150728-story.html. For a discussion of how similar principles are applied in the hotel industry, see Tim Winship, *Coming Soon to a Hotel Near You: Nuisance Fees*, FREQUENTFLYER.COM, Aug. 31, 2015, http://www.frequentflier.com/blog/coming-soon-to-a-hotel-near-you-nuisance-fees/; Tim Winship, *These Hotels Charge Extra for Air Conditioning*, FREQUENTFLYER.COM, Sept. 8, 2015, http://www.frequentflier.com/blog/these-hotels-charge-extra-for-air-conditioning/.

Perfect price discrimination results in increased total market welfare as compared to selling at a single supra-competitive price,[131] or even at several supra-competitive price points.[132] In fact, perfect competition is no more efficient in terms of total market welfare than is perfect price discrimination.[133] It is true that perfect price discrimination transfers all surplus from consumers to producers, but every consumer still gets the good she desires at her reservation price, and thus allocative efficiency is just as good under perfect price discrimination as it is under perfect competition.[134]

Price discrimination that is utilized in a fairly competitive market runs a greater risk of decreasing both consumer welfare and total welfare.[135] This is because if prices start near the competitive price, and sellers find ways to charge some consumers more, consumer welfare and allocative efficiency are decreased. In such a case, the decrease in welfare cannot be counterbalanced by selling to others at prices below the prevailing price because in competitive markets, the prevailing price is at or near the seller's cost. Price discrimination in a competitive market is difficult to achieve, however, because it generally requires illegal collusion amongst sellers.[136]

There is an exception, however, by which price discrimination that is utilized in a fairly competitive market can increase both net consumer welfare and total welfare. This can occur for a special class of products for which the marginal cost of selling extra units is below the market price.[137] Even in mostly competitive markets, for goods with marginal costs of distribution that approach zero, price discrimination can facilitate sales that would not happen even in a competitive market. This is because the additional sales can be made below the price that equates to average total cost, or the like, which would need to be charged to make up costs if a

131. A supra-competitive price is a price above the competitive price. *See* David Gilo, *Retail Competition Percolating Through to Suppliers and the Use of Vertical Integration, Tying, and Vertical Restraints to Stop It*, 20 YALE J. ON REG. 25, 27 (2003).

132. Meurer, *Copyright Law*, *supra* note 100, at 68–69.

133. Perfect price discrimination ensures that all consumers who value a good above cost receive the good, just as perfect competition does. HUBBARD & O'BRIEN, *supra* note 106, at 516–17. Both are more theoretical than realistic descriptions of markets.

134. *Id.*

135. Mark Armstrong & John Vickers, *Competitive Price Discrimination*, 32 RAND J. OF ECON, 579, 582, 600 (2001).

136. *See* MANKIW, *supra* note 104, at 314. While upward price discrimination in a competitive market reduces consumer and total welfare, price discrimination generally cannot be accomplished in competitive markets without collusion because other sellers have incentives to underbid above cost pricing by competitors. *Id.* Buyer arbitrage may also undermine such price discrimination, as discussed *infra* in note 141 and the accompanying text.

137. *See* Armstrong & Vickers, *supra* note 135, at 15–16.

producer could sell at only a single price. If it can price discriminate, the producer can sell the vast majority of its goods at or above average total cost, but can then profitably sell additional goods even significantly below average total cost, which means that consumers who would normally never have the chance to buy the good will be offered the good at a very low price. In this case, total welfare under price discrimination is greater than in a normally competitive market without price discrimination.

An example of such price discrimination can be found in Boston, where some bus companies sell a few seats for very low prices, certainly under average total cost. For instance, the Bolt Bus offers a specific number of seats from Boston to New York City for only $1.[138] Part of this discount can be counted as part of the cost of promoting the service, because the company can advertise rates as low as $1. But this is also a form of price discrimination resulting in consumers getting a service well below market price. And so long as the buses tend not to be full when they drive to New York City, this makes economic sense for the bus company. In general, the company must sell its seats at a price to cover its costs of fuel, driver, equipment, and overhead. But the marginal cost of selling the last few unsold seats on a bus bound for New York City is close to zero for the bus company. There will be a slight increase in fuel consumption to carry the weight of the extra passengers and luggage, and there is a small transaction cost arising from printing and selling the ticket, but otherwise, it is basically costless for the bus company to sell the seat. Thus, the bus company can be a bit more profitable even by selling some tickets significantly below market price.[139] As we will discuss below, software distribution meets this condition of having a very low marginal cost of making extra copies available.[140]

138. *See FAQ*, BOLTBUS, https://www.boltbus.com/faq.aspx (last visited Sept. 28, 2015) (citing the $1 fare).

139. The market price in a competitive industry should roughly reflect average total cost over the long run. *See* HUBBARD & O'BRIEN, *supra* note 106, at 419 tbl. 12-2. Thus, sales below market prices generally are also sales below average total cost. In these cases, the marginal cost of offering the unsold seats is much lower than average total cost, so selling at or near marginal cost is profitable for the business. *Id.* The bus company can only offer a few tickets at this low fare, however. If the bus company offered numerous tickets at the very low fare, then customers would be wise to attempt to buy tickets on a number of buses until they got the ultra low price. This would hurt normal sales. In addition, if the company offered too many tickets at the low price, consumers might be unwilling to pay for regular priced tickets, feeling that those tickets are "too expensive," which would mean that the company could not cover its costs. As it is, on the rare occasions when bus customers are able to get a $1 ticket, they may view it more as winning a prize, rather than thinking that the regular ticket prices are excessive. This builds goodwill with the bus company's customers, and allows the company to eke out a little more profit.

140. *See infra* Part III.C.

Price discrimination is often quite difficult to achieve even in a monopoly market, however, because arbitrage can easily occur.[141] A seller that wants to price discriminate in the sales of its product must do more than simply sort consumers into separate groups of those who value a product at a higher price and those who value it at a lower price. This is the easy part of price discrimination. The hard part is selling to each group and not having the low-priced sales destroy the market for the high-priced offerings. If the producer offers different prices to different groups, then some purchasers who are offered low prices will figure out that they can buy extra products and resell them at a medium price to those consumers to whom the seller is offering only a high price. This buying low and reselling high is classic arbitrage and is socially wasteful.[142] Price discrimination can only be successful if arbitrage can be mostly thwarted.[143] Producers utilize second- and third-degree price discrimination as means of preventing arbitrage. [144]

B. The Evolution of Software From Product to Ongoing Service

Prior to the growth of Internet computing, particularly in the home, computer programs and video games (collectively "software") were purchased by the user and installed on only one unit at a time.[145] Typically, the average household had only one computer or gaming system (if it had either), and the software purchased was only used on that single unit. Although multiple people accessed a single computer, there were not "users" with individual profiles the way there are today. Early computers had a single operating system (usually DOS-based) and could only run a

141. *See* John Shepard Wiley Jr. et al., *The Leasing Monopolist*, 37 UCLA L. REV. 693, 728 (1990). In a monopolistic or competitive market, price discrimination is also difficult due to competitive price pressure. *See* MANKIW, *supra* note 104, at 314.

142. *See* Daniel A. Farber & Brett H. McDonnell, *Why (and How) Fairness Matters at the IP/Antitrust Interface*, 87 MINN. L. REV. 1817, 1867 (2003).

143. *See* HUBBARD & O'BRIEN, *supra* note 106, at 508.

144. For instance, discounts based on age or student status are fairly easy to police, which explains the popularity of age discounts and student discounts. Establishments police these discounts by observing consumers or requiring identification before purchase. *See, e.g.*, SlugBooks, *Student ID Discounts & Deals Cheatsheet*, http://www.collegepackinglist.com/college-discounts-cheatsheet.html (last visited March 14, 2015) (listing companies that will give students discounts based on seeing their IDs). Establishments also generally employ contract law to prohibit reselling. For example, entertainment venues may prohibit transfers of tickets by treating the ticket "sale" for the event as a license to occupy a seat in the venue on a certain date at a certain time. Under the terms of the license (often printed on the back of the ticket) a number of conditions can void the license, including reselling or transferring the ticket. *See* Albert A. Foer, *Who Owns My Ticket?*, N.Y. TIMES, Jan. 19, 2012 (discussing the practice and how some states have made or tried to make it illegal).

145. "Windows software is installed with floppy discs bought in large boxes with heavy instruction manuals." *A History of Windows: 1990–1994*, MICROSOFT WINDOWS, http://windows.microsoft.com/en-us/windows/history#T1=era3 (last updated Nov. 2013).

single "program" at a time.[146] For example, the early Commodore 64 (64 signaling a memory capacity of 64 kilobytes of memory) required users, via the command prompt, to tell the operating system to run the piece of software that was loaded into the computer's floppy disk drive.[147] There was no "logging in" or identification process required to access the program, and there were no folders or files the way computer memory is arranged currently.[148] New data had to be saved to floppy disks, and there was no auto-save function.[149]

The development of new software was a difficult and time-consuming task, and most companies preferred to employ the "cathedral" method, through which software is "carefully crafted by individual wizards or small bands of mages working in splendid isolation, with no beta to be released before its time."[150] Software was tested, retested, and tested again before it was released for purchase.[151] When users identified bugs, they learned to navigate around or through them.[152] Sometimes independent coders would develop "fixes" for the bugs, which they shared with friends, or even published in newspapers or PC magazine articles.[153] Patches or bug fixes were not generally released on an individual basis.[154] While a typical home

146. For a description of the experience of using DOS, see Chris Hoffman, *PCs Before Windows: What Using MS-DOS Was Actually Like*, HOW-TO GEEK (May 11, 2014), http://www.howtogeek.com/188980/pcs-before-windows-what-using-ms-dos-was-actually-like/.

147. Reid C. Swenson, *What is a Commodore Computer?*, OLDSOFTWARE.COM, http://oldsoftware.com/history.html (last visited Sept. 28, 2015).

