

ARTICLES

DISABILITY AND DESIGN

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When scholars contemplate the legal tools available to policymakers for encouraging innovation, they primarily think about patents. If they are keeping up with the most recent literature, they may also consider grants, prizes, and taxes as means to increase the supply of innovation. But the innovation policy toolkit is substantially deeper than that. To demonstrate its depth, this Article explores the evolution of designs that help people with disabilities access the world around them. From artificial limbs to the modern wheelchair and the reshaping of the built environment, a variety of legal doctrines have influenced, for better and for worse, the pace and direction of innovation for accessible design.

This Article argues that two of the most important drivers of innovation for accessible design have been social welfare laws and antidiscrimination laws. Both were responsible, in part, for the revolution in accessibility that occurred in the second half of the twentieth century. Unlike standard innovation incentives, however, these laws operate on the demand side of the market. Social welfare laws and antidiscrimination laws increase the ability and willingness of parties to pay for accessible technology, ultimately leading to greater supply. But in doing so, these laws generate a different distribution of the costs and benefits of innovation than supply-side incentives. They also produce their own sets of innovation distortions by allowing third parties to make decisions about the designs that people with disabilities have to use.

The law can promote innovation, and it can hinder it. For example, the law's relationship to the wheelchair, the most important accessibility innovation of the twentieth century, produced both results. Policymakers have choices about which legal incentives doctrines they can use and how they can use them. This Article evaluates those tools, and it provides guidelines for their use to encourage accessible technology in particular and innovation generally.

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INTRODUCTION 953

 I. A PRIMER ON INNOVATION POLICY LEVERS 960

 II. THE ORIGINS OF REGULATION FOR ACCESSIBLE
 INNOVATION 963

 A. *Social Welfare, Innovation Incentives, and Artificial
 Limb Production* 964

 B. *Getting Veterans Behind the Wheel* 968

 C. *Innovation by Users with Disabilities* 971

 III. THE WHEELCHAIR: A CASE STUDY IN ACCESS
 INNOVATION INCENTIVES 974

 A. *Before E&J* 974

 B. *The E&J Revolution* 976

 C. *Anticompetitive Behavior, Innovation Brakes, and
 Backlash* 978

 1. *Products Liability Law* 981

 2. *Intermediary Payers* 982

 IV. ANTIDISCRIMINATION LAW AS DEMAND-SIDE
 INNOVATION INCENTIVE 985

 A. *Design Standards and the Social Model
 of Disability* 986

 B. *Disability Access Lawmaking: From the ABA to the
 ADA* 991

 C. *The Successes and Failures of Antidiscrimination
 Innovation Incentives* 996

 V. LESSONS FOR DISABILITY INNOVATION INCENTIVES 1002

 A. *Who Benefits and Who Pays?* 1004

 1. *Intellectual Property Law* 1004

 2. *User Innovation* 1007

 3. *Social Welfare* 1010

 4. *Antidiscrimination Law* 1012

 B. *Innovation Distortions* 1015

 1. *IP and Investment* 1015

 2. *Intermediaries* 1017

 3. *Saliency Biases* 1018

CONCLUSION 1020

INTRODUCTION

Although wheels and chairs are two of humanity’s oldest technologies, the wheelchair is a surprisingly modern invention.¹ Prior to the 1930s, wheelchairs that enabled people with disabilities to access the

¹ The history of wheelchairs is recounted in the first chapter of HERMAN L. KAMENETZ, *THE WHEELCHAIR BOOK: MOBILITY FOR THE DISABLED* 5–35 (1969). But also

world at large did not exist. Everything began to change with Everest & Jennings's (E&J) invention of the collapsible steel wheelchair in 1937. Subsidies to veterans and other people with disabilities made the wheelchair broadly available, and it revolutionized their abilities to live, work, and play. But most public and private spaces remained inaccessible to wheelchairs, and wheelchair innovation stalled for the next three decades. Not until antidiscrimination laws compelled the reshaping of the built environment and antitrust laws broke E&J's monopoly towards the end of the twentieth century did access and innovation significantly improve. Engineers, designers, architects, and activists—many of whom had disabilities—played important roles in the development of accessible designs, including the modern wheelchair.² And, for better and for worse, so has the law.³

An astonishing variety of legal doctrines have influenced the pace and direction of technological progress in designs that assist people with disabilities—often spurring innovation, but just as often hindering it. Some of these doctrines are standard in accounts of innovation incentives, including intellectual property (IP) laws, antitrust laws, and research grants and prizes.⁴ These are supply-side tools that reduce the costs of design innovation or increase the returns to innovators. For example, patents give inventors exclusive rights that allow them to charge higher prices for access to their inventions.⁵ Higher prices, in turn, help inventors to recoup the costs of their investments.⁶ Research grants, instead, provide financial incentives upfront that encourage innovation along particular pathways.⁷ These supply-side tools are the central pillars of innovation policy, and policymakers have used each of them to incentivize accessible design.

see Brandon Stark's discussion of wheelchair developments in Westeros in *Game of Thrones: The Last of the Starks* (HBO May 5, 2019).

² ELIZABETH GUFFEY, *DESIGNING DISABILITY: SYMBOLS, SPACE, AND SOCIETY* 49–51 (Bloomsbury Visual Arts 2019) (2018); AIMI HAMRAIE, *BUILDING ACCESS: UNIVERSAL DESIGN AND THE POLITICS OF DISABILITY* 53–54 (2017); BESS WILLIAMSON, *ACCESSIBLE AMERICA: A HISTORY OF DISABILITY AND DESIGN* 27 (2019). These three recent books have detailed the rich history of disability and design.

³ See *infra* Part IV.

⁴ See WILLIAM M. LANDES & RICHARD A. POSNER, *THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW* 372 (2003) (“A consideration of the economics of intellectual property would be seriously incomplete without some discussion of the intersection between intellectual property law and antitrust law.”); Daniel J. Hemel & Lisa Larrimore Ouellette, *Beyond the Patents-Prizes Debate*, 92 *TEX. L. REV.* 303, 310–15 (2013) (providing an overview of the traditional theory of patents, prizes, and grants as ways the government incentivizes innovation while tax credits are neglected by scholars).

⁵ See Hemel & Ouellette, *supra* note 4, at 311.

⁶ *Id.*

⁷ See W. Nicholson Price II, *Grants*, 34 *BERKELEY TECH. L.J.* 1 (2019) (documenting those particular pathways).

But other legal doctrines have also had important but underappreciated effects on access innovations.⁸ Central to this account are two areas of the law that produce demand-side incentives to innovate. Both social welfare laws and antidiscrimination laws⁹ have spurred the creation and dissemination of accessible designs by increasing people's willingness and/or ability to pay for them. Government subsidies to veterans for artificial limbs and accessible automobiles boosted demand, leading manufacturers to increase supply.¹⁰ In a related but far more important way, antidiscrimination laws like the Rehabilitation Act and the Americans with Disabilities Act (ADA) encouraged municipalities and private parties to invest in accessible designs for their buildings, transit systems, and public spaces.¹¹

Yet the innovation policy toolkit is even deeper than this. Other legal doctrines, like tort law, insurance law, healthcare law, and tax law, also find roles to play in accessible design. Some of these have boosted innovation, others have impeded it, and still others have mixed records. Finally, a vast amount of accessible design is created without any explicit relationship to the law; it is created by people with disabilities to solve problems in their lives.¹² As it turns out, the story of the most important accessibility innovation of the twentieth century—the wheelchair—involves each of these regimes.¹³

This Article's contributions are twofold. First, I demonstrate the myriad policy levers that can influence the pace and direction of innovation for good and for ill. Innovation scholars have recently begun to look outside the confines of IP law to some of these other fields, and this Article joins that chorus.¹⁴ In doing so, however, this Article con-

⁸ Throughout this Article I use the term "access innovations" to refer to new technologies, discoveries, information, and learning that aim to influence the abilities of people with disabilities to access the environment. Some access innovations are particular technologies or devices that would now fall under the rubric of "assistive technology," but others, as I discuss at length below, are based on new information or new understanding about the ways in which the environment can be changed to make it accessible for people with disabilities.

⁹ See Samuel R. Bagenstos, *The Future of Disability Law*, 114 *YALE L.J.* 1, 4 (2004) ("In short, the future of disability law lies as much in social welfare law as in antidiscrimination law.").

¹⁰ See *infra* Part II.

¹¹ See *infra* Part IV.

¹² For an extended discussion of the increasing ability of users to innovate for themselves, see generally ERIC VON HIPPEL, *DEMOCRATIZING INNOVATION* (2005).

¹³ See *infra* Part III.

¹⁴ See Michael Abramowicz, *Perfecting Patent Prizes*, 56 *VAND. L. REV.* 114 (2003); Michael J. Burstein & Fiona E. Murray, *Innovation Prizes in Practice and Theory*, 29 *HARV. J.L. & TECH.* 401 (2016); Rebecca S. Eisenberg & W. Nicholson Price II, *Promoting Healthcare Innovation on the Demand Side*, 4 *J.L. & BIOSCIENCES* 3 (2017); Rebecca S. Eisenberg, *The Role of the FDA in Innovation Policy*, 13 *MICH. TELECOMM. TECH. L. REV.*

tributes additional legal regimes to the innovation toolkit and demonstrates how these regimes interact with one another in order to foster or hinder accessible design. Innovation scholars have seldom noticed the impact of public laws, like antidiscrimination laws, on their field of study. Recognizing this broader set of policy levers will help scholars more precisely craft recommendations for spurring innovation.

Second, I introduce disability scholars to the multiple ways in which doctrines outside of antidiscrimination and social welfare laws influence accessibility. Virtually all recent scholarship on disability law focuses on the impact of social welfare laws and antidiscrimination laws like the Rehabilitation Act, the ADA, or the Fair Housing Act.¹⁵ In doing so, however, it may miss the numerous effects of other legal regimes—including patent, tort, and antitrust law—on the availability of accessible designs for people with disabilities.¹⁶ This is vitally important. When policymakers, courts, and scholars consider the range of designs that can improve accessibility,¹⁷ they are likely to consider the options as given. But accessible designs have histories, and those histories are influenced by a wide range of legal and non-legal inputs. If disability scholars wish to comprehensively understand the potential opportunities for improving access for people with disabilities, they must appreciate the full range of factors that affect accessible design, from intellectual property and antitrust law to tort law and user innovation. In some cases, accessible design may be more effectively promoted by relying on or changing one of these other legal doctrines.

To demonstrate these points, this Article traces the history of accessible design from the late nineteenth century to the late twentieth century. It begins with crutches and artisanal prostheses, and it ends with motorized wheelchairs, “universal design,” and the transformation of America’s built environment in response to the ADA—

345 (2007); Daniel Jacob Hemel & Lisa Larrimore Ouellette, *Innovation Policy Pluralism*, 128 *YALE L.J.* 544 (2019); Price, *supra* note 7; Arti K. Rai, *Building a Better Innovation System: Combining Facially Neutral Patent Standards with Therapeutics Regulation*, 45 *HOUSING L. REV.* 1037 (2008); Rachel E. Sachs, *Administering Health Innovation*, 39 *CARDOZO L. REV.* 1991 (2018) [hereinafter Sachs, *Administering Health Innovation*].

¹⁵ Interestingly, one of the first important law review articles about disability law focused on tort law. See Jacobus tenBroek, *The Right to Live in the World: The Disabled in the Law of Torts*, 54 *CALIF. L. REV.* 841 (1966).

¹⁶ One of the only studies to consider the relationship between disability law and innovation law is Heidi M. Berven & Peter David Blanck, *The Economics of the Americans with Disabilities Act Part II – Patents and Innovations in Assistive Technology*, 12 *NOTRE DAME J.L. ETHICS & PUB. POL’Y* 9 (1998).

¹⁷ For example, when trying to determine what counts as a “reasonable accommodation” under Title I of the Americans with Disabilities Act (ADA). See *infra* notes 273–76 and accompanying text.

which celebrates its thirtieth anniversary in 2020.¹⁸ I focus on designs that address mobility impairments, including both personal devices like prostheses and wheelchairs as well as the architectural design of buildings and public spaces. Accordingly, I will not address the considerable and important work on hearing and vision impairments or mental disabilities.¹⁹ Thus, when I use the term “accessible” to describe designs and innovations, I am referring to those that are designed to be used by (at least some) people with mobility impairments to improve their access to the environment. And for purposes of simplicity, when I refer to people with disabilities, I mean people with mobility impairments. I hope, however, that this work will assist scholars studying how the law impacts design and innovation for a full range of impairments.

More concretely, this Article begins to assess the tradeoffs that policymakers face when choosing how to structure innovation incentives for accessible design. Each of the different innovation regimes produces benefits, but each is also costly. I evaluate the relative costs and benefits of patent law, user innovation, social welfare laws, and antidiscrimination laws from the perspectives of which parties receive the benefits and which parties bear the costs of each regime. Although people with disabilities stand to gain under any regime that successfully incentivizes accessible innovation, they are far from the only beneficiaries.²⁰ Nondisabled people, governments, and firms may all benefit from various sorts of accessible design. Similarly, depending on the regime, different parties may bear the costs of innovation:

¹⁸ This is not meant to be a comprehensive historical study of design and disability, although there are several recent works that have detailed this history. *See generally* GUFFEY, *supra* note 2; HAMRAIE, *supra* note 2; WILLIAMSON, *supra* note 2. But see JESSICA L. ROBERTS & ELIZABETH WEEKS, HEALTHISM: HEALTH-STATUS DISCRIMINATION AND THE LAW 54–89 (2018) and Ani B. Satz, *Disability, Vulnerability, and the Limits of Antidiscrimination*, 83 WASH. L. REV. 513, 535–50 (2008) for critiques of the current antidiscrimination approach.