148. *See id.*

149. *See id.*

150. ERIC S. RAYMOND, THE CATHEDRAL AND THE BAZAAR: MUSINGS ON LINUX AND OPEN SOURCE BY AN ACCIDENTAL REVOLUTIONARY 29 (Tim O'Reilly ed., 1999) (comparing the corporate software development model, known as the "cathedral," with the open-source community development model employed with Linux development, known as the "bazaar"). It is important for the reader to understand, however, that Linux's open-source model relied upon access to an early form of inter/intranet access for developers to share ideas and improve the software on an ongoing basis. *Id.*

151. For a historical timeline of such testing, see Joris Meerts & Dorothy Graham, *The History of Software Testing*, TESTING REFERENCES, http://www.testingreferences.com/testinghistory.php (last visited Sept. 28, 2015).

152. Bugs could, however, have disastrous consequences depending on the context. For a collection of such stories, see Simson Garfinkel, *History's Worst Software Bugs*, WIRED MAG. (Nov. 8, 2005), http://archive.wired.com/software/coolapps/news/2005/11/69355?currentPage=all.

153. *See, e.g.*, Bruce Brown, *Bugout*, SEATTLE TIMES, Apr. 23, 1995, at C3 (suggesting a way to work around a bug that caused printing problems in Microsoft Excel).

154. Bill Gates is reported to have said: "There are no significant bugs in our released software that any significant number of users want fixed . . . . I'm saying: We don't do a new version to fix bugs. We don't. Not enough people would buy it." *Microsoft Code Has No Bugs (That Microsoft Cares About)*, FOCUS, Oct. 23, 1995, at 206, http://www.cantrip.org/nobugs.html.

> [U]pdates or upgrades to software were generally delivered by—and often installed by—tech support. Updates were also relatively infrequent. However, as viruses and other malware threats increased in number and severity in the following decades, operating systems and antivirus applications began to require more frequent updates.

computer today constantly checks for, downloads, and installs "updates," for the multitude of software programs stored on the hard drive,[155] there was no method for performing such a check before the existence of the World Wide Web.[156] Producers generally waited to fix a bug by improving the software in the next release.[157] On the earliest computers, there was not even a hard drive onto which a user would load the software—it ran off the floppy disk.[158] Even with the advent of the hard drive, there were no upgrades, and the user had to weigh the costs in time and money to install a new version of a program.[159]

For example, Windows 3.0 was released in 1990 and is widely regarded as the first truly successful Windows release, due in part to the introduction of virtual memory.[160] Windows 3.0 was one of the first software programs to release upgrades, which were sold as 3.0a, "a maintenance release, resolving bugs and improving stability."[161] The upgrades were optional purchases, and oftentimes users waited until an entirely new version was released to upgrade rather than buy the bug fixes.[162]

Jaime Henriquez, *10 Ways Tech Support Has Changed Since the 1980s*, TECHREPUBLIC (Aug. 9, 2013, 12:48 PM), http://www.techrepublic.com/blog/10-things/10-ways-tech-support-has-changed-since-the-1980s/.

155. *Understanding Windows Automatic Updating*, MICROSOFT WINDOWS, http://windows.microsoft.com/en-us/windows/understanding-windows-automatic-updating#1TC=windows-7 (last visited Sept. 28, 2015).

156. For an argument that the video game console industry launched consumer "lust" for upgrades, see Joshua Topolsky, *Welcome to the Age of the Upgrade*, VERGE (Dec. 31, 2013, 3:03 PM), http://www.theverge.com/2013/12/31/5261042/welcome-to-the-age-of-the-upgrade ("I believe it was this moment—the moment of the Genesis, TurboGrafx-16, and eventually the SNES—that changed consumer attitudes about technology in our lives forever . . . [, when] the consumer learned that the thing you already owned was going to be replaced, and the replacement was going to be awesome.").

157. *See supra* note 154.

158. *Life Without Hard Disk Drives*, THE PC GUIDE, http://www.pcguide.com/ref/hdd/histWithout-c.html (last visited Sept. 28, 2015). Indeed, it appears that U.S. nuclear missiles are still operated via computers that run off of floppy disks rather than a hard drive. *See* Emily Thomas, *Soooo Our Nuclear Missiles Are Run by Computers That Still Use 8-Inch Floppy Disks*, HUFFINGTON POST (May 1, 2014, 1:59 PM), http://www.huffingtonpost.com/ 2014/05/01/floppy-disk-nuclear-missile-minuteman_n_5243367.html.

159. *See, e.g.*, John Burgess, *Do You Really Need a New Operating System? Weigh Cost, Advantage Before Buying*, WASH. POST, Aug. 21, 1995, at E20 (discussing whether users should buy and install Windows 95 given the various hassles involved); Brit Hume, *Low-Price Software Upgrades Sometimes Are No Bargain*, WASH. POST, Dec. 13, 1993, at F20 (evaluating the costs of upgrading programs).

160. *A History of Windows*, *supra* note 145; Mark Ward, *The End of an Era—Windows 3.x*, BBC (last updated Nov. 5, 2008, 12:49 AM), http://news.bbc.co.uk/2/hi/technology/7707016.stm.

161. *Windows*, MICROSOFT'S FANS, http://www.microsoftsfans.com/windows.html (under subheading "Success with Windows 3.0") (last visited Sept. 28, 2015).

162. As one author has described:

> When software first became a consumer product in the 1980s, it was literally unchangeable. It was written on media that was write-once, placed in a physical box, shrink-wrapped, and

This pre-Internet method of distributing software was much more like a one-time sale of a product, rather than the "licensing" of something. Nevertheless, as we discuss in the previous Part,[163] while at first some courts treated transactions between software companies and consumers as sales,[164] courts generally allowed these transactions to be legally considered licensing transactions.[165] The early cases upholding the characterization of software transfers as licensing rather than sale were subject to understandable criticism. Certainly these transactions had many of the hallmarks of sales rather than licenses.[166] Nevertheless, we believe that it

> set on store shelves. Later releases of software in a box would likely include some bug fixes and minor feature additions, but conceptually, a software program was treated as any other kind of physical media—it was produced once, and if there were sufficient interest for a second edition or version, a user would be expected to purchase a completely new copy of the product. Until computer networking became ubiquitous, there was no straightforward method for computer software to be upgraded in-place, or "patched." In the 1990s and early 2000s, software updates were still done via formal release numbers and discrete new editions. The onus was on individual owners to find and acquire patches to update their own products, sometimes for free and on occasion by paying for an upgrade.

Liza Daly, *What We Can Do With "Books", in* BOOK: A FUTURIST'S MANIFESTO (Hugh McGuire & Brian O'Leary eds., 2012).

163. *See supra* Part II.

164. In *SoftMan Products Co., LLC v. Adobe Sys., Inc.*, 171 F. Supp. 2d 1075 (C.D. Cal. 2001), a district court held that when a software vendor transfers a copy of its software, that transfer should be viewed as a sale of goods rather than a license of intellectual property. Later rulings held that software is licensed, not sold. *See, e.g.*, Vernor v. Autodesk, Inc., 621 F.3d 1102 (9th Cir. 2010). Today, many users still think they purchase software, and companies often release reminders that the software is licensed, not bought. *See* Zachary Knight, *Microsoft Reminds Everyone: You Do Not Own Your Software*, TECHDIRT WIRELESS (Dec. 16, 2011, 4:05 PM), https://www.techdirt.com/blog/wireless/articles/20111209/08380617021/microsoft-reminds-everyone-you-do-not-own-your-software.shtml.

165. *See* sources cited *supra* note 100.

166. Notably, at the time, even software companies seemed to view the exchange of money for software between user and company as similar to the sale of a "thing." For instance, Borland used a software license titled "Just Like a Book." The EULA reads:

> This software is protected by both United States copyright law and international copyright treaty provisions. Therefore, *you must treat this software just like a book*, except that you may copy it onto a computer to be used and you may make archival copies of the software for the sole purpose of backing-up our software and protecting your investment from loss. By saying "just like a book," Borland means, for example, that this software may be used by any number of people, and may be freely moved from one computer location to another, so long as there is no possibility of it being used at one location while it's being used at another or on a computer network by more than one user at one location. *Just like a book can't be read by two different people in two different places at the same time, neither can the software be used by two different people in two different places at the same time.* (Unless, of course, Borland's copyright has been violated or the use is on a computer network by up to the number of users authorized by additional Borland licenses as explained below.)

Thom Holwerda, *Borland in the 1980's: "Treat Software Just Like a Book"*, OSNEWS (Oct. 15, 2009, 2:47 PM), http://www.osnews.com/story/22342/Borland_in_the_1980s_Treat_Software_Just_Like_a_Book_/ (emphases added). The "Just Like a Book" licensing approach was soon overtaken by the approach of licensing each copy of a software program to a specific machine. For instance, the Windows 3.1 licensing agreement for the most part limited its licensed use to installing the software copy on a single machine. *Windows 3.1 Licensing Policy Allows for One Copy Per License*, MICROSOFT SUPPORT (last reviewed Feb. 27, 2014), http://support.microsoft.com/kb/83926.

was better for the development and widespread distribution of software that courts treated software distribution as licensing rather than sales, even if to some extent this was merely a useful legal fiction. Had courts instead characterized these transfers of software from producers to consumers as sales, then the first sale doctrine would have applied and consumers would have been able to resell their software.[167] Allowing consumers to resell digital software would have had a greater effect on the software market than the ability to sell used books and music ever had on the book and music markets. Books degrade with age and use, as do record albums and cassette tapes.[168] Even CDs were relatively fragile media for purposes of everyday use for playing music.[169] CDs historically had to be used each time the music was played, which could lead to scratching or damaging of the CDs over time and loss of music.[170] Thus, while used books and music are partial substitutes for new books and music, they are far from perfect substitutes. When software was contained on floppy disks, the floppy disks had some of the fragility of the media used for books or music, although not to the same extent. While floppy disks were fairly sturdy, over time the magnetic recordings on them could degrade.[171]

Hence, there was some difference between a used and new floppy disk containing software, especially as the used floppy disk aged. But for purposes of the software user, all she cared about was being able to load the software from the disk onto her computer. If the program on the floppy disk was non-corrupt at the time of loading, then it was not as crucial if the disk later became damaged,[172] unlike for the purchaser of a CD, who would need the CD to remain undamaged to enjoy the music contained therein. Thus, used floppy disks were relatively better substitutes for new software

167. *See supra* Part II.

168. Indeed, some libraries are equipped with media preservation departments to deal with this exact problem. *See, e.g.*, *Media Preservation*, HARVARD LIBRARY, http://library.harvard.edu/preservation/media-preservation (last visited Sept. 28, 2015). In a nod to old cassette tapes, Sony has unveiled a modern tape that can hold millions of songs. Chris Coplan, *R.I.P. iPod: Sony Unveils Cassette Tape That Can Hold 64,750,000 Songs*, CONSEQUENCE OF SOUND (May 5, 2014, 8:45 AM), http://consequenceofsound.net/2014/05/r-i-p-ipod-sony-unveils-cassette-tape-that-can-hold-64750000-songs/.

169. The unrecorded shelf life of a CD is between five and ten years. The experiential life expectancy, however, is two to five years. *Frequently Asked Questions (FAQs) about Optical Storage Media: Storing Temporary Records on CDs and DVDs*, NATIONAL ARCHIVES, http://www.archives.gov/records-mgmt/initiatives/temp-opmedia-faq.html [https://web.archive.org/web/20150618201448/http://www.archives.gov/records-mgmt/initiatives/temp-opmedia-faq.html].

170. *See* Tom Bishop, *Is Music Safe on Compact Disc?*, BBC NEWS, http://news.bbc.co.uk/2/hi/entertainment/3940669.stm (last updated Aug. 27, 2004).

171. *See* Casey Morgan, *Data Storage Lifespans: How Long Will Media Really Last?*, STORAGECRAFT (Aug. 28, 2013), http://www.storagecraft.com/blog/data-storage-lifespan/.

172. Unless, of course, the computer hard drive developed problems and the program needed to be reloaded from the floppy disk onto the hard drive.

floppy disks than used books and music were for new books and music.[173] Used disks containing software were not perfect substitutes, however, because uncertainty about the condition of the data on these disks led to transaction and information costs that meant a buyer would not be willing to pay as much for a used disk, even if there were no copyright issues.[174]

Had courts treated transfers of software from producers to consumers as sales subject to the first sale doctrine, the relative durability of floppy disks, and the need to use them only once per transfer, would have made price discrimination much more difficult. Any purchasers of lower-priced software could have easily resold it to those to whom the software producer wanted to charge higher prices. It is true that software producers could have combatted this somewhat by making cheaper versions less functional and offering more expensive versions with greater numbers of features. This would have allowed some rough second-degree price discrimination, so long as the users of the higher-priced version needed the additional features, and the users of the lower-priced version did not. But other than that, the first sale doctrine would have opened the door to arbitrage such that more nuanced price discrimination would have been impossible.

In addition, allowing the resale of software would have made it much more difficult to detect copyright infringement of software. Under the current regime, software producers can monitor websites like eBay and Amazon Marketplace to check for copies of their software being sold.[175]

173. *Compact Disc (CD)*, COMPUTER HISTORY MUSEUM, http://www.computerhistory.org/revolution/memory-storage/8/262/1089 ("The Compact Disc (CD) was developed by Sony and Philips in 1982 for distributing music. DEC worked with them to store computer data, and it became the standard distribution media for software."). At least this was the case when consumers listened to music repeatedly from the medium upon which they purchased the music. Now that many listeners immediately upload any music they buy on CD to a digital file on a computer, music CDs actually function much like software on a disk, in terms of substitutability for a new copy of the music. Even Amazon recommends purchasing a CD and "ripping" it to other sources. *See Digital Decisions: Taking Your Media Beyond the Home Stereo*, AMAZON, http://www.amazon.com/gp/feature.html?docId=1000134651 (last visited Sept. 28, 2015). *See also Rip (Copy) Songs from Your CDs to Your Computer*, MICROSOFT WINDOWS, http://windows.microsoft.com/en-us/windows-xp/help/windows-media-player/11/rip-a-cd (last visited Sept. 28, 2015) ("You can use Windows Media Player 11 to rip songs from your CDs to your computer so that they become files on your computer.").

174. For a discussion on how perfect and imperfect substitutability affect market supply and demand in monopolistic new-used pricing models, see S. J. Liebowitz, *Durability, Market Structure, and New-Used Goods Models*, 72 AM. ECON. REV. 816, 820–22 (1982). But note that some libraries, especially those associated with educational institutions, may actually lend software to borrowers for short periods of time. *See, e.g.*, *Computer Hardware and Software to Checkout*, EMORY U. CANDLER SCH. OF THEOLOGY PITTS THEOLOGICAL LIBR., http://pitts.emory.edu/borrow/circulatingtechnology.cfm (last visited Sept. 28, 2015).

175. In other countries that apply different sets of rules to software licensing, markets may exist in used software that cannot legally arise in the United States. *See, e.g.*, USEDSOFT, https://www.usedsoft.com/en/company/business-idea/ (last visited Sept. 28, 2015). Some have sought to introduce legislation in the United States that would restrict manufacturers' ability to restrict resale of software-equipped products like smartphones. *See* Jon Healey, Opinion, *New Bill Would Protect the*

Any sales of software by consumers can be assumed to be infringing because software licenses generally prohibit consumer resale of software even on the original disks and in original packaging.[176] If consumers had the right to resell their software, policing infringing copies would be much more difficult because it would be hard to tell the resold software from illegal copies.

Nowadays, when digital files are stored on hard drives and shared over the Internet, software almost always can be transferred with perfect fidelity.[177] Today, previously purchased digital programs, songs, movies, and the like can serve as perfect substitutes for purchasing these digital files directly from the producer. Accordingly, if consumers now could resell software, this would allow arbitrage at low transaction costs, thus destroying the ability of software producers to price discriminate.

In sum, copyright protection, the treatment of transfers of software as licenses rather than sales, and the consequent lack of ability to resell software have combined together to facilitate price discrimination in the sale of software. This price discrimination has allowed software companies to make profits selling to high-value business users, but still offer their software at lower prices to lower-value consumers who have wanted to purchase the software for personal, noncommercial use. This has in turn resulted in the widespread proliferation of software among consumers, which has increased consumer and total welfare. This widespread distribution of software has created a particularly computer-savvy workforce, and thus contributed to the continuing productivity increases that the United States has witnessed.[178]

Market for Used High-Tech Goods, L.A. TIMES (Sept. 22, 2014), http://www.latimes.com/opinion/opinion-la/la-ol-farenthold-bill-first-sale-digital-devices-iphone-20140919-story.html.

176. Software producers disallow resale of software even on the original disk because they do not want consumers to buy the software on a disk, install it, and then resell the software. Amazon will not allow resale of certain software, including academic versions, original equipment manufacturer (OEM) products, or backup copies, while other types, such as video games, must be marked as "open box." *See Selling Software*, AMAZON, http://www.amazon.com/gp/help/customer/display.html?nodeId=1199154 (last visited Sept. 28, 2015).

177. In actuality, of course, digital files are copied from one medium of storage to another, rather than being transferred. One can construct a protocol in which the original copy is deleted after the new copy is made, and thus mimic a transfer of the digital file, but what occurs is still copying. This was the method ReDigi used in the system that it set up for transferring iTunes songs and that was struck down in district court for copyright violation. *See* Capital Records, LLC v. ReDigi Inc., 934 F. Supp. 2d 640 (S.D.N.Y. 2013).

178. *See, e.g.*, Steve Lohr, *Study Says Computers Give Big Boosts to Productivity*, N.Y. TIMES (Mar. 13, 2007), http://www.nytimes.com/2007/03/13/technology/13tech.html; Adam M. Zaretsky, *Have Computers Made Us More Productive? A Puzzle*, REGIONAL ECONOMIST, Oct. 1998, https://www.stlouisfed.org/publications/regional-economist/october-1998/have-computers-made-us-more-productive-a-puzzle.

Software is generally characterized by very high research and development costs and very low distribution costs.[179] The software producer must make up its cost of research and production in the sales price of its software, or it will lose money and eventually go out of business. The simplest way to attempt to cover costs would be to set a single price for the software, and then hope to sell enough copies to make up the costs of production and a return on investment. But software producers generally can sell more products and increase profits if they engage in price discrimination in setting prices for software distribution. An extended example using the Microsoft Office suite of software products will help to illustrate this point.

Microsoft's Office software is the dominant software for the creation of documents, spreadsheets, and audiovisual presentations.[180] Microsoft's costs to develop, test, produce, maintain, update, advertise, and sell its Office suite of software are, of course, substantial.[181] To achieve any return on its investment, Microsoft must make up all of these costs in the sales of its Office software. A simplistic way for Microsoft to choose a price to cover its costs would be for the company to try to predict the number of copies of Office for which people will pay, and to divide its total costs by that number. It could then add an extra charge to each sale to ensure that it made profits and thus got a return for its investors. This would be pricing based on Average Total Cost.[182]

But Microsoft does not just want to make up its costs and a small profit. The company wants to earn as much profit as it can on its highly demanded software. So Microsoft will not simply divide up its costs over its projected sales and then add on a profit. Instead, if Microsoft has market power, it will choose a price well above cost so as to maximize profits. This price may be a little above competitive level, or it may be at or near monopoly price, depending on the market power Microsoft has in its Office software suite. Although this can be represented graphically and

179. *See* Joseph P. Liu, *Owning Digital Copies: Copyright Law and the Incidents of Copy Ownership*, 42 WM. & MARY L. REV. 1245, 1350 (2001).

180. People often refer to slideshows simply as "powerpoint presentations," which shows how ubiquitous Microsoft's presentation software has become.

181. According to Microsoft's 2013 Annual Report, "[d]uring fiscal years 2013, 2012, and 2011, research and development expense was $10.4 billion, $9.8 billion, and $9.0 billion, respectively." *Microsoft Annual Report* 2013, MICROSOFT, http://www.microsoft.com/investor/reports/ar13/financial-review/business-description/research-development/index.html. While the report does not indicate exactly how much was spent on the development of Office, it is safe to assume that a significant portion of the R&D budget was used to create and improve this core product.