¹⁹ *See, e.g.*, ANGEL ANTKERS, SUSAN MILLER, SOPHIA GALLEHER, BLAKE E. REID & BRIANNA L. SCHOFIELD, AUTHORSHIP AND ACCESSIBILITY IN THE DIGITAL AGE: AN AUTHORS ALLIANCE, SILICON FLATIRONS, AND BERKELEY CENTER FOR LAW & TECHNOLOGY ROUNDTABLE REPORT (2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3254959; Peter David Blanck & Leonard A. Sandler, *ADA Title III and the Internet: Technology and Civil Rights*, 24 MENTAL & PHYSICAL DISABILITY L. REP. 855 (2000); Molly K. Land, *The Marrakesh Treaty as “Bottom Up” Lawmaking: Supporting Local Human Rights Action on IP Policies*, 8 U.C. IRVINE L. REV. 513 (2018); Caterina Sganga, *Disability, Right to Culture and Copyright: Which Regulatory Option?*, 29 INT’L REV. L. COMPUTERS & TECH. 88 (2015); John F. Waldo, *The ADA and Movie Captioning: A Long and Winding Road to an Obvious Destination*, 45 VAL. U. L. REV. 1033 (2011).

²⁰ *See* Elizabeth F. Emens, *Integrating Accommodation*, 156 U. PA. L. REV. 839, 850–58 (2008) (describing the many positive externalities that nondisabled people receive from accommodations for people with disabilities).

Sometimes it will be users with disabilities, sometimes competitor firms, and sometimes insurance companies, property owners, and taxpayers. This analysis offers initial suggestions for how the regimes compare with respect to the criteria of welfare and fairness in their distribution of costs and benefits.²¹

Over the course of this study, a number of important themes emerge. First, demand-side incentives can be just as powerful as the supply-side ones that the law typically uses.²² In addition to or instead of directly encouraging innovators, policymakers can boost demand for new designs by increasing people's ability and willingness to pay for them. Demand-side incentives can also help solve collective action problems. Both people with disabilities and those without them may be better off if businesses adopt accessible designs, but they might face coordination problems that prevent socially valuable changes from taking place. The ADA relieves the coordination burden by placing design requirements on businesses.²³

Second, accessible design innovation can happen at multiple levels of usability. Some designs, like an artificial limb, operate at the individual level—they increase accessibility for a single user at a time. Other designs, like ramps, elevators, and curb cuts, create accessibility for many users, whether they have a disability or not. Neither of these options is uniformly superior to the other, and they often intersect. Individual-level innovations may be cheaper to produce, but they may help fewer people, and the opposite may be true for environmental-level designs. Thus, when policymakers consider how to incentivize accessible design, they should determine whether it is best to focus on individual-level or environmental-level innovations.

Third, I analyze how the various innovation regimes can produce distortions that affect the nature of design. These include the distortions created by exclusive rights, by intermediary decisionmaking, and by the relative salience of costs and benefits. For example, patents tend to be useful when market demand is a good proxy for social wel-

²¹ These are not necessarily the only criteria that could matter to policymakers, scholars, or activists, but they have been the two most important ones in debates about accessibility. *See, e.g.*, Samuel R. Bagenstos, *The Americans with Disabilities Act as Welfare Reform*, 44 WM. & MARY L. REV. 921, 926–27 (2003) (positioning the ADA as a welfare reform law to explain why it has not fulfilled equal access for people with disabilities, at least in the employment context); Adam M. Samaha, *What Good Is the Social Model of Disability?*, 74 U. CHI. L. REV. 1251, 1297–1306 (2007) (analyzing the implications of utilitarian consideration of welfare and egalitarianism for disability policy).

²² *See infra* Part IV.

²³ *See infra* note 272 and accompanying text.

fare, but they can skew innovation when this is not the case.²⁴ Distortions also arise when the purchasers of accessible designs are not their ultimate users, because purchasers' preferences and users' preferences may not align. Finally, all incentives to spur accessible design are costly, but the incidence and public salience of their costs can vary. This can lead policymakers to disfavor otherwise effective tools because the public views them as too expensive. In each case, the pace or direction of accessible innovation can be misdirected towards inefficient or unfair outcomes.

In this Article, I take for granted that some level of accessible design innovation is socially valuable, but I do not engage in the deeper normative debate about the appropriate incentive type or amount of innovation incentive.²⁵ Doing so would require articulating and defending positions on welfarism, fairness, distribution, and autonomy that are far beyond the scope of a single paper. Instead, I analyze the innovation levers that policymakers can use to produce whatever amount and variety of accessible design that they deem appropriate. To do so, I explore the history of accessible innovation to produce a more contextualized picture of how these policy levers have succeeded or failed in the past. These lessons have continuing relevance, especially in light of the Trump Administration's proposed alterations to Social Security disability payments which could dramatically affect social welfare support and, thus, innovation incentives for accessible design.²⁶

This Article begins with a brief primer on the innovation policy toolkit in order to introduce readers to the standard mechanisms that policymakers use to promote innovation. Part II of this Article traces the history of accessible innovation from the Civil War to the years following the Second World War. This period marks the first major legal efforts to encourage the development of accessible design. During this period, a number of different innovation regimes operated

²⁴ See Amy Kapczynski & Talha Syed, *The Continuum of Excludability and the Limits of Patents*, 122 YALE L.J. 1900, 1942 (2013) ("Patents . . . link the expected private returns . . . to the portion of social value that can be effectively (or cheaply) extracted through the exercise of exclusionary rights. But there is no reason to think that variations in the ease or costs of exclusion are correlated with the underlying social value . . .").

²⁵ See Samaha, *supra* note 21, at 1252–53 (explaining how disability policy must be grounded on normative commitments beyond the social model of disability).

²⁶ Rules Regarding the Frequency and Notice of Continuing Disability Reviews, 84 Fed. Reg. 63588 (proposed Nov. 18, 2019) (to be codified at 20 C.F.R. pts. 404, 416), <https://www.federalregister.gov/documents/2019/11/18/2019-24700/rules-regarding-the-frequency-and-notice-of-continuing-disability-reviews> (last visited May 24, 2020); see also Christopher Buccafusco & Mariel Talmage, *The Trump Administration's Social Security Rules Will Harm Innovation in the Assistive Technology Industry and People with Disabilities*, 2020 CARDOZO L. REV. DE•NOVO 92.

to produce new artificial limbs, automobiles for people missing limbs, and a variety of accessible personal goods. Social welfare laws and user innovation were the principal drivers of accessible design, but patents also had a role to play. Part III presents a case study of the wheelchair and, in particular, the invention of the standard wheelchair by E&J in the middle of the twentieth century. The E&J wheelchair was easily the most important accessibility innovation of the twentieth century, but, as an innovation story, it's a mixed bag. The wheelchair was initially the product of user innovation, but unlike most other users, E&J obtained patents on its design. With these patents, as well as social welfare subsidies and philanthropy, the firm virtually monopolized the market. As its patents expired, E&J turned to anti-competitive strategies to maintain its monopoly until an antitrust settlement finally opened the market in the late 1970s. Typically this would mean a rush of other competitors and a flood of new designs, but other legal doctrines, including tort law and insurance law, may have slowed their development.

Part IV turns to developments in the design of physical spaces for accessibility. Designers and architects like Timothy Nugent began to develop design standards that removed barriers to access for people with disabilities. These innovations did not take hold on their own, however. From the 1960s to the 1990s, federal disability law increasingly required entities to adopt standards of accessible design into their buildings, buses, and public spaces. By threatening legal liability for noncompliance, the Rehabilitation Act and the ADA encouraged regulated entities to purchase accessible designs. Not surprisingly, many of them objected to having to bear these costs.

Part V analyzes the various regimes discussed throughout the Article to offer an outline of the innovation levers that policymakers can use to encourage accessible design. It contemplates the costs and benefits of these regimes, including their enforcement costs, and it considers the welfare and fairness consequences of the distributions each regime creates. Finally, it explores the distortions that can skew the pace and direction of innovative design, and it suggests some principles for choosing among these options.

I

A PRIMER ON INNOVATION POLICY LEVERS

For millennia, humans have solved the problems they have faced without the need for legal intervention, and many still do today. A robust and growing literature has shown that many areas of creative

activity are largely untouched by law.²⁷ People may be influenced by intrinsic desires, social norms, or other market structures that encourage creative activity.²⁸ And often, people create new products simply because they recognize a need or opportunity in their own lives, and they devise a solution to it.²⁹

The legal system, however, often operates on the premise that incentives are necessary to stimulate innovation. Innovation is a costly activity.³⁰ Typically, people must obtain years of education to learn the tools of their trade. Then, whether they join firms or work on their own, they must spend considerable time and resources developing designs, testing them, and reworking them until they produce something that works.³¹ These research and development (R&D) investments can be enormous, and, according to the standard innovation policy story, inventions will be undersupplied unless innovators are given special help to recoup their investments.³²

This is where innovation policy's incentive tools enter the picture. These days, when people think about incentivizing innovation, they likely think about utility patents.³³ Utility patents allow the creators of new inventions to secure exclusive rights to make and sell their inven-

²⁷ For a sustained account of IP's "negative spaces" in areas of creativity such as fashion design, cuisine, and comedy routines, see KAL RAUSTIALA & CHRISTOPHER SPRIGMAN, *THE KNOCKOFF ECONOMY: HOW IMITATION SPARKS INNOVATION* (2012).

²⁸ See, e.g., YOCHAI BENKLER, *THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM* 111–12 (2006) (noting the role of intrinsic motivation in peer production); Dotan Oliar & Christopher Sprigman, *There's No Free Laugh (Anymore): The Emergence of Intellectual Property Norms and the Transformation of Stand-Up Comedy*, 94 VA. L. REV. 1787, 1790 (2008) ("[I]n stand-up comedy, social norms substitute for intellectual property law."); Aaron Perzanowski, *Tattoos & IP Norms*, 98 MINN. L. REV. 511, 513 (2013) ("[T]attoos rely on a set of informal social norms to structure creative production and mediate relationships within their industry."); Betsy Rosenblatt, *Belonging as Intellectual Creation*, 82 MO. L. REV. 91 (2017) (discussing belonging's importance to creativity and intellectual property law); Rebecca Tushnet, *Payment in Credit: Copyright Law and Subcultural Creativity*, 70 LAW & CONTEMP. PROBS. 135 (2007) (examining the dynamics at play in fandom creativity).

²⁹ See, e.g., VON HIPPEL, *supra* note 12, at 25.

³⁰ See Suzanne Scotchmer & Stephen M. Maurer, *Institutions: A Brief Excursion Through History*, in SUZANNE SCOTCHMER, *INNOVATION AND INCENTIVES* 1, 1 (2004) [hereinafter *INNOVATION AND INCENTIVES*] ("The United States currently devotes about 2.6 percent of GDP—\$264 billion—to research and development.").

³¹ See LANDES & POSNER, *supra* note 4, at 294.

³² See *id.*

³³ Utility patents focus on encouraging new "useful" features rather than new "ornamental" or aesthetic product features as design patents do. See Christopher Buccafusco, Mark A. Lemley & Jonathan S. Masur, *Intelligent Design*, 68 DUKE L.J. 75, 76–78 (2018). Thus, utility patents are more relevant to this Article's focus on accessibility, although design patents could also cover many of the innovations that will be discussed below.

tions for twenty years.³⁴ Because the patent holders have these rights, they may be able to sell products that embody their inventions for prices above the marginal cost of production.³⁵ Thus, for example, although a medication may only cost several dollars to manufacture, when it is covered by a patent, the patentee can charge many times that price for access to the drug.³⁶ The promise of supracompetitive profits can encourage innovation because innovators will have more confidence in their ability to recoup their R&D costs.

However, patents are far from the only means of encouraging innovation. One of the biggest drivers of scientific research is the system of federal, state, and private grants.³⁷ For example, the National Institutes of Health provides more than \$32 billion in support for biomedical research each year.³⁸ Unlike patents, which begin only after R&D has substantially finished, grants deliver funding upfront. In addition, grant funding is based on the preferences of the funding agency, usually a central planner,³⁹ whereas patent-based incentives are derived from the market. Innovators relying on patents as an innovation incentive must strive to provide products that consumers want to buy.⁴⁰

Policymakers have even more tools to spur innovation. They may offer financial prizes to the first innovator to solve a particular problem,⁴¹ or governments can provide tax incentives for investments in R&D.⁴² All of these are means for putting money into innovators' pockets to offset their expenses. In this sense, they are all supply-side

³⁴ See 35 U.S.C. § 154(a)(2) (2018) ("Subject to the payment of fees under this title, such grant shall be for a term beginning on the date on which the patent issues and ending 20 years from the date on which the application for the patent was filed in the United States . . ."); *id.* § 271(a) ("[W]hoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.").