182. For a definition of average total cost and an explanation of its use in calculating economic profit at loss, see AUSTIN FRAKT & MIKE PIPER, MICROECONOMICS MADE SIMPLE 61–62, 68–70 (2014).

mathematically,[183] basically what a monopolist does when it sets a monopoly price is to make the price high enough that each sale is very profitable, but not so high as to drive away enough buyers that the high price becomes self-defeating. Put in economic terms, a monopolist sets prices at the level at which further increasing the price would lead to lower profits because too few sales would occur, but decreasing the price to sell more units would also decrease profitability because the increase in unit sales would not be great enough to make up for the revenue loss from decreasing the price.[184] In the case of a software seller like Microsoft, if it had to set a single price for its software, it might find that its profits were maximized at a relatively high price that only businesses and consumers who greatly value the software could afford. If Microsoft set a single high price, then many consumers would never get to buy and use the software for personal use. It is in Microsoft's interest, however, to sell to these consumers who value the software at less than a single profit-maximizing price. If Microsoft could somehow sell to these consumers for a lower price that is still above cost without disrupting its high-price sales to the business community, then the company would do so because it would make more profits. And, indeed, this is exactly what Microsoft and other software distributors do.

Software producers employed price discrimination from early on in the distribution of software. Software is particularly suited to price discrimination because software is an example of a good with large investment and development costs but a marginal cost of distribution that approaches zero.[185] Especially now that a great deal of software is distributed via downloads, the cost of distributing an additional copy of a program is basically a fraction of the cost of maintaining the sales web interface, the price of the servers hosting the program, and the cost of accounting for the sale. Because the marginal cost of distribution is so low for software, if a software producer can sell extra copies of its program for anywhere much above zero without cannibalizing sales at a higher price point, the producer has every motive to do so. Microsoft historically has applied some rough price discrimination in selling Office. The company traditionally has charged more to business users, while including some

183. *See, e.g.*, Cohen, *supra* note 117, at 1804 (illustrating economic effects of price discrimination); Fisher, *supra* note 100, at 23–24 (displaying graphically two monopolistic pricing scenarios, one allowing price discrimination while the other does not); Lunney, *supra* note 100, at 409–14 (explaining at length, using both mathematical formulae and graphical representations, two price discrimination models).

184. To be exact, a monopolist stops decreasing prices just before the point at which marginal cost would exceed marginal revenue.

185. *See* Liu, *supra* note 179.

extra functionality with the software.[186] Microsoft has also offered various options to large businesses, like allowing all of the business's employees to use the software for a fixed price, or charging "seat" licenses, i.e., fees per employee using the software.[187] Microsoft generally has sold a less robust version of its Office suite to individual consumers for a lower price point.[188] The company has also offered educational versions of its software, which are basically the same as the home version, but are sold at a still lower price point.[189] Microsoft has used these methods of price discrimination as a means of engaging in rough-cut second- and third-degree price discrimination.

Microsoft knew that business owners were likely to value its software more because the software can be an important input to a business's productivity. Thus, Microsoft wanted to sell to those customers at a higher price. The company was also aware that individual consumers want to use the same software that most of the country uses and with which they are likely already familiar from work or school.[190] At the same time, Microsoft realized that many individual consumers are not willing to pay the same rate as businesses. Individual consumers typically do not value productivity software as much for their personal use as a business enterprise values it for business use. Microsoft was probably aware that if the price became too high for home consumers, they likely would substitute with some other software that may seem inferior, but that they would prefer to a high-priced Microsoft Office. Other home consumers might simply forgo having this type of software at all if the Microsoft price was too high and there were no acceptable substitutes.

While Microsoft traditionally distributed and sold its software using the price discrimination methods just described, times have changed, and so has the way that software is developed, released, and regularly updated. The relationship between software producers and consumers has shifted from one of software producers providing software products on a one-time basis to consumers to one of software producers entering ongoing

186. *Compare Office 365 Business Plans*, MICROSOFT OFFICE, https://products.office.com/en-us/business/compare-office-365-for-business-plans (last visited Sept. 28, 2015).

187. *Compare All Office 365 for Business Plans*, MICROSOFT OFFICE, https://products.office.com/en-us/business/compare-more-office-365-for-business-plans (last visited Sept. 28, 2015).

188. *Buy Office 365 Personal*, MICROSOFT OFFICE, https://products.office.com/en-us/office-365-personal (last visited Sept. 28, 2015).

189. *Office 365 Education Plan*, MICROSOFT OFFICE, https://products.office.com/en-us/academic/compare-office-365-education-plans (last visited Sept. 28, 2015).

190. *See, e.g.*, MICHAEL B. BECRAFT, BILL GATES: A BIOGRAPHY 70 (2014) ("Microsoft helped secure the company's own success through path dependence . . . . If commercial and home users become exceptionally comfortable with Windows and Microsoft Office, there becomes little incentive to change to a different operating system and application.").

relationships with consumers in which they provide continually changing software and service. From productivity software to software for games and entertainment, the norm has shifted from one-time transactions to ongoing relationships, pursuant to which the consumer expects, and regularly receives, bug fixes, security patches, and updates that improve the performance of the software. Software applications ("apps") for smartphones provide a prime example. When a consumer downloads an app for a smartphone, she expects that as she upgrades her operating system software on her phone, the app developers will keep pace and release updates to ensure that the app works well on multiple versions of the operating system software.[191] The relationship between the software manufacturer and the consumer has changed from that of a seller and a purchaser to that of an ongoing service relationship between a software producer and a user. Depending on the software and the relationship, there will be different financial transactions during the course of the relationship—no longer does the relationship look like that of a one-time sale. Accordingly, not only does the legal classification of license facilitate price discrimination in software distribution, it is now also the classification most factually accurate in describing the relationship.[192]

The change in the relationship between software producers and consumers to one of ongoing service also gives software producers an opportunity that they never had previously. Because of the regular contact between producers and consumers, producers now have the opportunity to monitor very closely who uses software and how they use it. It is well known that Internet users are closely monitored in their use of the Internet.[193] Companies gather and collate extensive data on people's personal characteristics, interests, Internet surfing, online purchasing, and social media posts and usage.[194] Increasingly, data aggregators tie this information about people's online lives to information gathered from other companies, including mail-order or brick-and-mortar purchases, magazine subscriptions, demographic data, real-estate records, income data, and

191. *See, e.g.*, *Old Versions of Windows, Mac, and Linux Software, Apps & Abandonware Games*, OLDVERSION.COM, http://www.oldversion.com (last visited Sept. 28, 2015) (making available older versions of software).

192. Nor is it important whether a consumer pays a single time to enter this license relationship. Some have argued that the sale versus license determination should be based on whether payments are ongoing, but this reifies superficial financing choices above the actual characteristics of the ongoing services being provided. For a discussion of this topic, see Perzanowski & Schultz, *supra* note 72, at 1255–60 (2014).

193. *See generally* Lauren E. Willis, *Why Not Privacy by Default?*, 29 BERKELEY TECH. L.J. 61 (2014).

194. *See* Michael Mattioli, *Disclosing Big Data*, 99 MINN. L. REV. 535 (2014) (describing these techniques).

voting registration and habits.[195] "Big data" is widely hailed as the future of advertising, loyalty programs, fundraising, and get-out-the-vote efforts.[196] There is a robust discussion of whether this data collection and aggregation is a good thing.[197] For purposes of this Article, we assume that these practices are already prevalent and will only increase in the future.

Just because software producers can monitor consumers in myriad ways does not mean that they will. An active and vigilant constituency watches for perceived excessive data gathering and invasions of consumer privacy.[198] There are regular announcements and news stories about companies revising their monitoring of consumers and their terms and conditions of use agreements in the face of public criticism of data-gathering practices. Thus, while it becomes ever easier to monitor users, some types of monitoring will likely be avoided because of the "creepy factor" and probable consumer backlash thereto.[199] It is especially objectionable to privacy advocates and many consumers when data is gathered on consumers and not anonymized.[200]

C. The Costs and Benefits of Enabling More Perfect Price Discrimination for Software

The evolution in the relationship between software producers and users, increased ability to monitor users, and very low marginal cost of distributing software are making more fine-tuned price discrimination

195. *See id.*

196. *See, e.g.*, Jane Yakowitz, *Tragedy of the Data Commons*, 25 HARV. J.L. & TECH. 1 (2011) (arguing in favor of some of the uses of big data).

197. *See, e.g.*, JOHN PALFREY & URS GASSER, BORN DIGITAL: UNDERSTANDING THE FIRST GENERATION OF DIGITAL NATIVES 79 (2008); David Grey & Danielle Citron, *The Right to Quantitative Privacy*, 98 MINN. L. REV. 62 (2013) (discussing the implications that data collection and aggregation have on the Fourth Amendment); Andrew J. McClurg, *A Thousand Words Are Worth a Picture: A Privacy Tort Response to Consumer Data Profiling*, 98 NW. U. L. REV. 63 (2003) (arguing that tort law should be used to address the privacy threat from consumer data profiling).

198. One of these organizations is the Electronic Privacy Information Center (EPIC). *See* ELECTRONIC PRIVACY INFORMATION CENTER, https://www.epic.org (last visited Sept. 28, 2015).

199. *See, e.g.*, Jeremy Bailenson, *Your Kinect Is Watching You*, SLATE (Mar. 7, 2012, 6:40 AM), http://www.slate.com/articles/technology/gaming/2012/03/kinect_research_the_amazing_disturbing_things_your_gaming_console_can_learn_about_you_.html (describing the risks of having a game console watch its users); Benjy Sarlin, *Microsoft Backtracks on Xbox One Camera Amid Spying Fears*, MSNBC (Sept. 13, 2013, 8:47 AM), http://www.msnbc.com/hardball/microsoft-backtracks-xbox-one-camera-amid ("Microsoft will no longer require users of its upcoming Xbox One game console to attach its advanced camera, Kinect, in order to play. The move comes after gamers expressed concern that the device . . . could facilitate spying by the National Security Agency or hackers.").

200. "Anonymizing" in the industry refers to steps taken so that data on consumers can be reviewed and parsed without the data being identifiable with a particular consumer by name. Among the ways that data can be anonymized are by aggregating it, by stripping out names and other personally identifying information, or by substituting pseudonyms for actual identifying information. *See* Yakowitz, *supra* note 196, at 44–47 (describing methods for anonymization).

possible, and will continue to do so in the future, as software producers increasingly know more about the preferences of their users and have many contacts with them that can facilitate differential pricing.