³⁵ See LANDES & POSNER, *supra* note 4, at 297–98.

³⁶ See C. Scott Hemphill, *Paying for Delay: Pharmaceutical Patent Settlement as a Regulatory Design Problem*, 81 N.Y.U. L. REV. 1553, 1562 (2006) (discussing the importance of patents to ensure pharmaceutical company profits); Arti K. Rai, *Fostering Cumulative Innovation in the Biopharmaceutical Industry: The Role of Patents and Antitrust*, 16 BERKELEY TECH. L.J. 813, 814 & n.3 (2001) (same).

³⁷ See Price, *supra* note 7, at 3–4.

³⁸ *Grants & Funding*, NAT'L INSTS. HEALTH, <https://www.nih.gov/grants-funding> (last visited May 24, 2020).

³⁹ Hemel & Ouellette, *supra* note 4, at 321.

⁴⁰ See Kapczynski & Syed, *supra* note 24.

⁴¹ See Abramowicz, *supra* note 14, at 119–21; Burstein & Murray, *supra* note 14, at 403 (noting the past and present practice of offering prizes to encourage development of inventions); Heidi Williams, *Innovation Inducement Prizes: Connecting Research to Policy*, 31 J. POL'Y ANALYSIS & MGMT. 752 (2012) (discussing how to evaluate the effectiveness of innovation inducement prizes).

⁴² See Hemel & Ouellette, *supra* note 4, at 322–23.

incentives. They goad creators into supplying new and valuable products that they might not otherwise produce.

Importantly, all of these incentives are costly.⁴³ Whether it's through higher consumer prices or expenditures of government revenue, innovation incentives are expensive. Policymakers, then, must select the right mix of incentives to optimally encourage innovation.⁴⁴ Scholars are increasingly attending to the tradeoffs that policymakers face when choosing among these regimes,⁴⁵ but this exercise will only succeed if we appreciate the full range of innovation incentives available. The remainder of this Article demonstrates their interaction in the context of accessible design, and it introduces other legal tools into the mix.

II

THE ORIGINS OF REGULATION FOR ACCESSIBLE INNOVATION

Diseases and wars have been the principal causes of physical impairment, yet they have also generated some of the greatest advances in innovations for disabled access. The years between the Civil War and the Second World War evidence rapid technological development in accessible design in response to impairments caused by war, disease, and industrial labor. This period also represents the first major engagement of the U.S. legal system in response to the perceived challenges of disability. As this Part will demonstrate, progress in accessible design came from a variety of sources in the years between the Civil War and the Second World War. Importantly, many of the most important technical advances throughout this period owed their origin to incentives beyond the traditional legal policy levers of patents, grants, and prizes. Although these are the tools that modern societies typically use to encourage innovation, they were only one piece of this story. Finally, virtually all of the designs discussed below operate at the individual level—they allow the particular person using the technology to gain access to the built environment. During this period, innovation focused on helping people with disabilities adapt to an inaccessible environment rather than on adapting the environment for people with disabilities.

⁴³ See Hemel & Ouellette, *supra* note 14, at 551–52.

⁴⁴ See Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1580 (2003); Hemel & Ouellette, *supra* note 14, at 558–93 (proposing an “original taxonomy” for policymakers to combine IP and non-IP approaches).

⁴⁵ See, e.g., sources cited *supra* note 14.

A. *Social Welfare, Innovation Incentives, and Artificial Limb Production*

Prior to the twentieth century, the most important technologies for providing people with disabilities access to the world at large were crutches and prostheses.⁴⁶ Originally, and continuing into the twentieth century, these items were often bespoke creations produced by artisans for individual users.⁴⁷ The onset of the American Civil War substantially increased demand for assistive technologies from the thousands of soldiers who lost arms and legs.⁴⁸ Modern machinery, including railroads and factories, also caused thousands of injuries every year.⁴⁹ Advances in medicine meant that injuries that would previously have killed people were now survivable.⁵⁰ At this early stage, several major innovation incentives were already at work.

First, many of America's artificial limb manufacturers were themselves amputees, and they used this status both to experiment with the best means of creating new limbs and to establish their authority as knowledgeable inventors.⁵¹ They often had backgrounds in mechanical work that enabled them to reconceptualize the means of building, attaching, and moving artificial arms and legs.⁵² And their status as amputees was commercially valuable, giving credence to the quality of their inventions. The inventor James Foster advertised:

I claim to be the only PATENTEE and MANUFACTURER in America (and perhaps in the world) who wears a full length artificial leg and who was a practical mechanician at the time of amputation, and that no other manufacturer has had the same facilities for

⁴⁶ Cf. Stephen Mihm, *A Limb Which Shall Be Presentable in Polite Society*, in *ARTIFICIAL PARTS, PRACTICAL LIVES: MODERN HISTORIES OF PROSTHETICS* 282–83 (Katherine Ott et al. eds., 2002) (describing the increasing need for prosthesis during the industrial age).

⁴⁷ See HAMRAIE, *supra* note 2, at 54; BETH LINKER, *WAR'S WASTE: REHABILITATION IN WORLD WAR I AMERICA* 103 (2011) (“The prosthetist would rework the leg and the socket numerous times until the fit was acceptable to both the patient and the limb maker.”).

⁴⁸ See Mihm, *supra* note 46, at 282–83.

⁴⁹ See JOHN FABIAN WITT, *THE ACCIDENTAL REPUBLIC: CRIPPLED WORKINGMEN, DESTITUTE WIDOWS, AND THE REMAKING OF AMERICAN LAW* 23–24 (2004) (noting industrial accidents appeared to “overshadow” the thousands of war deaths); Mihm, *supra* note 46, at 282 (“The flywheels and pulleys of the new mills and factories severed arms and legs with alarming frequency throughout the nineteenth century, as did the wheels of railroad locomotives”); John Fabian Witt, *Toward a New History of American Accident Law: Classical Tort Law and the Cooperative First-Party Insurance Movement*, 114 *HARV. L. REV.* 690, 702–04 (2001) (explaining how tort law adjusted to the increasing accident rates from manufacturing and railroads); *cf. id.* at 769–70 (noting the thousands of injury victims without a remedy as tort law attempted to catch up to modern times).

⁵⁰ See WITT, *supra* note 49, at 25.

⁵¹ See HAMRAIE, *supra* note 2, at 53–54; LINKER, *supra* note 47, at 99–100, 105.

⁵² See LINKER, *supra* note 47, at 105.

experimenting with and improving artificial limbs that I have had⁵³

Presumably, designers like Foster and William Carnes, the creator of the popular “Carnes arm,”⁵⁴ were driven, at least initially, by the limitations and shortcomings of existing medical devices.⁵⁵ They were, in contemporary terminology, user innovators.⁵⁶

While these inventors may have been motivated to solve accessibility problems that they themselves faced, they occasionally turned to the patent system in an attempt to secure financial reward for their efforts. Stephen Mihm reports that inventors submitted 167 patents for prosthetic devices between 1846 and 1873.⁵⁷ With the growing market for prosthetics, the exclusive rights offered by patent protection may have offered a means for capturing a larger share of it.⁵⁸ It is also possible, however, that the value of a patent to these inventors had less to do with conveying exclusive rights than it did with constituting a legal recognition of innovativeness and achievement. Inventors may have cared less about the ability to use their patents to sue other manufacturers than they did for the signaling value that the patents conveyed to purchasers—and perhaps, to themselves.⁵⁹

User innovation and patent protection were both operating on the supply side of disabled access innovations in the second half of the nineteenth century and into the twentieth century, but major changes were happening on the demand side as well. Throughout this period, industrial accidents produced “an accident crisis like none the world had ever seen.”⁶⁰ First the Civil War and then World War I created thousands of disabled veterans who desired assistive technologies.⁶¹ Their numbers grew ever greater after the Second World War largely because other technological changes meant that more injured soldiers

⁵³ HAMRAIE, *supra* note 2, at 53–54.

⁵⁴ LINKER, *supra* note 47, at 105.

⁵⁵ *Cf. id.* (discussing J.F. Rowley’s motivation coming “out of frustration with the prosthetic legs available on the market”).

⁵⁶ *See* VON HIPPEL, *supra* note 12, at 10–11.

⁵⁷ Mihm, *supra* note 46, at 283.

⁵⁸ This is the standard story about how patent law’s exclusive rights convey incentives to innovate. *See supra* Part I.

⁵⁹ *See* Jeanne C. Fromer, *Expressive Incentives in Intellectual Property*, 98 VA. L. REV. 1745, 1771–72 (2012) (suggesting that some inventors may care about invention as a reflection of self-identity); Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 664–79 (2002) (discussing the information value of patents).

⁶⁰ Witt, *supra* note 49, at 694 (“In the second half of the nineteenth century, the United States experienced an accident crisis . . . like none any Western nation has witnessed since. By the turn of the century, one worker in fifty was killed or disabled for at least four weeks each year because of a work-related accident.”).

⁶¹ *Cf. LINKER, supra* note 47, at 56 (mentioning the thousands of British disabled soldiers returning after World War I).

than before were surviving their wounds. The ready availability of penicillin by the 1940s, coupled with surgical improvements, meant that many amputees and paraplegics would not only survive the battlefield but also have substantial life expectancies.⁶² Many of these veterans wanted to return to work on farms or in factories, and they desired technologies that would enable them to do so.⁶³ Their injuries, however, often left them unable to find jobs and earn the income necessary to purchase expensive prostheses.⁶⁴ While veterans may have been willing to pay for access to innovations, they often lacked the means to do so.

As Beth Linker recounts, unemployed veterans were political boogeymen in the decades following the Civil War as “dragging the nation down a path toward moral and economic decline.”⁶⁵ The pensions paid to Civil War veterans cost the federal government more than fighting the war itself.⁶⁶ Whole political campaigns revolved around the issue of veterans’ pensions.⁶⁷ Accordingly, as the specter of hundreds of thousands of new veterans loomed in the twentieth century, the federal government adapted its social welfare system for pensioners away from mere financial support and towards “rehabilitation.” Writing on the eve of the First World War, the orthopedic surgeon Gwilym Davis expressed the anxiety starkly:

A cripple is a menace both to himself and the community and is apt to become a burden on his relatives, his friends and the public. The aim then is to improve his physical condition and character as to make him . . . self-supporting, self-respecting, self-reliant and able and willing to take and perform his part in the communal life.⁶⁸

Injured veterans were to be “fixed” and returned to the labor force as quickly as possible.

⁶² See Brian Woods & Nick Watson, *The Social and Technological History of Wheelchairs*, 11 INT’L J. THERAPY & REHABILITATION 407, 408 (2004).

⁶³ See SARAH F. ROSE, NO RIGHT TO BE IDLE: THE INVENTION OF DISABILITY, 1840S-1930S, at 212 (2017) (discussing barriers to veterans’ ability to return to work).

⁶⁴ See LINKER, *supra* note 47, at 37, 55–56 (noting the connection between disability and poverty or concern that it meant inability to work).

⁶⁵ See *id.* at 12, 21–34; see also THEDA SKOCPOL, PROTECTING SOLDIERS AND MOTHERS: THE POLITICAL ORIGINS OF SOCIAL POLICY IN THE UNITED STATES (1992) (documenting the evolution of Civil War pensions); Rabia Belt, *Ballots for Bullets?: Disabled Veterans and the Right to Vote*, 69 STAN. L. REV. 435, 462–68 (2017) (detailing the widespread social and political contempt of soldiers following the Civil War); Peter David Blanck & Michael Millender, *Before Disability Civil Rights: Civil War Pensions and the Politics of Disability in America*, 52 ALA. L. REV. 1 (2000).

⁶⁶ See LINKER, *supra* note 47, at 12; Bagenstos, *supra* note 9, at 10.

⁶⁷ See LINKER, *supra* note 47, at 21–34.

⁶⁸ *Id.* at 37 (quoting Gwilym G. Davis, *President’s Address*, 12 AM. J. ORTHOPEDIC SURGERY 1 (1914)).

Rehabilitation following war wounds took many forms,⁶⁹ but throughout this period, policymakers and veterans groups argued that veterans, especially those who had lost limbs, needed more than pensions or job training. They needed to be able to purchase technologies that would enable them not just to work but also to get to work in the first place.⁷⁰ In the years following the Civil War, and again after the First and Second World Wars, the federal government created programs that subsidized veterans' purchases of artificial limbs and encouraged innovation in new technology.⁷¹ Amputee veterans of the Civil War were given "limb allowances" that enabled them to purchase artificial limbs.⁷² By the end of World War I, the federal government had gone further, both by investing in artificial limb innovation at Walter Reed Hospital and by mandating that veterans wear the artificial limbs that they were given.⁷³

In these situations, the government's disability policy was operating as a demand-side innovation incentive. Wounded veterans were unlikely to be wealthy in the first place, and their disabilities further decreased their earnings.⁷⁴ Although they may have wanted to purchase expensive artificial limbs, without government allowances they often would not have been able to afford them.⁷⁵ In an economic sense, wars created increased willingness to pay for assistive technology, but they also limited veterans' ability to pay for it. Government subsidies and pensions boosted that ability to pay, and firms rushed to meet it. For example, in 1917, Albert Follett introduced the E-Z-Leg, a mass-produced artificial leg made of vulcanized fiber that could be made available to veterans for only twenty dollars, one-tenth of the price of standard wooden legs.⁷⁶ The administrators at Walter

⁶⁹ See *id.* at 37; Belt, *supra* note 65, at 451 (noting that although amputations were the most visible disability caused by the Civil War, mental illnesses were the predominant ones). The U.S. government passed laws to assist with the rehabilitation of returning veterans. See, e.g., Vocational Rehabilitation Act, Pub. L. No. 65-178, 40 Stat. 617 (1918).

⁷⁰ See LINKER, *supra* note 47, at 37 (discussing welfare reform's emphasis on productive capacity in this period).

⁷¹ See HAMRAIE, *supra* note 2, at 51 ("Following the Civil War, the U.S. federal government offered subsidies for the invention and manufacture of artificial limbs for soldiers, creating a marketplace for new innovations in prosthetics. As the new technologies proliferated, inventors advertised their products by claiming their authority to know and make these devices.").

⁷² LINKER, *supra* note 47, at 98.

⁷³ See *id.* at 99, 101.

⁷⁴ See *id.* at 37 (noting the link between disability and poverty).

⁷⁵ See Mihm, *supra* note 46, at 292 (discussing the disparity in artificial limbs available to the working class versus wealthier classes).

⁷⁶ LINKER, *supra* note 47, at 108–10.

Reed were pleased with the E-Z-Leg's modular construction, which allowed them to mix and match parts for each veteran.⁷⁷

Importantly, however, the goals of policymakers, orthopedists, and administrators did not always match up with veterans' preferences. That the government had to require artificial limb use suggests that many veterans preferred not to use a prosthesis or that they were satisfied with a common peg leg.⁷⁸ But while peg legs were even cheaper and often just as functional as the more sophisticated options, Charles Silver, the limb program administrator at Walter Reed in the years after World War I, viewed the peg leg as a means for veterans to garner sympathy and alms rather than rejoin the work force.⁷⁹ Silver cared about more than how well the leg would work or how much it would cost; for him, the limb's aesthetics mattered too.⁸⁰ Yet to soldiers who actually had to use it, the E-Z-Leg could be "unreliable and uncomfortable," and, despite the government's best efforts, many of them found that they could adapt to their conditions more easily without a prosthesis.⁸¹

B. *Getting Veterans Behind the Wheel*

New technology that enabled amputee veterans to walk and to work was important, but even before the Second World War ended, many veterans groups realized that their post-war employability would also depend on their ability to get to work.⁸² In the 1940s, the forces of social welfare laws and corporate research combined to offer disabled veterans a solution. While many amputee veterans were

⁷⁷ *Id.* at 110.

⁷⁸ *See id.* at 101.

⁷⁹ *Id.* at 113 ("The E-Z-Leg . . . provided Silver with a solution to the societal fear that World War I ex-servicemen would expect charitable handouts as their predecessors had. . . . [T]he hope behind the E-Z-Leg was that it would prevent veterans from misusing their artificial limbs as a means to garner unwarranted sympathy or alms."); *see also* SUSAN M. SCHWEIK, *THE UGLY LAWS: DISABILITY IN PUBLIC* (2009) (discussing the history of "ugly laws" that banned "unsightly beggars" in public); Jasmine E. Harris, *The Aesthetics of Disability*, 119 COLUM. L. REV. 895 (2019) (proposing a framework for acknowledging the role of aesthetics in the fight for disability rights).

⁸⁰ *See* LINKER, *supra* note 47, at 112 ("For Silver, artificial legs were more than mere tools for standing and support—they were symbols, material entities that embodied sociopolitical fears and hopes, artificial devices embedded with stories from the past and visions for the future."). Stephen Mihm suggests that similar issues arose with artificial limbs in the years following the Civil War, where Oliver Wendell Holmes, Sr. urged the adoption of limbs that would "be presentable in polite society." Mihm, *supra* note 46, at 288 (quoting Oliver Wendell Holmes, *The Human Wheel, Its Spokes and Felloes*, ATLANTIC MONTHLY, May 1863, at 574).

⁸¹ *See* LINKER, *supra* note 47, at 118.

⁸² *See, e.g.*, GUFFEY, *supra* note 2, at 51 ("[D]riving was encouraged as part of veterans' recuperation.").

rehabilitating their injuries at military hospitals, they were provided with automobiles from the major car manufacturers that had been modified with controls adapted to drivers with disabilities.⁸³ The soldiers who practiced driving the cars in the hospital parking lot realized that the car was a key feature of mid-century American independence.⁸⁴ To them, the use of a car was as much a part of their reintegration into society as was a seeing-eye dog, a wheelchair, or a prosthetic limb.⁸⁵ The automakers, for their part, saw the opportunity to burnish their public image and a new market during a period of rationing that had curtailed their ability to sell cars.⁸⁶

Again, though, disabled veterans might have been willing to pay for these expensive new automobiles, but in the majority of cases they simply would not have been able to afford them. Accordingly, veterans groups began lobbying federal and state governments to provide specific allowances that would enable them to purchase accessible vehicles. They found a supporter in Representative Edith Nourse Rogers, one of the drafters and sponsors of the G.I. Bill.⁸⁷ With her backing, Congress passed legislation that provided a \$1600 automobile subsidy for veterans who had lost the use of one or both legs.⁸⁸ Unsurprisingly, demand for the subsidy was robust. Tens of thousands of veterans applied, and more than fifteen thousand of them received new automobiles within the first fourteen months since the bill's passage.⁸⁹ The governmental allowance had a demand-boosting effect, enabling veterans to purchase accessible technologies at a higher rate than they would have in its absence.

The automobile allowance was one of the first successful collaborations between government and mass-market commercial producers rather than between government and specialized manufacturers of medical devices.⁹⁰ As an innovation story, however, the automobile

⁸³ See *id.* ("Several major automakers concurred, with Ford and Oldsmobile providing adaptations to some of their most popular automobile makes. At Birmingham Hospital the program was so successful that the patient parking lot was informally dubbed 'Oldsmobile Row.'" (citation omitted)); see also WILLIAMSON, *supra* note 2, at 33 (cataloguing the variety of adaptations from automobile makers).

⁸⁴ See GUFFEY, *supra* note 2, at 49 ("This new mobility was also egalitarian. White and non-white, rich and relatively poor, able-bodied and disabled all had access to the road, and all the freedoms it implied.").

⁸⁵ WILLIAMSON, *supra* note 2, at 33.

⁸⁶ *Id.*

⁸⁷ *Id.* at 34.

⁸⁸ *Id.*; PARALYZED VETERANS OF AM., AN ORAL HISTORY OF THE PARALYZED VETERANS OF AMERICA 7 (1985); ROGERS, Edith Nourse, HISTORY, ART & ARCHIVES: U.S. HOUSE OF REPRESENTATIVES, [https://history.house.gov/People/Listing/R/ROGERS,-Edith-Nourse-\(R000392\)/](https://history.house.gov/People/Listing/R/ROGERS,-Edith-Nourse-(R000392)/) (last visited June 3, 2020).

⁸⁹ WILLIAMSON, *supra* note 2, at 34.

⁹⁰ *Id.*

subsidy is not quite so straightforward. Many of the automakers had already developed the necessary technology prior to the subsidy's passage.⁹¹ Perhaps they were innovating in expectation of forthcoming demand, but it's also possible that the innovations would have emerged in the absence of the subsidy.

Of course, fewer veterans would have been able to take advantage of the innovation in the absence of a government subsidy, so from their perspective, at least, governmental action was essential to widespread technological diffusion. But other details complicate the story. First, most of the innovation was directed towards veterans who had lost one or both legs, while fewer options emerged for armless veterans.⁹² Next, many of the veterans who received the subsidy found that it was not well adapted to their needs. The allowance was only to be used for purchasing new cars, but some veterans found that \$1600 was not enough to purchase a new vehicle with automatic transmission—one of the most important technological developments for drivers with disabilities.⁹³ According to one veteran:

At that time the law said you had to purchase the car for \$1600. Well, you couldn't get a car with an automatic transmission for \$1600. So what we had to do was buy a Chevrolet, say, have it rigged up with all sorts of crazy controls to prove you could drive it, then sell it. It wasn't hard to do because it was right after the war and cars were rationed to dealers. So we had no trouble getting our Oldsmobiles once we got rid of this \$1600 or less car⁹⁴

As with the case of artificial limbs, the nature of the innovation incentive distorted the supply of assistive technologies away from the preferences of users with disabilities. Here again, intermediaries' demands—in this case, automakers' desire to sell new cars—created an incentive mechanism that was not as well adapted to the needs of users with disabilities as it could have been if, for example, the veterans had simply been given a subsidy to purchase accessible technology.⁹⁵

⁹¹ See *id.* at 33.

⁹² See *id.* at 34 (noting Edith Nourse Rogers's observation that upper-limb amputees and the blind encountered serious access barriers).

⁹³ *Id.* at 90.

⁹⁴ PARALYZED VETERANS OF AM., *supra* note 88, at 6 (quoting founding member George Hohmann).

⁹⁵ See Jacobus tenBroek & Floyd W. Matson, *The Disabled and the Law of Welfare*, 54 CALIF. L. REV. 809, 831 (1966) ("It is the agency of welfare, not the recipient, who decides what life goals are to be followed, . . . what services are appropriate, . . . and what funds allocated to each. In short, the recipient is told *what* he wants as well as how much he is wanting.").

However successful the automobile allowance may have been for disabled veterans, it had little sustained effect thereafter. The allowance augmented demand for accessible technology by increasing veterans' ability to pay for new vehicles. But when the subsidy disappeared, so did the technology.⁹⁶ Disabled civilians in the years after the war had to "work[] directly with mechanics to develop and install their own designs."⁹⁷ When demand-boosting incentives produce individual-level innovations like this, availability of the innovation may tend to wane once the incentive is removed.⁹⁸

C. Innovation by Users with Disabilities

Access innovations in the middle of the twentieth century didn't only come from governments or corporations, they weren't always supported by patents or grants, and they didn't only focus on veterans. Throughout this period, thousands of people with disabilities created and shared solutions to accessibility issues in their homes, workplaces, and leisure activities. Often these were tweaks to existing gadgets—the sorts of things that we would now call "life hacks."⁹⁹ Even the smallest of them could meaningfully improve people's lives, while others completely reshaped our understanding of disability and access.

Perhaps the most fascinating cohort of user innovators in the middle of the twentieth century were survivors of polio. The disease affected hundreds of thousands of Americans during this period, causing varying degrees of paralysis, including respiratory paralysis and quadriplegia.¹⁰⁰ Thanks again to improved medicine and surgery, many paralyzed polio victims survived far longer than they would have previously. Yet while the March of Dimes raised millions of dol-

⁹⁶ Cf. Mary Tremblay, Audrey Campbell & Geoffrey L. Hudson, *When Elevators Were for Pianos: An Oral History Account of the Civilian Experience of Using Wheelchairs in Canadian Society. The First Twenty-Five Years: 1945–1970*, 20 *DISABILITY & SOC'Y* 103, 107 (2005) ("Hand-controls for automobiles were developed specifically for WW II veterans in 1945 by automobile companies. Production ceased once the veterans' needs had been met.").

⁹⁷ Cf. *id.* (noting the challenges of Canadian civilians with disabilities who attempted to obtain cars with hand controls).

⁹⁸ One could imagine situations in which consumers are simply unaware of their needs for a new piece of technology, and the demand-side incentive helps more people figure out that they desire the technology. Cass Sunstein, for instance, uses the example of backup cameras on automobiles as an experience good that has an initially unclear value. Cass R. Sunstein, *Rear Visibility and Some Unresolved Problems for Economic Analysis (with Notes on Experience Goods)*, 10 *J. BENEFIT-COST ANALYSIS* 317, 328 (2019).

⁹⁹ See, e.g., Liz Jackson, Opinion, *We Are the Original Lifehackers*, *N.Y. TIMES* (May 30, 2018), <https://www.nytimes.com/2018/05/30/opinion/disability-design-lifehacks.html>.

¹⁰⁰ See DAVID M. OSHINSKY, *POLIO: AN AMERICAN STORY* 17, 70 (2005).

lars for polio research and treatment,¹⁰¹ polio survivors found that they were largely responsible for handling their own daily needs.