In the future, software companies will progressively know more about the users of their software. This information will let producers make better guesses about users' willingness to pay. Combining restrictive software licenses with the increased ability to monitor the use of software will allow software producers to engage in increasingly precise price discrimination. Put plainly, software producers can license software to be used on only a single machine, or only by a single person, and with conditions such as no commercial use. Producers will be able to monitor that the users follow the conditions by having the software report back to the producer. Generally, software producers will not use the most pervasive monitoring available to them because the public backlash would be costly.[201] But software producers will increasingly be able to monitor for usage of the software relevant to the producers' purposes while not invading users' privacy to the point of a damaging outcry.

Software producers have already begun to refine their price discrimination and user monitoring. A look at Microsoft and Google provides examples. In June of 2011, Microsoft launched an online-based subscription service called Office 365.[202] The service offers access, typically paid for on an annual subscription basis, to its most popular Office Suite programs including Word, Excel, PowerPoint, Publisher, and OneNote.[203] The subscriptions also offer free data storage on Microsoft's cloud-based server, OneDrive.[204] There are a variety of plans available, based primarily on the number of users and devices that have access.

Microsoft uses Office 365 as a way to price discriminate amongst various users. Office 365 Personal allows only one user to use the program on one computer, tablet, and phone for $69.99 per year.[205] The user is also

201. Lee Rainie & Janna Anderson, *The Future of Privacy: Elaborations: More Expert Responses*, PEW RES. CTR. (Dec. 18, 2014), http://www.pewinternet.org/2014/12/18/elaborations-more-expert-responses-4/ (Laural Papworth: "Products that damage fidelity will be destroyed by mass word-of-mouth media before they get too far. Rights will be managed, not because of any ethical behavior, but because not to will be bad for business.").

202. *Microsoft Launches Office 365 Globally*, MICROSOFT NEWS CTR. (June 28, 2011), http://news.microsoft.com/2011/06/28/microsoft-launches-office-365-globally/.

203. For a list of programs offered in the subscription plans, see, for example, *Buy Office 365 Home*, MICROSOFT STORE, http://www.microsoftstore.com/store/msusa/en_US/pdp/Office-365-Home/productID.286395000 (last visited Sept. 28, 2015).

204. *Id.*

205. *Buy Microsoft Office 365 Personal*, MICROSOFT STORE, http://www.microsoftstore.com/store/msusa/en_US/pdp/Office-365-Personal/productID.297833200 (last visited Sept. 28, 2015). *See also Microsoft License Terms*, MICROSOFT, http://www.microsoft.com/en-us/UseTerms (last visited Sept. 28, 2015) [hereinafter "*Office EULA*"].

granted one terabyte (1 TB) of storage on OneDrive.[206] Office 365 Home is offered for only $30 more annually than Personal.[207] Home allows up to 5 users to use the software across five computers, tablets, and phones for $99.99 per month.[208] The significant discount for use by an entire family makes sense, given that most people are probably unwilling to pay $69.99 for each child to use Office, but they are willing to pay an additional $30 per year to enable their family to use Office. Microsoft also discounts for students and educators by offering Office 365 for only $79.99 for four years to people in these groups.[209] Again, this discounting makes sense assuming that students and teachers are not willing to pay nearly as much, on average, for Office, but consider it worth at least $20 per year. And ensuring that students are familiar and comfortable with Office can drive sales of the full-price licenses when those students graduate and are in the market for full-priced software.

Microsoft also offers at least five types of licenses for Office 365 for business users, ranging from $5 per user per month to $20 per user per month, depending on the level of functionality and number of users.[210] Along with the Office suite of software, and depending on their subscription type, both home and business users get cloud storage of documents, frequent updates, and a number of other services like email, calendaring, and video conferencing.[211] Microsoft's subscription service lets Microsoft easily keep in touch with where and how its software is being used. If a user does not connect Office 365 to the Internet regularly, the software functionality is downgraded to only very basic features.[212] This allows Microsoft to ensure that the software checks in regularly, at which point Microsoft can catch instances of multiple copies of the software being used or other violations of its terms of service. All of this

206. *Buy Microsoft Office 365 Personal*, *supra* note 205.

207. *Buy Microsoft Office 365 Home*, MICROSOFT STORE, http://www.microsoftstore.com/store/msusa/en_US/pdp/Office-365-Home/productID.286395000 (last visited Sept. 28, 2015).

208. *Id.*

209. *Buy Microsoft Office 365 University*, MICROSOFT STORE, http://www.microsoftstore.com/store/msusa/en_US/pdp/Office-365-University/productID.275549300 (last visited Sept. 28, 2015). University grants a license for four years, with one opportunity to renew at the end of the third year, for another four years. *Id.* The license is good for up to two PCs or tablets and one phone, and also includes 60 minutes of Skype time for making Voice over Internet Protocol (VoIP) calls on the Skype platform. *Id.*; *see also Office EULA*, *supra* note 205.

210. *Compare All Office 365 for Business Plans*, *supra* note 187.

211. *Id.*

212. *See* Susan Harkins, *10+ Things You Should Know Before Buying Office 365*, TECHREPUBLIC (Nov. 26, 2013, 11:04 AM), http://www.techrepublic.com/blog/10-things/10-things-you-should-know-before-buying-office-365/ (describing the need to connect to the Internet for full functionality).

allows Microsoft greater flexibility to price discriminate and greater ability to monitor use of its software.

Google Drive offers similar online storage plans for both personal and business use,[213] and several apps that are compatible with the Microsoft Office Suite.[214] For example, Google Docs is a word-processing program—similar to Word—which will convert Word files into Docs files, and Docs files can be converted into Word files.[215] Google has other programs available as well, such as Sheets (a substitute for Excel) and Slides (a substitute for PowerPoint).[216] Yet the file conversion process can, and often does, alter formatting and fonts, especially in the instance of proprietary fonts.[217] Apple similarly uses Pages, Sheets, and KeyNote to convert Word, Excel, and PowerPoint respectively, each of which experiences similar conversion issues.[218] Apple's productivity software acts as a substitute for Microsoft's software, and thus helps to constrain pricing for the Office suite and Office 365. Google's much more basic productivity programs are inferior substitutes[219] but still apply some pricing pressure.[220]

213. *Using Google Drive*, GOOGLE DRIVE, https://www.google.com/drive/using-drive/ (last visited Sept. 28, 2015).

214. *See, e.g.*, *Google Docs*, GOOGLE, http://www.google.com/docs/about/ (last visited Sept. 28, 2015); *Google Sheets*, GOOGLE, http://www.google.com/sheets/about/ (last visited Sept. 28, 2015); *Google Slides*, GOOGLE, http://www.google.com/slides/about/ (last visited Sept. 28, 2015).

215. *Google Docs*, *supra* note 214.

216. *Google Sheets*, *supra* note 214; *Google Slides*, *supra* note 214.

217. The Microsoft Office EULA limits the use of certain fonts. *See, e.g.*, *Office EULA*, *supra* note 205 ("While the software is running, you may use its fonts to display and print content. You may temporarily download the fonts to a printer or other output device to print content, and you may embed fonts in content only as permitted by the embedding restrictions in the fonts."). Examples of restricted fonts that are available in Word but not Google Docs are Calibri and Cambria; examples of fonts available in Docs but not Word are Sigmar One and Just Me Again Down Here. *See id.*

218. John Rizzo, *iWork and Office: Can They Work Together?*, MACWORLD (June 12, 2008, 12:00 PM), http://www.macworld.com/article/1133922/iworkoffice.html (describing some of the conversion issues).

219. Google's programs treat standard Microsoft features as functionality add-ons, such as a thesaurus, label creators, highlighting, and clip art. *Overview of Add-Ons*, GOOGLE, https://support.google.com/docs/answer/3641454?hl=en (last visited Sept. 28, 2015). Google states that its intention in providing bare-bones productivity programs is to increase speed, but many users who have become accustomed to standard Word features become frustrated by the need to activate and install an add-on for what they perceive to be basic functions. *See* Will Kelly, *5 Apps That Help Microsoft Office and Google Apps Play Nice Together*, LIFEHACK, http://www.lifehack.org/articles/technology/5-apps-that-help-microsoft-office-and-google-apps-play-nice-together.html (last visited Sept. 28, 2015) (acknowledging that Docs and Word are not always easily compatible); Ian Paul & Matt Egan, *Top 12 Google Docs Tips: Fix Google Docs Annoyances—How Your Business Can Get More from Google Docs*, TECHWORLD (Aug. 3, 2015), http://www.techworld.com/tutorial/apps/top-12-google-docs-annoyances-how-fix-them-3343873/ (addressing common complaints about Google Docs being "infuriating, incomplete, and limited").

220. Google makes money from consumers who use its programs by data mining and selling advertising, rather than by charging consumers directly. *See* Ryan Singel, *How Does Google Make the Big Bucks? An Infographic Answer*, WIRED MAG. (July 19, 2011, 10:44 AM), http://www.wired.com/2011/07/google-revenue-sources/. For a general discussion of how some forms of price discrimination

As computing increasingly moves to the cloud, these opportunities to price discriminate and monitor increasingly will be available to software producers. The evolution of cloud computing and pervasive monitoring will greatly increase the ability of software producers to price discriminate. Take Microsoft's Office 365 Home subscription, which is designed to allow families to use the software at a discount price per person. If five unrelated working adults decided to share the subscription, they would be taking advantage of a discount that Microsoft did not intend to offer, and that is not as profitable to Microsoft. With better monitoring abilities, Microsoft can specify in its terms of service that the home edition is only for members of a single household, or single family, and then be able to monitor compliance with those terms. This will allow Microsoft to fine tune its price discrimination strategy.

But this is only the beginning. With increased monitoring ability, Microsoft can begin to price discriminate with ever-greater particularity. For instance, rather than offering a Home subscription for up to five users, Microsoft could price differently for each additional user and could further discriminate based on the age of the user. Based on monitoring usage, software producers will be able to know just who is using their software, and how much. This will enable producers to prevent users from evading price discrimination—e.g., the hypothetical five working adults would be prevented from sharing a Microsoft Office 365 Home subscription. But it will also allow software producers to offer really low prices to specific users. For instance, a single parent with a ten-year-old child may not think it worth paying the extra $30 per year for an Office 365 Home license. But that parent might think it worth $5 per year to have the license allowing a second account and installation on the child's computer or tablet. If Microsoft can adequately ensure that only the ten-year-old will use such an account, then it is in Microsoft's interest to offer such a license. The same goes for licenses of software to the elderly, to casual users, and to poorer users.