At home, work, and play, polio survivors innovated customized technologies that enriched their lives, and they shared their innovations with others. In the 1950s, Sally Russell and Ruth Shema, both respiratory polio survivors, or “respos” as survivors would eventually call themselves, began publishing a newsletter called the *Toomeyville Gazette* for polio survivors at the Toomey Pavilion rehabilitation center in Ohio.¹⁰² The first issue dealt with mundane matters like the Christmas card sale and recognition of the doctor, nurse, and aide of the month.¹⁰³ By the release of the September 1957 issue, the *Gazette* began featuring descriptions of innovative problem solving that others might try.¹⁰⁴ In that issue, a man named Don Kollar reported that he had jerry-rigged his station wagon to power his respirator on car trips to and from the hospital.¹⁰⁵ Subsequent issues became increasingly devoted to technological issues and adaptations, including a regular “Equipment” column, descriptions of do-it-yourself fixes called “Oddments and Endments,” and a classified advertisement section that was limited to sellers who themselves had disabilities.¹⁰⁶ By 1959, the issue had grown to forty-four pages in length, and it reached readers from across the U.S. and Canada.¹⁰⁷ Throughout its history, the *Gazette* “boast[ed] an all-female editorial board of ‘three horizontal respos’—women paralyzed by polio—and two nondisabled ‘vertical volunteers’ whom these women had met at the Toomey Pavilion rehabilitation center.”¹⁰⁸

Examples of user innovations included dozens of varieties of mouthsticks adapted to a host of different uses such as painting, writing, and typing.¹⁰⁹ The editors relied on these tools both to publish issues and for their entertainment. Other innovations involved modifications to commercial medical equipment and switches that allowed

¹⁰¹ See, e.g., *id.* at 151 (detailing a “record-breaking \$55 million March of Dimes campaign in January 1954”).

¹⁰² TOOMEYVILLE GAZETTE, July 1955, http://www.polioplacelibrary.org/sites/default/files/files/Toomeyville_Gazette_July_1955.pdf; see WILLIAMSON, *supra* note 2, at 74–76.

¹⁰³ TOOMEYVILLE GAZETTE, *supra* note 102, at 1, 3, 7.

¹⁰⁴ See TOOMEYVILLE GAZETTE, Sept. 1957, at 9, http://www.polioplacelibrary.org/sites/default/files/files/Toomeyville_Gazette_September_1957.pdf.

¹⁰⁵ *Id.*

¹⁰⁶ WILLIAMSON, *supra* note 2, at 76, 82.

¹⁰⁷ TOOMEYVILLE JR. GAZETTE, Summer 1959, http://www.polioplacelibrary.org/sites/default/files/files/Toomeyville_Jr_Gazette_Vol_2_No_2_Summer_1959_OCR.pdf; see *id.* at 11–14 (noting equipment ideas from Canada, California, North Carolina, and Ohio).

¹⁰⁸ WILLIAMSON, *supra* note 2, at 74.

¹⁰⁹ See *id.* at 87–88.

people to operate multiple appliances from a single location.¹¹⁰ Still others offered suggestions for modifying living environments to make them accessible, convenient, and safe.¹¹¹

The contributors to the *Gazette* seemed pleased that others might learn from their efforts, and they were happy to share their personal successes with others. Some referred to themselves as “inventors,” and some offered their services as commercial transactions in the classified section.¹¹² But for the most part, formal intellectual property law was far from contributors’ minds. One exception was Alice Loomer, a rehabilitation psychologist and respiratory polio survivor herself. Loomer lamented the inability of “scientists and technologists” to “picture[] our real needs in practical (and cheap) terms.”¹¹³ People with disabilities often needed simple, inexpensive solutions, but, relative to nondisabled people, they made up a much smaller market.¹¹⁴ Manufacturers and corporations, however, “need products so complicated that they have exclusive rights.”¹¹⁵ Here, Loomer pointed out a distortion in the market for innovation caused by the patent regime. Many of the products that people with disabilities needed were too simple to obtain patent rights, but firms wouldn’t invest in creating products unless they could be confident of obtaining a meaningful return.¹¹⁶ Firms would either create products that were too complicated to be used (and paid for), or they would simply avoid the market entirely.

Decades before modern antidiscrimination laws, a variety of legal and non-legal factors were already shaping innovation in accessible design and improving opportunities for people with disabilities. These included both supply-side incentives like patents and demand-side incentives like social welfare payments. User innovations also supplemented the availability of accessible designs. I now turn to another

¹¹⁰ *Id.* at 71; *Engineer-Inventor*, TOOMEY J GAZETTE, Indian Summer 1960, at 23, http://www.polioplace.org/sites/default/files/files/Toomey_J_Gazette_Vol_3_No_2_Summer_1960_OCR.pdf.

¹¹¹ WILLIAMSON, *supra* note 2, at 71, 84–86. Similar user innovations were published by *Paraplegia News*, a periodical published by the Paralyzed Veterans of America. *Id.* at 76.

¹¹² TOOMEY J GAZETTE, Fall–Winter 1962, at 33, <https://www.yumpu.com/en/document/read/45180434/toomey-j-gazette-vol-5-no-2-fall-winter-1962-polio-place> (describing the “SWITCH-O-MATIC” that “was invented by Herb Merrill, an electronics design engineer, who is almost totally paralyzed by polio, to fulfill his own need for more independence”); *id.* at 51 (advertising automotive hand controls, car hoists, and electric page turners, for instance).

¹¹³ Alice Loomer, *Hanging onto the Coattails of Science*, REHABILITATION GAZETTE, 1982, at 30 (emphasis omitted). Note that this is the same publication as the *Toomeyville Gazette*, *Toomeyville Jr. Gazette*, and *Toomey j Gazette*.

¹¹⁴ *See id.*

¹¹⁵ *Id.*

¹¹⁶ *See* discussion *infra* Section V.A.

user innovation that completely reshaped disability and access: the modern wheelchair.

III THE WHEELCHAIR: A CASE STUDY IN ACCESS INNOVATION INCENTIVES

For most of human history, people with disabilities in search of mobility aids were limited to canes, crutches, and walking sticks.¹¹⁷ Wheeled chairs have been used for centuries, but until the mid-twentieth century they were largely devices for wealthy people, and their principal uses were at home or in institutions.¹¹⁸ Everything changed dramatically with the introduction of the modern wheelchair by Herbert Everest and Harry Jennings in the 1930s. Everest and Jennings began as user innovators, but they secured patents on their inventions and used them to capture almost ninety percent of the market for wheelchairs in the United States. But by the time their patents expired, Everest & Jennings, Inc. (E&J) had stopped innovating and turned to other measures to restrict competition, ultimately leading to an antitrust lawsuit by the Department of Justice in 1979. Only thereafter did the market for innovation in wheelchair design open up, but E&J's activities had altered the landscape of disability, access, and innovation in myriad ways, both literally and figuratively.¹¹⁹

The story of wheelchair innovation is monumentally important to understanding the law's effects on accessible design. The creation and dissemination of the modern wheelchair exhibit the influence of numerous legal and non-legal innovation levers, and they demonstrate how these levers can both promote and impede development of accessible design. Moreover, the widespread diffusion of the modern wheelchair enabled the next stage of the law's response to disability—the creation and dissemination of design codes that would be mandated by antidiscrimination law.

A. *Before E&J*

Before the middle of the twentieth century, most wheeled chairs were designed for indoor use by wealthy people.¹²⁰ The wheelchairs developed in the eighteenth century had small wheels that prevented

¹¹⁷ See GUFFEY, *supra* note 2, at 20; see also KAMENETZ, *supra* note 1, at 8–13 (describing the limited use of wheeled chairs in ancient societies).

¹¹⁸ See Woods & Watson, *supra* note 62, at 407–08.

¹¹⁹ See *infra* Sections III.B, C.

¹²⁰ See Woods & Watson, *supra* note 62, at 407–08.

them from being taken outside, and they were generally meant to be pushed by an attendant rather than self-propelled. They were typically made out of wood or wicker, so they were simultaneously heavy and fragile.¹²¹

Some early wheelchairs did manage to capture significant public attention, if not widespread use. Belgian inventor John Joseph Merlin's mechanical chair, released in the late eighteenth century, was atypically self-propelled.¹²² Merlin heavily promoted his chair, and for a century thereafter nearly all self-propelled chairs were known as "Merlin chairs."¹²³ At the same time, inventors in the English spa town of Bath produced chairs that could be used by people using the city's rejuvenating baths.¹²⁴ These tricycle-like devices had large rear wheels and a smaller front wheel that could be steered, but not propelled, by the rider. An attendant was required for mobility in a Bath chair.¹²⁵ These were chairs for the wealthy, but the cataclysm of a major war would begin to alter wheelchair design.

Just as it had done for artificial limbs, the American Civil War pushed innovation in wheelchair design. After the war, inventors began to adapt technologies and materials from adjacent fields like bicycle design into wheelchairs' wheels and brakes.¹²⁶ Several of these inventors patented their creations, but most of them failed to find much of a market.¹²⁷

The biggest change during the late nineteenth and early twentieth centuries was not, however, technological. Instead, it was the increasing treatment of wheelchairs as medical devices, rather than contrivances for the wealthy.¹²⁸ Ironically, though, the medicalization of the wheelchair did not result in its recognition as essential assistive technology akin to crutches or prostheses. Rather, in light of the prevailing rehabilitation model, where recovery from disability meant doing things in the same way that nondisabled people did them, "[w]heelchair use symbolized either the failure of medicine to find a

¹²¹ See GUFFEY, *supra* note 2, at 22–27.

¹²² *Id.* at 25.

¹²³ *Id.*

¹²⁴ *Id.* at 27.

¹²⁵ See *id.*; Woods & Watson, *supra* note 62, at 407 fig.1.

¹²⁶ GUFFEY, *supra* note 2, at 32.

¹²⁷ See *id.* at 32–33 (noting the increasingly limited use of wheelchairs outside of hospitals); see also U.S. Patent No. 40,547 (issued Nov. 10, 1863) (granting a patent to Charles L. Bauder); U.S. Patent No. 150,022 (issued Apr. 21, 1874) (granting a patent to Peter Gendron).

¹²⁸ See GUFFEY, *supra* note 2, at 32; Woods & Watson, *supra* note 62, at 407.

cure and/or that the wheelchair user had given up on rehabilitation.”¹²⁹

B. *The E&J Revolution*

This was the world of wheelchairs that Herbert Everest, a mining engineer, entered when he became disabled in 1918.¹³⁰ Everest had a large wicker wheelchair that had to be strapped onto his car if he wanted to travel with it.¹³¹ This was a challenging operation for Everest, and it risked damaging the fragile device. If Everest couldn't get his wheelchair into his car, he couldn't earn a living and support his family.¹³² Accordingly, he did what the people at Toomey did—he invented a solution to the problem.

Everest recalls that his wife discovered a folding wooden chair that would fit in the car rather than having to be strapped onto it.¹³³ From there, Everest contacted his neighbor, another engineer named Harry Jennings, and together they produced a version of the folding chair with tubular steel and welded joints.¹³⁴ The chair resembled a film director's chair with small wheels.¹³⁵ At this point, the Everest and Jennings design was similar to the user innovations discussed in Part II: a person with a disability and his family and friends adapted a familiar product to the person's needs. Everest and Jennings differed from most of the innovators at Toomey in one important way: on February 11, 1936, they filed for a U.S. patent.¹³⁶ It was granted on October 12 of the following year.¹³⁷

Everest and Jennings formed a company, Everest & Jennings, Inc., to produce and market their wheelchair, and over the next decade they continued iterating its design. They added folding foot-rests in 1939,¹³⁸ and several years later they enlarged the rear wheels and shrunk the front ones, obtaining a patent on a design that became the archetypal wheelchair for the remainder of the century.¹³⁹

On the strength of its innovation, and supported by its patents, E&J established wheelchairs as an essential assistive technology and itself as the technology's dominant provider. Benefiting from the

¹²⁹ Woods & Watson, *supra* note 62, at 407.

¹³⁰ GUFFEY, *supra* note 2, at 37.

¹³¹ *See id.*

¹³² *See* Woods & Watson, *supra* note 62, at 408.

¹³³ GUFFEY, *supra* note 2, at 37.

¹³⁴ *Id.*

¹³⁵ *See* U.S. Patent No. 2,095,411 (filed Feb. 11, 1936) (issued Oct. 12, 1937).

¹³⁶ *Id.*

¹³⁷ *Id.*

¹³⁸ U.S. Patent No. 2,181,420 (filed Oct. 8, 1937) (issued Nov. 28, 1939).

¹³⁹ U.S. Patent No. 2,486,015 (filed Oct. 1, 1945) (issued Oct. 25, 1949).

increase in people with disabilities from the Second World War and polio (President Franklin Delano Roosevelt was an E&J user¹⁴⁰), the company saw a massive jump in demand for its product.¹⁴¹ And this need-based demand was further enhanced by government provision of E&J chairs to disabled veterans¹⁴² and March of Dimes philanthropy for polio survivors.¹⁴³ Accordingly, by 1987, E&J had control of ninety percent of the market in the United States.¹⁴⁴

E&J's wheelchair revolutionized the meaning of disability and access for millions of people.¹⁴⁵ People with mobility impairments were no longer confined to their homes or institutions. Because the chairs were lightweight and foldable, they could be packed in cars and driven to work and to leisure.¹⁴⁶ As the Paralyzed Veterans of America put it, the E&J wheelchair "has signed the 'declaration of independence' for many thousands of physically handicapped people all over the world."¹⁴⁷ Or as E&J's early advertising brochure encouraged: "Work! Play! Go Anywhere! Without that invalid look."¹⁴⁸ E&J's wheelchair, in creating a newfound sense of independence among people with disabilities, also had the effect of aiding the reconceptualization of public access.