Producers will be able to further refine their price discrimination via cloud computing because they will be able to gather an even greater wealth of data as to the use of their software.[221] It will become increasingly easy for software producers to tell who is using their software a lot and who is using it only a little. If a person who only rarely uses the software declines

drive customers toward alternative forms of software, see Peter Sheldon, *Losing Customers with Price Discrimination?*, GETELASTIC ECOMMERCE BLOG (Sept. 3, 2010), http://www.getelastic.com/customer-retention/.

221. *See generally* Jay P. Kesan et al., *Information Privacy and Data Control in Cloud Computing: Consumers, Privacy Preferences, and Market Efficiency*, 70 WASH. & LEE L. REV. 341 (2013).

to renew a subscription, then the producer may choose to make a special discount offer to that user, realizing that the user has a low reservation price.[222] Likewise, the producer would like to charge the "power user" more and will seek ways of doing so. Because simply charging one person more than another without offering anything extra often provokes bad will, the producers will come up with clever strategies to seem to offer more such as to raise prices. For instance, if via careful monitoring of its users, a software producer realizes that power users of its software tend to regularly use macros, and others do not, the producer may allow macro functionality only with more expensive licenses to the software. This is just one example. A significant proportion of the mobile apps industry relies on similar principles, from different degrees of functionality in Microsoft Office for iPad[223] to the multitudinous ways in which software products such as games rely on the possibility of in-app purchases.[224] Many other techniques will be developed to further refine price discrimination.

In general, finer-grained price discrimination will decrease the consumer surplus of high-value software users. Put plainly, those willing to pay more will be made to pay more, and thus will be less well off than they would be absent price discrimination. This does not, however, reduce total welfare—it is merely a transfer from consumer to producer.[225] But because marginal costs of software distribution are so low, users who value software less—especially poor users—will be offered the software at prices

222. In some ways, this will be similar to the way that real-time data collection on gamblers has revolutionized the casino industry. This began when Harrah's Casino hired a Harvard Business School professor as a consultant and eventually as CEO. He adopted the use of data analytics to track clients and determine things like when a gambler was likely to give up and leave. By doing things like approaching such a gambler with an offer of complimentary goods, services, or chips, Harrah's was able to significantly increase time in the casino and money spent per gambler. *See* Gary W. Loveman, *Diamonds in the Data Mine*, HARV. BUS. REV., May 2003, https://hbr.org/2003/05/diamonds-in-the-data-mine/ar/1 (describing the model).

223. Karen Haslam, *How to Get Word, Excel and PowerPoint on Your iPad or iPhone*, MACWORLD, Mar. 2, 2015, http://www.macworld.co.uk/how-to/iosapps/how-get-microsoft-office-word-excel-powerpoint-iphone-ipad-ios-3452845/ (mentioning how a subscription to Office 365 will unlock features such as "advanced change tracking features, no limits on the ways you can use paragraph styles, and advanced chart, table, and picture formatting tools. And if you're planning on using OneDrive for business documents, you will be required to purchase an Office 365 account.").

224. *See generally* ERIC BENJAMIN SEUFERT, FREEMIUM ECONOMICS: LEVERAGING ANALYTICS AND USER SEGMENTATION TO DRIVE REVENUE (THE SAVVY MANAGER'S GUIDES) (2014).

225. How one feels about this may depend on how one feels about consumers or producers having more surplus after a transaction, and it may especially depend on who the particular producers and consumers are. If the producers are large corporations with record profits and the consumers whose surplus is being taken are poor widows and orphans, this seems distasteful in the least. On the other hand, if the consumers are wealthy trust-fund beneficiaries, and the producers are artisans from an impoverished shantytown, one might be happy to see additional surplus transferred from consumers to producers. The point is that transfers of surplus are not automatically good or bad. So long as the market operates efficiently, and allocative efficiency is not decreased, the total welfare of a society is not hurt by such transfers.

they can afford. This will be of great benefit to these lower-value, and often poorer, software users.[226] In addition, the more fine-grained a monopolist's price discrimination, the better the chances that total welfare will increase. If a monopolist can engage in fine-grained price discrimination approaching perfect price discrimination, then total welfare is increased, and welfare for all consumers who are willing to pay a price below market price but above cost is increased. In this case, the producer transfers almost all consumer surplus to itself. But all of those consumers who previously could not buy the product are better off, and allocative efficiency is increased.

Not all software products have significant market power, however. Indeed, even with copyright and patent protection, some software has close enough substitutes that the market is quite competitive.[227] Because the marginal cost of distributing software approaches zero, even in somewhat competitive software markets, allowing near-perfect price discrimination will increase total welfare. In competitive markets, in the long run, all producers sell at cost, and thus all consumers are offered competitive prices.[228] Producers, however, may at times sell at prices above variable cost, but below total cost.[229] This may happen, for instance, when a bumper crop makes the price of wheat drop below the total cost to produce it, but above the variable cost to harvest the wheat from the field. In this case, harvesting and selling the wheat does not make a profit for the farmer, but it does reduce his losses.[230] Further, a producer should be willing to sell an additional unit at any price down to the level of marginal cost, so long as those low-price sales do not undermine the ability of the producer in the long run to sell at a price high enough to cover total costs. For goods with extremely low marginal costs, like software, producers could profitably license their software to some consumers at prices approaching zero, so long as those low-price offers did not undermine licensing to many consumers at the higher prices necessary to cover total cost.

It is not only low-value users in the United States who benefit from perfect price discrimination; rather, many people in the developing world would also be able to purchase desired software for the first time. If software producers could prevent reselling of software they provided to

226. For a discussion of how price discrimination can benefit the poor, see, for example, Fisher, *supra* note 100.

227. *See, e.g.*, Debabrata Dey et al., *Quality Competition and Market Segmentation in the Security Software Market* 38 MIS Q. 589, 591 (2014) ("[M]ost vendors offer nearly identical products, despite being in a severely competitive market.").

228. *See* MANKIW, *supra* note 104, at 314.

229. *See* Brooke Grp. Ltd. v. Brown & Williamson Tobacco Corp., 509 U.S. 209, 217, 248–49 (1993).

230. ROGER A. ARNOLD, ECONOMICS 501–02 (10th ed. 2010).

hospitals, libraries, schools, orphanages, and nonprofit companies in the developing world, software producers would have an incentive to offer their products at very low prices to organizations and people in impoverished communities. Medical monitoring programs could be licensed to health organizations in poor communities to enable better medical care. Sophisticated software used by professional architects, engineers, and computer scientists could be licensed for very low rates to certain schools and students unable to pay much. These are but a few examples of how enabling increasingly perfect price discrimination can benefit people who otherwise will never be able to afford software at unitary market pricing.[231]

In sum, facilitating increasingly perfect software price discrimination is a way to ensure more widespread distribution of software to greater numbers of users who value the software above marginal cost, but below market price. Under a system of near-perfect price discrimination and monitoring, virtually everyone who values software at a price above zero should be able to get that software.

IV. SOFTWARE LICENSING AND THE INTERNET OF THINGS

In the near future, household appliances, automobiles, toys, and consumer products increasingly will be computerized and will communicate via the Internet with other computers and devices.[232] The interconnection and intercommunication of these devices is only expected to accelerate in the coming years.[233] A number of commentators have argued that unless we act quickly, a dystopian future is bearing down on us as the reality of the "Internet of Things" draws nearer.[234] Christina Mulligan has stated recently that as software becomes increasingly present in consumer goods, manufacturers will include restrictive software licenses in sales of their products, which licenses will limit what consumers can do

231. Note that geographic price discrimination can be carried out via software licensing, whereas the Supreme Court has ruled that it cannot be accomplished through the 17 U.S.C. § 106 importation right for copyrighted products lawfully sold overseas, because the first sale doctrine trumps the importation right in that circumstance. Kirtsaeng v. John Wiley & Sons, Inc., 133 S. Ct. 1351, 1355–56 (2013).

232. In many ways, of course, that future is now. Numerous consumer products and appliances are already communicating via the Internet, including thermostats, appliances, security systems, baby monitors, utility meters, bathroom scales, coffee pots, DVRs, lighting systems, door locks, heat and air conditioning systems, cars, etc. *See* Peppet, *supra* note 6, at 109.

233. *See id.* at 89.

234. *See* Rainie & Anderson, *supra* note 201 ("The situation will worsen as the Internet of Things arises and people's homes, workplaces, and the objects around them will 'tattle' on them. The incentives for businesses to monetize people's data and governments to monitor behavior are extremely potent.").

with the goods themselves.[235] Her argument is that companies will utilize licenses to the software contained in devices to drastically restrict both the uses of the devices and the resale or transfer of devices.[236] Accordingly, she and others argue, lawmakers and the courts should consider preventing the use of idiosyncratic copyright software licenses.[237]

We believe that these commentators' fears are misplaced, and that to the extent producers use licensing provisions to constrain the use of their devices, for the most part market realities will force such restrictions to be limited to when they can provide welfare enhancement. We agree that *some* companies will attach restrictive licensing terms to the products they sell as a way to constrain consumer resale and facilitate price discrimination. But for reasons we will explain, generally it simply will not be in companies' interests to hamper consumers' uses of goods.[238] Most often, if companies restrict consumer devices in ways that make them less valuable to consumers, then consumers will not be willing to pay as much for the devices, and companies' profits will suffer.[239]

Price discrimination when it comes to consumer goods and appliances can prove beneficial for total welfare and for poorer consumers for the reasons set forth above in our discussion of software price discrimination. Although the marginal cost of consumer goods and appliances is much higher than that of software, many of these goods may still be able to be sold at a lower price point if price discrimination is practiced. Likewise, software licenses tied to consumer products can facilitate a range of price-discrimination techniques that enhance metering of use and therefore benefit low-volume users.

Those worried about the exploitation of software licenses to restrict consumers' uses of the devices make the following arguments. First, given that courts treat software transfers from producers to consumers as licensing transactions rather than sales, producers can attach many conditions and restrictions on these transfers, and can use licensing to escape the first sale doctrine. Second, producers will include license agreements to the software contained in Internet of Things devices. Third, producers will make these licenses very restrictive. They will restrict the ability of consumers to transfer or resell the devices. They will restrict

235. *See* Mulligan, *supra* note 38, at 44–46.