The success of the E&J wheelchair also fundamentally shifted ideas of rehabilitation for both people with disabilities and medical specialists. Veterans had even less tolerance for the maladapted crutches and prostheses with which they were made to walk once they could use wheelchairs that were much more efficient for mobility.¹⁴⁹ Eventually, rehabilitation professionals began to catch on: "[W]hereas

¹⁴⁰ GUFFEY, *supra* note 2, at 38.

¹⁴¹ See Woods & Watson, *supra* note 62, at 408.

¹⁴² See *id.* (noting the federal government's provision of wheelchairs to veterans in the aftermath of World War II).

¹⁴³ See Daniel J. Wilson, *Braces, Wheelchairs, and Iron Lungs: The Paralyzed Body and the Machinery of Rehabilitation in the Polio Epidemics*, 26 J. MED. HUMAN. 173, 173, 182–85 (2005).

¹⁴⁴ DONALD S. SHEPARD & SARITA L. KAREN, THE MARKET FOR WHEELCHAIRS: INNOVATIONS AND FEDERAL POLICY (HEALTH TECHNOLOGY CASE STUDY 30) (1984), <https://ota.fas.org/reports/8418.pdf>; see also Woods & Watson, *supra* note 62, at 408 (describing Everest & Jennings, Inc. (E&J) as holding a "near monopoly on the North American prescription market by the 1960s").

¹⁴⁵ See GUFFEY, *supra* note 2, at 38.

¹⁴⁶ See *id.*

¹⁴⁷ Woods & Watson, *supra* note 62, at 408 (citation omitted).

¹⁴⁸ Mary Tremblay, *Going Back to Civvy Street: A Historical Account of the Impact of the Everest and Jennings Wheelchair for Canadian World War II Veterans with Spinal Cord Injury*, 11 DISABILITY & SOC'Y 149, 154 (1996).

¹⁴⁹ See *id.* at 159 ("[A veteran said that] '[t]he emphasis then was on trying to make a paraplegic walk. And that certainly delayed our rehabilitation for months and months. . . . Then these [E&J] wheelchairs became available so they decided the answer was we were going to be confined to a wheelchair and that's it.'").

the objective was still to acquire normal capacities, this no longer involved an alignment with ordinary physical and functional capacities but the acquisition of new functional capacities pertaining specifically to the use of the wheelchair.”¹⁵⁰ The goal now, both for wheelchair users and for specialists, was to “compensate for the loss of mobility.”¹⁵¹

C. Anticompetitive Behavior, Innovation Brakes, and Backlash

The importance of E&J’s wheelchair innovations in the 1930s and 1940s cannot be overstated. Unfortunately, with the market power provided by its patents and government contracts, E&J began to rest on its laurels, producing no new innovation. And when its patents began to expire, it engaged in anticompetitive behaviors to retain its substantial profits. These activities hindered development of new wheelchair technology for decades, and they soured some people with disabilities on the use of patents as tools to encourage access innovations. Furthermore, other features of the market for wheelchairs—including third-party payers and the prospect of tort liability—limited innovation once new firms began to enter the market.

According to a story in *Forbes* magazine, “once Everest & Jennings had its fundamental design down, time essentially stood still—an old story in business. After all, why change a good thing?”¹⁵² E&J largely rested on the successful design that they had patented in the 1930s and 1940s, and they produced few new innovations thereafter. In fact, Ralf Hotchkiss, a disability rights activist and wheelchair innovator, suggests that E&J’s wheelchair design “actually started sliding backwards.”¹⁵³ E&J altered the design of the chair to make it easier to manufacture, but in so doing, they produced a structurally weaker chair that was more liable to break.¹⁵⁴ Because E&J’s patents gave it exclusive rights to make its wheelchairs, they also gave the firm exclusive rights to repair them.¹⁵⁵ More fragile wheelchairs meant

¹⁵⁰ Myriam Winance, Anne Marcellini & Éric de Léséleuc, *From Repair to Enhancement: The Use of Technical Aids in the Field of Disability*, in *INQUIRING INTO HUMAN ENHANCEMENT: INTERDISCIPLINARY AND INTERNATIONAL PERSPECTIVES* 119, 121 (Simone Bateman et al. eds., 2015).

¹⁵¹ *Id.*

¹⁵² Robert Teitelman, *De-Handicapping the Handicapped*, *FORBES*, Sept. 24, 1984, at 196, 197.

¹⁵³ RALF HOTCHKISS, *DISABILITY RIGHTS AND INDEPENDENT LIVING MOVEMENT ORAL HISTORY PROJECT 13* (Univ. of Cal., Berkeley, Reg’l Oral History Office ed., 2010), https://digitalassets.lib.berkeley.edu/roho/ucb/text/hotchkiss_ralf.pdf.

¹⁵⁴ *Id.* at 13–14.

¹⁵⁵ See Leah Chan Grinvald & Ofer Tur-Sinai, *Intellectual Property Law and the Right to Repair*, 88 *FORDHAM L. REV.* 63, 100 (2019).

more repairs. And more repairs, which could take weeks, meant that users were encouraged to purchase a second wheelchair, also from E&J, to avoid losing their independence.¹⁵⁶

E&J's patents began to expire in the early 1950s, and, according to the standard incentives-access tradeoff at the heart of patent policy,¹⁵⁷ this should have meant that competitors could enter the market and drive down the prices of wheelchairs. E&J, however, took a number of steps to preclude competitor entry. First, E&J acquired many of their potential competitors and shut them down.¹⁵⁸ Not until 1983, following a sweeping antitrust investigation by the Department of Justice, did E&J release an ultralight wheelchair.¹⁵⁹ These “killer acquisitions”—the sort that happen in a variety of other industries—preserved E&J's rent seeking ability.¹⁶⁰

In addition, E&J was able to take advantage of third-party payers for medical devices to structure the market in its favor.¹⁶¹ From the 1950s onward, the majority of wheelchairs were purchased by the federal government through the Veterans Administration (VA) or were ultimately paid for by Medicaid and Medicare insurance.¹⁶² Each of these bodies established specifications for the sorts of medical products that they would cover, and in each case the agencies developed specifications that mapped closely onto the products that E&J produced.¹⁶³ According to a 1984 report by the Government Accountability Office (GAO) of the U.S. Congress: “When VA standards were written in accord with E&J specifications, products were

¹⁵⁶ *Fair and Effective Enforcement of the Antitrust Laws, S. 1874: Hearings Before the Subcomm. on Antitrust & Monopoly of the S. Comm. on the Judiciary*, 95th Cong. 444 (1978) [hereinafter *Hearings*] (statement of Deborah Kaplan, Director, Disability Rights Center) (“[R]etailers and the manufacturer often take weeks to perform routine servicing and repair work[,] . . . forcing consumers to purchase two wheelchairs . . .”).

¹⁵⁷ See *supra* text accompanying notes 33–36.

¹⁵⁸ See HOTCHKISS, *supra* note 153, at 15 (describing E&J's anticompetitive practices, including taking “repressive . . . actions against small competitors in the U.S., crushing them”); Brian Woods & Nick Watson, *A Short History of Powered Wheelchairs*, 15 ASSISTIVE TECH. 164, 168 (2003) (noting that E&J bought up rights to produce motorized wheelchairs from a company that had gone out of business).

¹⁵⁹ See HOTCHKISS, *supra* note 153, at 15–16 (detailing the investigation into E&J's practices); Teitelman, *supra* note 152, at 197.

¹⁶⁰ Colleen Cunningham, Florian Ederer & Song Ma, *Killer Acquisitions* (Apr. 22, 2020) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3241707.

¹⁶¹ On insurers and innovation, see Eisenberg & Price, *supra* note 14, at 5 (“[P]ayers have an incentive to reduce healthcare costs rather than to increase them, providing a counterweight to the incentives of product-developing firms.”).

¹⁶² SHEPARD & KAREN, *supra* note 144, at 4, 24. Medicaid and Medicare came into existence in 1965. *History*, CTRS. FOR MEDICARE & MEDICAID SERVS., <https://www.cms.gov/About-CMS/Agency-Information/History> (last visited May 27, 2020).

¹⁶³ SHEPARD & KAREN, *supra* note 144, at 27.

often evaluated on the basis of how closely they conformed to E&J's model."¹⁶⁴ Thus, to the extent that a competitor's wheelchair diverged from E&J's models, it would have a more difficult time gaining approval from the major purchasers and insurers in the federal government.

Finally, and perhaps most importantly, E&J established agreements with foreign manufacturers and retailers to prevent them from exporting wheelchairs to the United States.¹⁶⁵ When Ralf Hotchkiss went to London to buy wheelchairs to bring back to the United States, he was told by the local retailer that they could not sell to him.¹⁶⁶ Accordingly, throughout the 1960s and 1970s, E&J was virtually the only game in town when it came to the American market. The effect on prices from lack of competition would be obvious to anyone: An E&J wheelchair that sold for \$161 in England cost \$496 in the United States.¹⁶⁷ Americans with disabilities were getting poorer quality wheelchairs at substantially higher cost because E&J turned the legitimate market power provided by its patents into illegitimate market power via anticompetitive behavior.

By the middle of the 1970s, E&J's behavior had become sufficiently notorious that disability rights activists began to complain. Hotchkiss joined with other members of consumer advocate Ralph Nader's "Nader's Raiders" to bring public and legal pressure on the manufacturer.¹⁶⁸ Journalists became interested in the story,¹⁶⁹ and the Department of Justice opened up an antitrust inquiry into E&J's activities.¹⁷⁰ This led to a lawsuit that E&J settled in 1978.¹⁷¹ As Hotchkiss describes it, "It was a classic consent decree, in which Everest & Jennings swore they had never done anything wrong, and promised never to do it again."¹⁷²

Following the antitrust settlement, E&J's market share dropped precipitously as competitors entered the market,¹⁷³ consumer prices fell, and quality improved.¹⁷⁴ In many respects, however, wheelchair

¹⁶⁴ *Id.*

¹⁶⁵ *Hearings*, *supra* note 156, at 443–44 (statement of Deborah Kaplan).

¹⁶⁶ HOTCHKISS, *supra* note 153, at 15; Jack Anderson & Les Whitten, *Yes, Virginia, There Is a Justice Department*, DAILY STANDARD, Dec. 26, 1977, at 2.

¹⁶⁷ *Hearings*, *supra* note 156, at 444 (statement of Deborah Kaplan).

¹⁶⁸ HOTCHKISS, *supra* note 153, at 11–15.

¹⁶⁹ *See, e.g.*, Anderson & Whitten, *supra* note 166, at 2.

¹⁷⁰ *Id.*

¹⁷¹ SHEPARD & KAREN, *supra* note 144, at 3.

¹⁷² HOTCHKISS, *supra* note 153, at 16.

¹⁷³ *See* Teitelman, *supra* note 152, at 197.

¹⁷⁴ HOTCHKISS, *supra* note 153, at 16.

innovation did not speed up as rapidly as many had hoped.¹⁷⁵ Although new entrants like Invacare and Sunrise Medical put pressure on E&J, they also began to buy up other smaller competitors. “[I]n most cases [Invacare and Sunrise Medical] bought them up to shut them down. . . . [U]nfortunately [it was] also in order to eliminate innovation. To stop innovation in its tracks.”¹⁷⁶ Seven years after the settlement of the antitrust suit against E&J, the GAO report still described the wheelchair market as “oligopolistic.”¹⁷⁷

There are a variety of reasons why the wheelchair market may have been less innovative and less competitive in the last quarter of the twentieth century than some might otherwise imagine. Although the size of the market was growing, there were various aspects of the prevailing legal regimes and of the market structure that may have curtailed innovation. I will now address the legal barrier to innovation, because it has gotten almost no attention in the literature, before turning to the market barrier issue which has been discussed at greater length.

1. *Products Liability Law*

When, in 1984, the GAO interviewed eleven wheelchair manufacturers to discuss innovation (and the lack of it) in the industry, several of them cited fear of products liability litigation as the principal reason for their failure to introduce new products.¹⁷⁸ Wheelchairs are potentially dangerous to their users, and manufacturers claimed that introducing new products, without established safety records, could subject them to massive liability should people get hurt. Accordingly, they tended to stick to minor modifications of existing products rather than introduce a completely novel product line.¹⁷⁹ If they continued to make wheelchairs following E&J’s established design, users would have a difficult time arguing, if and when they got hurt, that the product was fundamentally unsafe. Although it is hard to know whether these manufacturers were being honest about their innovation decisions, their story was consistent with users’ experiences. According to some, motorized wheelchairs only had two speeds: “slow and very slow.”¹⁸⁰ By this time, creating more dynamic motorized

¹⁷⁵ See *id.* (noting “slippage” in the rate of innovation after the initial post-lawsuit boom).

¹⁷⁶ *Id.*

¹⁷⁷ SHEPARD & KAREN, *supra* note 144, at 3.

¹⁷⁸ *Id.* at 30.

¹⁷⁹ See *id.* (noting that manufacturers’ fear of litigation “is greatest for an entirely new product and less for the majority of innovations, which are modifications of existing products”).

¹⁸⁰ WILLIAMSON, *supra* note 2, at 103 (quoting a wheelchair technician).

wheelchairs was increasingly feasible due to technological advances, but manufacturers still did not supply products that users demanded. Apparently, the choice to regulate wheelchairs had less to do with technological limitations than it did with manufacturers' desire to avoid causing injuries for which they may have to pay.

Interestingly, this story runs counter to one of the major reasons why U.S. courts adopted strict products liability during the second half of the twentieth century.¹⁸¹ By preventing manufacturers from escaping liability when their products were no more dangerous than others on the market, strict liability was supposed to create incentives to most efficiently reduce the costs of accidents.¹⁸² If products could be made safer, then strict liability should have motivated innovation.¹⁸³ To the extent that the story is different here, the answer likely lies in the fact that wheelchair users were often not the actual purchasers of the technology. Because third-party payers decided which products would be covered and which ones would not, wheelchair manufacturers may not have felt compelled to search for innovations that would increase safety while also improving performance.¹⁸⁴ To the extent that they did produce innovations, they tended to be “tweaks” of decades-old designs rather than revolutionary alternatives.¹⁸⁵

2. *Intermediary Payers*

An even larger distortion in the market for wheelchair innovation arose from the existence of intermediaries—government and private purchasers and insurers—who sit between manufacturers and users and make decisions that affect which products are available to consumers. By 1984, the VA, Medicaid, Medicare, and private insurance companies accounted for almost ninety percent of the funding for

¹⁸¹ See, e.g., *Ind. Harbor Belt R.R. v. Am. Cyanamid Co.*, 916 F.2d 1174, 1177 (1990) (“By making the actor strictly liable . . . we give him an incentive, missing in a negligence regime, to experiment with methods of preventing accidents that involve . . . relocating, changing, or reducing (perhaps to the vanishing point) the activity giving rise to the accident.”); Steven Shavell, *Strict Liability Versus Negligence*, 9 J. LEGAL STUD. 1 (1980) (comparing reductions in accident costs under negligence versus strict liability rules); Mark A. Geistfeld, *Products Liability* 304–06 (N.Y. Univ. Law & Econ. Working Paper Series, No. 09-19, 2009) (detailing the effects of tort liability on innovation).

¹⁸² Shavell, *supra* note 181, at 14–15.

¹⁸³ There is mixed evidence for whether strict liability has been able to deliver on its promise of improved innovation incentives. This literature is discussed in Geistfeld, *supra* note 181, at 304–06.

¹⁸⁴ See *infra* notes 189–94 and accompanying text.

¹⁸⁵ See generally Christopher Buccafusco, Stefan Bechtold & Christopher Jon Sprigman, *The Nature of Sequential Innovation*, 59 WM. & MARY L. REV. 1 (2017) (discussing tweaking versus pioneering innovations).

wheelchair purchases, and a variety of their activities distorted innovation incentives.¹⁸⁶

For example, each of these parties employ specifications about which wheelchairs they would cover and which they would not. E&J was able to manipulate these specifications to capture more market share.¹⁸⁷ But even after E&J's share was reduced, introducing an innovation wheelchair design was risky.¹⁸⁸ If one or more of the payers refused to cover the new design, the manufacturer's chances of recouping its R&D costs were much lower.¹⁸⁹ Scholars have recognized this problem in a variety of healthcare-related fields, and it seems to have affected wheelchair innovation as well.¹⁹⁰

Third-party payers' specifications distorted innovation in a number of other ways. For example, in order to receive coverage from Medicare and Medicaid for at least some wheelchairs, people with disabilities needed to have a prescription.¹⁹¹ But according to the GAO, physicians often wrote prescriptions for a "standard wheelchair," so the insured party only received reimbursement for one of the cheapest models.¹⁹² Manufacturers would not make more innovative and thus more expensive products if they did not believe that they would be able to sell them. One particular distortion arose from the way in which many third-party payers covered wheelchairs. Often when considering which wheelchairs are justifiable expenditures, the only costs that payers contemplated, at the time of GAO's study, were initial purchase costs.¹⁹³ Medicare, for example, might prefer Firm A's chair over Firm B's chair because the former sells for one hundred dollars less than the latter. The lower upfront price, though, could be based on Firm A's use of cheaper materials that would wear out more quickly. But if Medicare does not cover repair costs, then it would not factor them into its determination of which wheelchair is a better

¹⁸⁶ SHEPARD & KAREN, *supra* note 144, at 4.

¹⁸⁷ See *supra* notes 162–64 and accompanying text.

¹⁸⁸ See *supra* notes 178–80 and accompanying text.

¹⁸⁹ See SHEPARD & KAREN, *supra* note 144, at 4 ("The extensive amount of third-party reimbursement steers innovation to devices that can expect to receive such funds."); *id.* at 41–42 (documenting eligibility of various designs for Veterans Administration (VA) reimbursement).

¹⁹⁰ See Wendy Netter Epstein, *Payors, Data, and Nudges to Improve Care*, 46 J.L. MED. & ETHICS 927, 927–28 (2018) ("Insurer financial motivations are likely to prompt denial of reimbursement for profit maximization reasons and not the betterment of patient health."); Sachs, *Administering Health Innovation*, *supra* note 14, at 2012 ("[R]eimbursement decisions also give [Medicare and Medicaid] great power to influence ex ante the kind of technologies that are developed.").

¹⁹¹ SHEPARD & KAREN, *supra* note 144, at 41.

¹⁹² *Id.* at 7.

¹⁹³ *Id.* at 4.

value. Thus, firms tended to compete on keeping initial purchase costs low at the expense of long-term use and performance value.¹⁹⁴ As the GAO argued, “[t]he emphasis on price over performance in the reimbursement procedures for general manual wheelchairs has probably discouraged innovation. As manufacturers have difficulty selling a higher priced, higher quality, manual wheelchair, they probably have little reason to produce one.”¹⁹⁵

Ultimately, intermediaries in the wheelchair market seem to have distorted innovation in a variety of ways. This was mostly the case because the intermediaries’ preferences didn’t match up well with users’ preferences. We’ve seen this phenomenon already when rehabilitation specialists tried to get disabled veterans to conform to their ideas of recovery.¹⁹⁶ Similarly, when manufacturers did not have to worry about users’ preferences for speedier wheelchairs, they seem to have avoided innovating designs that could combine performance with safety.¹⁹⁷ Here again, when disabled users of technology are prevented from choosing the products that they want and using them in the ways that they see fit, the innovative process will be distorted.

The wheelchair, and in particular E&J’s wheelchair, was inarguably the most important access technology of the twentieth century. Not only did it enable extraordinary gains in independence for people with disabilities, but it also reshaped the medical profession’s approach to rehabilitation and encouraged a new sense of political empowerment for people with disabilities—a topic I turn to below. As a matter of the law’s innovation policy, however, the story of the wheelchair is much more complicated. It was sparked by user innovation, but its widespread commercialization was encouraged both by patent rights on the supply side and by social welfare laws and philanthropy on the demand side. The market power these forces created continued even after their disappearance, as E&J solidified its position by colluding with competitors and manipulating standards. Finally, when federal antitrust action brought these practices to an end, wheelchair innovation did not see the immediate growth that might have been expected due to legal and market factors that inhibited the creation and dissemination of novel technology. Nonetheless,

¹⁹⁴ See *id.* at 4, 27.

¹⁹⁵ *Id.* at 4.

¹⁹⁶ See *supra* notes 78–81 and accompanying text.

¹⁹⁷ See *supra* note 180 and accompanying text.

the modern wheelchair ushered in a new era of disability access that led to the development of further tools for encouraging innovation.

IV

ANTIDISCRIMINATION LAW AS DEMAND-SIDE INNOVATION INCENTIVE

With the aid of their E&J wheelchairs, by the middle of the twentieth century people with disabilities could venture out of their homes and hospitals into the world around them. These improvements in access cannot and should not be understated. But wheelchair users quickly recognized that, in many respects, access was illusory. They repeatedly confronted barriers, including stairs, curbs, narrow doorways, and unusable bathrooms, that limited their ability to “live in the world.”¹⁹⁸ Increasingly, activists, designers, and scholars began to construct a new understanding of disability, one that focused not on physical or medical impairment but instead on the ways in which the built environment limited access for people with disabilities.¹⁹⁹

The same group of activists, designers, and scholars also engaged in a large-scale project to literally reshape that environment. It began in private homes and hospitals, but innovations in reconstructing the environment soon spread to college campuses, driven by the insight and passion of a cohort of people with disabilities and designers. While these were important steps, activists saw that more would be needed to encourage public and private buildings and transportation systems to adopt technologies that would make them usable for people with disabilities. Governments and private actors would have to be compelled to recognize their interests.

From the late 1960s to the end of the century, activists with disabilities pushed for and received legal regulations, modeled on contemporary civil rights laws, that would encourage, if not always force, first the federal government and then municipalities and private actors to implement technologies that enabled people with disabilities to access public spaces. In this respect, the antidiscrimination laws from 1968’s Architectural Barriers Act (ABA)²⁰⁰ to 1990’s Americans with Disabilities Act (ADA)²⁰¹ operate as demand-forcing innovation incentives. By threatening legal liability if regulated entities fail to adopt accessible features, these laws increase willingness to pay for

¹⁹⁸ See generally tenBroek, *supra* note 15.

¹⁹⁹ See WILLIAMSON, *supra* note 2, at 96–101.

²⁰⁰ Pub. L. No. 90-480, 82 Stat. 718 (codified as amended at 42 U.S.C. §§ 4151–57 (2018)).

²⁰¹ Pub. L. No. 101-336, 104 Stat. 327 (codified as amended at 42 U.S.C. §§ 12101–213 (2018)).

innovation.²⁰² A municipal bus service that previously had low willingness to pay for accessible transport should be incentivized by antidiscrimination laws to adopt innovative measures in order to avoid legal liability.

Several important themes emerge in the discussion that follows. First, antidiscrimination law motivated innovations in accessible design, but these innovations were not always in the form of products. For example, many of the changes to streets and buildings used simple, pre-existing devices like ramps. New, however, was the creation of systematic knowledge about the needs of people with disabilities and the motivation to distribute that knowledge to architects and designers. Although the ADA did spur innovation in products like accessible buses or wheelchair lifts, its principal effect was on the creation and dissemination of information.

Second, unlike the access innovations discussed above, which were exclusively available to an individual user, many of the designs motivated by antidiscrimination laws were aimed at the environmental level. These designs could be used by many people, often at the same time, and often by nondisabled people. Relatedly, incentives for environment-level innovations tended to produce more stable diffusion of technology. The ramps, curb cuts, and elevators that were installed in response to the 1973 Rehabilitation Act²⁰³ may still be in use, unlike the driver controls that emerged for WWII veterans but largely disappeared thereafter.²⁰⁴

Finally, although antidiscrimination laws can increase demand for access innovations, the purchasers of those innovations are often third parties rather than people with disabilities themselves. Whenever innovation purchasers are not the ultimate users, there are opportunities for distortions. In addition, when the costs of accessible design are borne by non-users, those costs are especially salient, and often objectionable, to payors.

A. *Design Standards and the Social Model of Disability*

There had been attempts, in the first half of the twentieth century and earlier, to modify buildings to minimize stairs, but, with the exception of hospitals and institutions, these efforts were largely confined to the private homes of wealthy people with disabilities.

²⁰² See Ian Ayres & Amy Kapczynski, *Innovation Sticks: The Limited Case for Penalizing Failures to Innovate*, 82 U. CHI. L. REV. 1781, 1807 (2015) (“[Innovation] sticks . . . may be especially useful in situations in which . . . market signals diverge in predictable ways from what we desire as a social matter.”).

²⁰³ Pub. L. No. 93-112, 87 Stat. 355 (codified as amended at 29 U.S.C. §§ 701–96 (2018)).

²⁰⁴ See *supra* Section II.B.

Throughout the mid-1800s, the British city of Bath leveled off and widened its streets to improve access to its bath houses and spas.²⁰⁵ And President Roosevelt modified both the White House and his retreat in Warm Springs, Georgia to accommodate his wheelchairs.²⁰⁶ But to many nondisabled people and to designers, the prevalent attitude was that people with mobility impairments should either stay at home or learn to adapt to the world they found.²⁰⁷ By the 1950s and 1960s, activists and designers at university campuses began challenging the idea that accessibility was only for special places or special people.

Timothy Nugent was certainly not the first person to notice the manifold ways in which the built environment of public and private spaces created access barriers for people with mobility impairments, but he became one of the most prominent early proponents of design standards that would remedy these issues.²⁰⁸ Nugent was a professor of health education and director of the Rehabilitation Education Center at the University of Illinois from the 1940s to the 1980s, and he worked to reengineer the campus at Urbana-Champaign to, in his words, “[make] it possible for the talents and resources of millions of physically handicapped individuals to be put to use for the betterment of mankind.”²⁰⁹

Nugent was a designer, and he recognized—and named—the architectural “barriers” that hindered access to the university.²¹⁰ Principal among these were the innumerable curbs and steps that made getting around campus and entering buildings all but impossible for students using wheelchairs. Without thinking, centuries of architects had been designing buildings and spaces that incorporated features that were accessible to some people but inaccessible to others.²¹¹ In

²⁰⁵ GUFFEY, *supra* note 2, at 28.