236. *See id.* at 42–43.

237. *Id*. at 42–44, 57.

238. Manufacturers will, of course, continue to include customary restrictions and warnings related to warranties and safety.

239. CHARLES WHEELAN, NAKED ECONOMICS: UNDRESSING THE DISMAL SCIENCE 11–13 (2002) (discussing the idea that companies are constantly trying to maximize profits and to do that they need to produce things that add value to the consumer so that she will be willing to pay higher prices).

commercial use of the devices by consumers who bought for personal use. They will restrict modification of the devices. They will restrict purchasing parts or service for the devices from sources other than the producers. They will restrict the ability of their devices to interoperate with devices from other manufacturers. They will restrict the right to comment negatively on the devices. Fourth, they will scrupulously enforce these restrictive licensing agreements.[240]

Why will device producers place all of these restrictions in software licenses? The answer of those raising the alarm seems to be simply because they can.[241] Those worried about software license misuse in regards to the Internet of Things assume that manufacturers will always want to be as restrictive as possible by default. This assumption lacks foundation. In this Part, we show that much of the time, it is not advantageous to producers to place onerous restrictions on the use of their devices. Market pressures for the most part will limit the use of restrictive licenses to situations in which they are likely to facilitate price discrimination that will both enable lower-value users to buy the products and enhance total welfare, if done properly.

Notwithstanding certain parades of horribles offered by some commentators, most producers will not utilize software licensing to restrict use of their products.[242] The reason is that it would cost producers money to do so. A consumer values a product according to the total value of the uses he can make of it.[243] If a producer narrows the use of its goods, then to the extent consumers value those restricted uses, they will be willing to pay less, and sales will be hurt. A producer will only limit use in cases in which it can make up the net present value of the decline in sales and prices caused by its use restrictions. Thus, for the most part, a producer will not impose limitations.[244]

240. See the discussion of restrictions in car software licenses in note 244, *infra.*

241. *See infra* text accompanying note 244.

242. Of course such manufacturers will continue to have license requirements for the warranty to be honored, and they will try to restrict misuse of the product that may result in tort liability, but these restrictions and warnings are independent of the rights given to software producers to restrict use via licenses to the copyrights for software contained in devices.

243. This includes aesthetic use, when applicable.

244. Take, for instance, the market for consumer cars. If a car manufacturer restricted the ability of consumers to let others drive, resell, modify, or independently service the car, consumers would find the car less valuable, and therefore would not be willing to pay as much for it. In addition, competitors could compete by selling cars without these restrictions and win business from consumers who do not like the restrictions. This will serve to discipline any manufacturer who seeks to restrict use of its products without good reason. The debate has recently heated up about the status of cars in the Internet of Things, with some car manufacturers seeking to restrict consumers from repairing and modifying their vehicles. *See* Lily Hay Newman, *Who Owns the Software in the Car You Bought?*, SLATE (May 22, 2015, 2:37 PM), http://www.slate.com/blogs/future_tense/2015/05/22/gm_and_john_deere_say_they_still_own_the_software_in_cars_customers_buy.html. Car manufacturers cite safety and regulatory concerns about doing otherwise. *See* Pete Bigelow, *Automakers to Gearheads: Stop*

On the other hand, producers can use restraints arising from software licenses in a number of beneficial ways. Producers may restrict use to achieve selling fractional rights to products, metering of use,[245] financing of purchases, risk sharing, and price discrimination. A producer can use software license restraints to facilitate selling fractions of a durable good. One example of this is car leases. A car lease allows the lessee to purchase the right to use a car for a prescribed period of time, often three years.[246] At the end of that time, the lessee simply returns the car to the lessor, and the lessor takes on the cost of reselling the car to get the rest of the value from it. Thus, the car seller utilizes leases, complete with their restriction of ownership to a prescribed amount of time and mileage, to sell to consumers who want to drive new cars but cannot afford to buy them outright. The buyer gets to drive a new car with certain restrictions, and the seller gets to sell part of the rights to the car (the right to use it for a set period of time

Repairing Cars, AUTOBLOG (Apr. 20, 2015, 10:31 AM), http://www.autoblog.com/2015/04/20/automakers-gearheads-car-repairs/. Some critical voices have called for changes to the DMCA to mandate greater consumer control. *See* Kit Walsh, *Automakers Say You Don't Really Own Your Car*, ELECTRONIC FRONTIER FOUNDATION (Apr. 3, 2015), https://www.eff.org/deeplinks/2015/04/automakers-say-you-dont-really-own-your-car; Kyle Wiens, *We Can't Let John Deere Destroy the Very Idea of Ownership*, WIRED MAG. (Apr. 21, 2015, 9:00 AM), http://www.wired.com/2015/04/dmca-ownership-john-deere/. One scholar has argued that manufacturers' greater control over products post-sale may increase their legal liability in some settings. *See* Bryant Walker Smith, *Proximity-Driven Liability*, 102 GEO. L.J. 1777 (2014). This point has received attention lately in the context of white hat hackers using security flaws to control cars remotely. *See* Andy Greenberg, *Hackers Remotely Kill a Jeep on the Highway—With Me in It*, WIRED MAG. (July 21, 2015, 6:00 AM), http://www.wired.com/2015/07/hackers-remotely-kill-jeep-highway/; Nicole Perlroth, *Security Researchers Find a Way to Hack Cars*, N.Y. TIMES BITS (July 21, 2015, 2:32 PM), http://bits.blogs.nytimes.com/2015/07/21/security-researchers-find-a-way-to-hack-cars/?_r=0. One recent major story that has highlighted the question of consumers' relationship with car software involves Volkswagen's cheating on emissions tests via car software. *See* Alex Davies, *The EPA Opposes Rules that Could've Exposed VW's Cheating*, WIRED, Sept. 18, 2015, http://www.wired.com/2015/09/epa-opposes-rules-couldve-exposed-vws-cheating/; Jim Dwyer, *Volkswagen's Diesel Fraud Makes Critic of Secret Code a Prophet*, N.Y. TIMES, Sept. 22, 2015, http://www.nytimes.com/2015/09/23/nyregion/volkswagens-diesel-fraud-makes-critic-of-secret-code-a-prophet.html?_r=0; Andrew Morriss, Letter to the Editor, *What VW Knew*, ECONOMIST, Oct. 10, 2015, http://www.economist.com/news/letters/21672008-letters-editor; Tim Fernholz, *Draconian US Copyright Rules Made It Easier for Volkswagen to Cheat*, QUARTZ, Sept. 23, 2015, http://qz.com/509418/draconian-us-copyright-rules-made-it-easier-for-volkswagen-to-cheat/; James Grimmelmann, *Harry Potter and the Mysterious Defeat Device*, SLATE, Sept. 22, 2015, http://www.slate.com/articles/technology/future_tense/2015/09/volkswagen_s_cheating_emissions_software_and_the_threat_of_black_boxes.html; Zeynep Tufekci, *Volkswagen and the Era of Cheating Software*, N.Y. Times, Sept. 23, 2015, http://www.nytimes.com/2015/09/24/opinion/volkswagen-and-the-era-of-cheating-software.html?r=0.

245. For explanations of metering, see Tim Sommer, OMTCO, *Top 200 SAM Terms – A Glossary of Software Asset Management Terms* 18–19 (2013), http://omtco.eu/wp-content/uploads/OMTCO-Top-200-SAM-Terms-A-Glossary-Of-Software-Asset-Management-And-Licensing-Terms.pdf; *Software Metering*, MICROSOFT SYSTEM CENTER, https://technet.microsoft.com/en-us/library/cc181604.aspx (last visited Sept. 28, 2015).

246. Philip Reed, *Four Ways to Spot a Good Lease*, EDMUNDS.COM, Feb. 7, 2012, http://www.edmunds.com/car-leasing/four-ways-to-spot-a-good-lease.html.

and distance) to someone who otherwise may not have been able to afford a new car.

Manufacturers can also use restrictive software licenses to provide consumer financing for purchases. Smartphones are often sold on a financing plan.[247] Typically, a buyer pays some amount up front, say $200.[248] The buyer will then pay the remaining price over time, often as part of the price of the buyer's mobile phone plan. This financing benefits consumers, and the costs of enforcing the financing are low because the seller typically locks the phone to a particular mobile phone carrier. That carrier can suspend service if the additional payments are not made. Because the phone cannot be used on any other carrier's network until it is unlocked, consumers will not be able to profitably abscond with phones that they have not paid off. Once the phones are paid off, the mobile phone carrier unlocks the phone so that the user may use the phone without restriction.[249]

Manufacturers can further use software licenses to tie parts and services to the product being sold. There are numerous examples of this. Printer manufacturers often use both technology and restrictive licenses to require consumers to buy printer ink cartridges from the manufacturer.[250] Likewise, Keurig has used technology to tie the use of its K-cup coffee inserts to Keurig coffee machines.[251] Other manufacturers may use software licensing in place of technology to accomplish a similar

247. For a description of a number of available options in this area, see Lisa Gerstner, *Best Cell-Phone Plans for Every Type of User*, YAHOO! FINANCE (Oct. 10, 2014, 6:00 PM), http://finance.yahoo.com/news/best-cell-phone-plans-every-182328257.html.

248. Some plans require as little as $0 down. *See, e.g.*, *Early Upgrade Option*, U.S. CELLULAR, http://www.uscellular.com/cell-phones/device-financing.html (last visited Sept. 28, 2015).

249. Cell phones now also have to be unlocked in some situations as a matter of law. For a discussion of the enactment of related legislation, see Marguerite Reardon, *President Signs Cell Phone Unlocking Bill into Law*, CNET (Aug. 1, 2014, 2:42 PM), http://www.cnet.com/news/president-signs-cell-phone-unlocking-bill-into-law/.

250. John C. Dvorak, *The Secret Printer Companies Are Keeping from You*, PC MAG. (Sept. 6, 2012), http://www.pcmag.com/article2/0,2817,2409373,00.asp. *See also* Tim Cushing, *Your Toner Is No Good Here: Region-Coding Ink Cartridges. . . For the Customers*, TECHDIRT, Aug. 20, 2015, https://www.techdirt.com/articles/20150815/02480731963/your-toner-is-no-good-here-region-coding-ink-cartridges-customers.shtml. Some manufacturers are now eliminating the need for cartridges altogether. *See* David Pogue, *Review: New Inkjet Printers Eliminate Cartridges, Save You $500 a Year*, YAHOO! TECH, Aug. 9, 2015, https://www.yahoo.com/tech/review-epsons-new-inkjet-printers-eliminate-125950545829.html?soc_src=social-sh&soc_trk=fb.

251. Keurig's tying of pods to its coffee machines provoked both consumer backlash and circumvention techniques. *See* Ry Crist, *Keurig 2.0 Brews up DRM to Freeze Out Copycat Cups*, CNET (Mar. 3, 2014, 2:15 PM), http://www.cnet.com/news/keurig-2-0-brews-up-drm-to-freeze-out-copycat-cups/. In the end, the cost in public goodwill became too great, and Keurig had to abandon its price discrimination scheme. Alex Hern, *Keurig Takes Steps Towards Abandoning Coffee-Pod DRM*, GUARDIAN (May 11, 2015), http://www.theguardian.com/technology/2015/may/11/keurig-takes-steps-towards-abandoning-coffee-pod-drm.

purpose.[252] Tying can be used to provide consumer financing.[253] For instance, a seller of computer printers may sell the printer for below cost, but the cartridges for above cost. This would allow consumers to effectively pay the price of the printers and cartridges over time. Tying can also serve to share risk.[254] For example, if a manufacturer of petroleum exploration equipment sells its machines below cost and the parts for the machines above cost, then companies uncertain as to whether they will earn enough money to pay for the machine will pay less, while successful companies who can afford it will pay more. Tying works similarly when it comes to price discrimination.[255] If a manufacturer has market power such that it can price above cost, it can tie sales of the replacement parts for its product to sales of the product. It can price the product at cost and the replacement parts above cost. Tying cartridges to printers again provides an example. If the printers are sold at cost, and the cartridges above cost, then those who use the machine more will pay more over the life of the machine.[256] Because intensity of use probably correlates fairly well with how much the consumer values the product, this can be an effective way to price discriminate.[257]

Producers can also price discriminate simply by offering different prices for the good to different consumers, depending on estimates of willingness to pay.[258] This, combined with restraints on alienation and effective monitoring, could allow software companies to sell software licenses at individualized prices based on estimates of reservation prices. That would increase total welfare compared to monopoly pricing, or even to competitive market pricing, because it would allow for selling the goods at marginal cost of distribution to those willing to pay only that amount. But it would also look like naked price hikes for the wealthy and those who

252. Whether this practice is legal is a question pending in the Federal Circuit as of this writing. *See* Lexmark Int'l, Inc. v. Impression Products, Inc., 785 F.3d 565 (Fed. Cir. 2015).

253. Eastman Kodak Co. v. Image Tech. Servs., Inc., 504 U.S. 451, 502 (1992) (Scalia, J., dissenting).

254. *Id.* at 478 (majority opinion).

255. *Id.* at 476.

256. *See* Ill. Tool Works Inc. v. Indep. Ink, Inc. 547 U.S. 28, 44–45 (2006).

257. *See id.* at 44.

258. The best current example of collecting information so as to price discriminate nearly perfectly is probably found in higher education. Universities get very detailed information on a family's ability to pay for a student's education, including income, savings, and how many other children are in school. The universities then use this to set the discount from their sticker price by offering a combination of loans, grants, and work-study programs. Universities are thus able to charge each student an individualized price, so as to maximize revenue according to ability to pay. See Frederick G. Tiffany & Jeff A. Ankrom, *The Competitive Use of Price Discrimination by Colleges*, 1 EASTERN ECON. J. 99–110 (1998); Robert A. Lawson & Ann Zerkle, *Price Discrimination in College Tuition: An Empirical Case Study*, 5 J. OF ECON AND FINANCE EDU. 1–7 (2006), http://www.economics-finance.org/jefe/econ/Lawsonpaper.pdf.

highly value the software. Charging consumers more simply because they are willing to pay more tends to anger customers, notwithstanding its overall efficiency.[259] Accordingly, it is unlikely that companies would engage in naked price discrimination on a person-by-person basis. Companies may, however, start with a high price for the software, and then come up with "promotional offers," points towards purchases, or other clever ways of discounting the software according to estimates of reservation prices. It is possible that due to public backlash and competition, software sellers will continue to be able to make only rough cuts in terms of price discrimination. But to the extent that they are able to make software pricing more fine-grained, total welfare should increase, and more consumers should be able to purchase desired software.

Another worry about the use of restrictive software license conditions attached to durable consumer goods is that manufacturers of these goods will use the restrictions to create and get a monopoly profit by preventing consumers from buying service or replacement parts from competitors.[260] For instance, a car manufacturer might include a license restriction on having the car serviced anywhere besides official dealerships. The manufacturer and dealer could then split the profits from increasing the price of service above the market price. But basic economics shows that manufacturers and dealers will not be able to succeed in this scheme to have consumers pay more for owning a car so long as the market generally prices in the cost of service to the overall price of owning and using the car.[261] Different brands of car certainly have different reputations for how expensive they are to service and maintain.[262] So unless market participants overall fail to see that manufacturers are tying sales of goods to expensive service or parts, this scheme should be corrected adequately in the long run by information in the market and by competition. Moreover, so long as consumers consider costs to own durable goods as well as the initial

259. *See* Xia & Monroe, *supra* note 113.

260. *See supra* note 252.

261. The dissenting opinion in *Kodak* referred to this as "life-cycle pricing" and argued that so long as the market generally included the price of ownership in the decision to buy a car, manufacturers could not get a double monopoly profit by tying service to sales of cars. *Eastman Kodak Co.*, 504 U.S. at 496 (Scalia, J., dissenting).

262. A number of people and organizations collect and distribute data on the cost of ownership of cars and other durable goods over time. *See, e.g.*, *New & Used Car Reviews & Ratings*, CONSUMER REPORTS, http://www.consumerreports.org/cro/cars/index.htm (last visited Sept. 28, 2015); *New & Used Car Price Values*, KELLEY BLUE BOOK, http://www.kbb.com (last visited Sept. 28, 2015); *New Cars, Used Cars, Car Reviews and Pricing*, EDMUNDS, http://www.edmunds.com/ (last visited Sept. 28, 2015).

purchase price, it is in the interest of the manufacturer to have consumers use the least expensive sufficient service and parts available.[263]

While a good deal of the price discrimination described above could be accomplished with purchase contracts, software licenses are superior to purchase contracts when it comes to enforcing restrictions on the use of products containing the software at issue. Contract enforcement is expensive, cannot be used against downstream third parties, and results at best in contract damages, which may not be high. Software licenses and monitoring, however, make it easy to protect restrictions from arbitrage. First, software licenses run with the software or software-enabled device, and thus restrict downstream purchasers. Second, when software that is part of a device checks in with the software company—as it will do to receive updates—and as devices increasingly communicate with users and each other, the company will be able to limit or disable the software until any breach of the restrictions is cured. Because compliance with software license restrictions can increasingly be monitored and enforced directly by software companies, and because information about restrictions can be stored in the device software itself, the policy reasons for not allowing restraints on use and alienation for personal property largely do not apply to software licenses. The information cost problem is largely solved by the fact that the restrictions can ride with the software and be displayed to users on demand. Restrictions can also be listed on the Internet.[264] Similarly, the transaction cost problem of enforcing restrictions on personal property

263. For instance, say that a car buyer is willing to pay $40,000 for a car over five years. If the cost of service for the car averages $1,500 per year, then the buyer will only be willing to pay $32,500 for the initial purchase price. The buyer actually would be willing to pay a bit of a higher initial purchase price because the net present value of $1,500 per year for five years is less than $7,500, but for the sake of simplicity, we will not use net present value in this simple example. Assume further that the $1,500 yearly maintenance price is for maintenance at the dealership, and that the cost of the maintenance to the dealer is only $1,000 per year. Even if the manufacturer gets half of the monopoly maintenance profits via charging inflated prices for parts, it is only getting a total of an extra $1,250 over five years. If instead the manufacturer allowed the car to be serviced anywhere using compatible parts, then assuming the competitive price for service is $1,000 per year, the buyer would now be willing to pay $35,000 for the initial purchase price. The manufacturer would get all of this money, and so would be better off than by overcharging for parts over five years. The situation is even better for the manufacturer if independent providers can offer parts and service at lower prices than the manufacturer or its dealers. If independent part makers and service stations can service the car for only $500 per year, then the manufacturer can stop making replacement parts, save the money from that, and also have a buyer who is willing to pay $37,500 for the initial purchase price. Thus, it is not in the manufacturer's interest to prevent lower-price complementary parts from being sold by competitors. So long as the manufacturer has some market power, it can make more money up front if the consumer knows she will have to pay less over the life of the product. In competitive markets, the manufacturer will also be forced to allow cheaper service options, because otherwise the total cost of ownership of its cars will not be competitive with other carmakers.

264. For a discussion of the relationship between information costs and registries, see Abraham Bell & Gideon Parchomovsky, *Of Property and Information* (Univ. of Pa. Inst. for Law & Econ. Research, Paper No. 15-29), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2632082.

largely disappears because software companies can use self-help to enforce the restrictions.

V. CONCLUSION

In this Article we examined the history of the disallowance of equitable servitudes in personal property and concluded that the reasons that restraints on personal property were generally disfavored—mainly problems with transaction costs and information costs—for the most part do not apply to software and software-enabled goods. We studied the history of treating transfers of software as license events rather than sales, and showed that given the modern evolution of software, characterizing the transactions as licenses is appropriate. We showed the particular social benefits of fine-grained price discrimination for software distribution. We also analyzed how manufacturers are likely to use restrictive software licenses to price discriminate in selling the Internet-connected consumer goods that will compose the coming Internet of Things. While the potential increase in social welfare is not as great from more perfect price discrimination in selling consumer goods as it is in licensing pure software, the Article showed that use of restrictive licenses to facilitate price discrimination in selling consumer goods is likely to be neutral or socially beneficial overall. Accordingly, calls for changes to laws and judicial interpretations to prevent the use of restrictive software licenses to facilitate price discrimination are misplaced. If anything, the law will increase social welfare by facilitating more fine-grained price discrimination for software and software-enabled devices.