²⁰⁶ *Id.* at 41–42.

²⁰⁷ *See id.* at 3 (“Today, [a student’s difficulty navigating campus on crutches] is understood as a question of access. But in the 1950s . . . most people[] interpreted issues like this as a kind of personal challenge. It was [the student’s] responsibility to ‘fit in.’”).

²⁰⁸ *Id.* at 55 (noting that the efforts led by Nugent and others “mark[ed] a profound shift in the very conception of access”).

²⁰⁹ *Id.* at 71 (citation omitted); *see also* TIMOTHY J. NUGENT, DISABILITY RIGHTS AND INDEPENDENT LIVING MOVEMENT ORAL HISTORY PROJECT 17, 74 (Univ. of Cal., Berkeley, Reg’l Oral History Office ed., 2009), https://digitalassets.lib.berkeley.edu/roh/ucb/text/nugent_timothy.pdf.

²¹⁰ GUFFEY, *supra* note 2, at 59 (“[U]ltimately, [Nugent] began to argue, lack of access could be hunted down and tied to the minutiae of design. These he began to call ‘barriers.’”).

²¹¹ *Id.* at 58–59 (“Society has given the real range of bodies and abilities very little thought. . . . Stairs, [Nugent] explained, are an architectural convenience based on centuries of social convention, yet they are now so naturalized that we scarcely reflect on them long enough to realize that they are an accommodation.”).

Nugent's view, features such as stairs, which made accessing upper stories of buildings possible for some people but impossible for others, were no more natural or any less "special" than other features that could be used by more people.²¹²

Nugent began working to retrofit as much of the UIUC campus as possible to make it accessible to wheelchair users. These redesigns primarily included the installation of ramps on buildings, including rather elaborate ones to get to the second floor of a classroom building.²¹³ These were hardly revolutionary technologies in the sense that one normally associates with the concept of innovation. The inclined plane is one of the six traditional "simple machines," and it occurs in nature and has been used throughout human existence.²¹⁴ Instead, Nugent's innovation was to create a systematic body of knowledge about wheelchair users' needs that would radically transform the lives of students on campus. Interestingly, Nugent reported that many of the accommodations for people with disabilities were also used and preferred by nondisabled people.²¹⁵

Beyond demonstrating the means of designing accessible spaces, Nugent led the development of standards that would enable architects around the world to reproduce these designs.²¹⁶ Working with researchers at the VA and the American National Standards Institute (ANSI), Nugent's team from UIUC worked with students with disabilities to measure the amount of space that wheelchair users required for opening doors and making turns.²¹⁷ They determined the appropriate incline for ramps to make them usable for people with upper limb impairments that limited their strength.²¹⁸ And they determined the optimal dimensions of water fountains (30-36 inches from the floor), bathroom stalls (3' x 5' with a 32" outward swinging door), and

²¹² *Id.* at 75 (responding to a questioner at a conference who asked how he entered the building, Nugent retorted: "'Well, just a minute. How did you get in this building?' . . . [The questioner] said, 'I climbed up the steps.' [Nugent] said, 'Oh, wouldn't you have looked like a jackass crawling up the face of that wall if someone hadn't thought of those steps first?'" (quoting NUGENT, *supra* note 209, at 138)).

²¹³ *Id.* at 71-72. The university also purchased two buses with hydraulic lifts. *Id.* at 71.

²¹⁴ *See, e.g.,* ERNST MACH, *THE SCIENCE OF MECHANICS: A CRITICAL AND HISTORICAL ACCOUNT OF ITS DEVELOPMENT* 31 (Thomas J. McCormack trans., Open Court Publ'g Co. 6th ed. 1960) (1893).

²¹⁵ GUFFEY, *supra* note 2, at 154.

²¹⁶ WILLIAMSON, *supra* note 2, at 63-64.

²¹⁷ ANSI 117.1—1961: AMERICAN NATIONAL STANDARD SPECIFICATIONS FOR MAKING BUILDINGS AND FACILITIES ACCESSIBLE TO, AND USABLE BY, THE PHYSICALLY HANDICAPPED § 5.3 (AM. NAT'L STANDARDS INST. 1961); *see also* HAMRAIE, *supra* note 2, at 73; WILLIAMSON, *supra* note 2, at 64.

²¹⁸ HAMRAIE, *supra* note 2, at 110; WILLIAMSON, *supra* note 2, at 64. *But see id.* at 65 ("The 1:12 rise specified for wheelchair ramps . . . was still steep, and required a certain wheelchair skill to climb.").

elevators (a complex measure of total area, door width, and button height).²¹⁹ All of these measurements were based on the “standard model” wheelchair, which, at this time, would have certainly been an E&J.²²⁰

In 1961, they compiled their findings and published them as the official ANSI standards, number 117.1.²²¹ ANSI 117.1 was a short pamphlet that provided standards for “all buildings and facilities used by the public.”²²² At the time of its publication, it was not binding on any architects or designers, but it helped to codify and communicate the knowledge that Nugent and his colleagues had developed.²²³ The standards helped architects envision the ways in which their choices affected accessibility, and the document began to revolutionize architects’ design vocabularies.²²⁴ As with the simple ramps he installed on buildings, Nugent’s guidelines were not the sort of product that is normally associated with innovation, and he would not have been able to obtain patent protection had he wanted it.²²⁵ Nonetheless, their contribution to accessible design was immense.

While the work of Nugent and other designers showed that spaces could be designed to make them accessible to wheelchair users if institutions were willing, in most cases the parties that owned buildings and buses simply were not interested. The same was true for the designers and architects who built them. Building owners and municipalities were not inclined to spend money retrofitting spaces for what they saw as a tiny population of users.²²⁶ And to many design professionals, Nugent’s designs were ugly.²²⁷ Although Nugent and others

²¹⁹ ANSI 117.1—1961 §§ 5.6–5.9.

²²⁰ *Id.* § 3.1.

²²¹ *Id.*

²²² *Id.* § 1.1.1.

²²³ See HAMRAIE, *supra* note 2, at 73, 86.

²²⁴ See GUFFEY, *supra* note 2, at 68–69 (“[Nugent’s] specifications were seen as the impartial, scientific, and definitive solution to the question of disability and environmental change. They became a model for builders and architects.”); see also WILLIAMSON, *supra* note 2, at 64–65.

²²⁵ The standards were subject to copyright protection with respect to the book in which they were published, but the copyright likely would not extend to the measurements and data that it reported. See 17 U.S.C. § 102(b) (2018) (“In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.”).

²²⁶ See WILLIAMSON, *supra* note 2, at 137–38 (describing popular pushback following federal efforts to improve public buses by including wheelchair accessibility).

²²⁷ Joanne Milner, Dennis Urquhart & David Cox, *Universal Design and Designer Awareness: The Constraints of Architectural Education*, INDEP. LIVING INST. (1991), <https://www.independentliving.org/cib/cibbudapest19.html> (“A common view shared by many architects is that access is a byword for ugly. They argue that it is a costly and unnecessary

offered innovations that could make the environment more accessible, the people with disabilities who most valued these changes were not in a position to implement them. FDR could adapt the White House to accommodate his wheelchair, but the average citizen had no means to get the local post office or courthouse to do the same.

Things began to change in the 1960s and 1970s as groups of people with disabilities, most prominently those at the University of California Berkeley's Center for Independent Living, began to adopt the pervasive language of discrimination and civil rights to push for laws that would require accessibility. First, these activists had to convince lawmakers and the public that "overcoming disability," and the lack of access that it entailed, was not primarily the responsibility of people with disabilities.²²⁸ This belief—that people with disabilities must adapt themselves to the world—was pervasive in the 1950s and 1960s, and even leading rehabilitation professionals like Rusk and Nugent subscribed to some version of it.²²⁹ Protesters across the country stopped traffic, attempted to board public buses, and held rallies to demonstrate that the problem of access was social and environmental rather than personal.²³⁰

Increasingly, these efforts had major effects. In general, they helped establish the social model of disability. As Adam Samaha summarizes it, "the model moves causal responsibility for disadvantage from physically and mentally impaired individuals to their architectural, social, and economic environment."²³¹ Or, as Iris Marion Young has put it: "[M]oving on wheels is a disadvantage only in a world full of stairs."²³² The fundamental idea behind the social model of disability is to clearly distinguish between an *impairment*, such as difficulty walking, and a *disability*, the lack of access to a building with stairs. As Jessica Roberts explains, a person "may not experience that condition as disabling until she attempts to enter a building with a stairwell or a narrow doorway. Thus, the *impairment*—difficulty walking—is dis-

constraint, cluttering up clean pure spaces with hospital hardware, like grab-rails, stair/chair lifts and ramps.").

²²⁸ See WILLIAMSON, *supra* note 2, at 99 (noting that most of the Berkeley activists "had received rehabilitation and social services that pushed strongly an idea of 'overcoming' disability").

²²⁹ See *id.* at 45 (arguing that the forms of access developed by Rusk and Nugent "reflected a clear stance that navigating and negotiating the inaccessible society was the responsibility of the individual").

²³⁰ See *id.* at 141. See generally *id.* at 96–128 (documenting protest efforts).

²³¹ Samaha, *supra* note 21, at 1255.

²³² HAMRAIE, *supra* note 2, at 100 (quoting Iris Marion Young, *Foreword to DISABILITY/POSTMODERNITY: EMBODYING DISABILITY THEORY*, at xii (Mairian Corker & Tom Shakespeare eds., 2002)).

tinct from the *disability*—a lack of access.”²³³ Stairs, curbs, and the design of bathrooms are the problem, not the bodies of people with disabilities.

B. Disability Access Lawmaking: From the ABA to the ADA

From the idea that environmental features are responsible for disability and lack of access, many activists concluded that the environment must be fixed.²³⁴ No longer should people with disabilities have to adapt to their environments; instead, their environments should have to adapt to them.²³⁵ The challenge, though, was to have governments, transportation authorities, and private businesses alter their spaces to make them accessible. In some cases, these parties might be willing to eliminate barriers to access because doing so was in their economic self-interest.²³⁶ Others might have done so out of a sense of fairness to people with disabilities. But in many cases, these parties could be expected to balk at the costs of changing environments or purchasing different tools. Building ramps, modifying bathrooms, and buying accessible buses all cost money, and the groups who owned and operated public facilities might determine that the expenditures were not worth it. Accordingly, activists turned to legislation—in particular, legislation couched in the terms of antidiscrimination law—to encourage the creation of accessible environments.²³⁷

The legal landscape developed rapidly beginning in the middle of the 1960s, first with state legislation that adopted variations on Nugent’s ANSI 117.1 standards into building codes.²³⁸ In response to advocacy by the National Easter Seal Society for Crippled Children and Adults, the University of Illinois, and the President’s Committee on Employment of the Handicapped, more than half of the states had adopted some form of accessible building codes by 1965.²³⁹ That year saw the beginning of major federal legislation with the passage of the

²³³ Jessica L. Roberts, *Health Law as Disability Rights Law*, 97 MINN. L. REV. 1963, 1987 (2013).

²³⁴ See, e.g., Samaha, *supra* note 21, at 1269.

²³⁵ Winance, Marcellini & de Léséleuc, *supra* note 150, at 122 (“[I]nstead of adapting themselves to that society, they asked society to change.”).

²³⁶ See Pamela S. Karlan & George Rutherglen, *Disabilities, Discrimination, and Reasonable Accommodation*, 46 DUKE L.J. 1, 24 (1996) (“Even before the passage of the ADA, some employers found such expenditures to be profitable and hired the disabled . . .”).

²³⁷ Bagenstos, *supra* note 9, at 5.

²³⁸ James S. Jeffers, *Barrier-Free Design: A Legislative Response*, in BARRIER-FREE ENVIRONMENTS 44, 46 (Michael J. Bednar ed., 1977).

²³⁹ *Id.* at 45–46.

Vocational Rehabilitation Act Amendments of 1965,²⁴⁰ creating the National Commission on Architectural Barriers to the Rehabilitation of the Handicapped.²⁴¹ Among the Commission's responsibilities was studying the uptake (or lack thereof) of barrier-free architecture.²⁴² It released a report, *Design for All Americans*,²⁴³ that detailed challenges to accessible design, including failure to fully adopt ANSI standards into building codes, leading to insufficient attention by architects who were often unaware of the standards.²⁴⁴ In addition, the ANSI standards did not refer to accessible transportation.²⁴⁵

The Commission's findings encouraged further legislative efforts, in particular the passage of the Architectural Barriers Act (ABA) of 1968.²⁴⁶ The ABA began the process of incorporating ANSI standards into legislation, requiring compliance with the standards for buildings owned or leased by the federal government.²⁴⁷ The law did not include any explicit enforcement provisions, and, unsurprisingly, compliance was far from perfect.²⁴⁸ In response to the statute's passage, the General Services Administration, the Department of Housing and Urban Development, and the Department of Defense began issuing regulations for the use of federal funds on building design.²⁴⁹ The ABA did not apply, however, to preexisting buildings, federally financed transportation systems, state governments or local municipalities, or private parties.²⁵⁰

Congress continued to develop a more robust approach to disability access, passing the Rehabilitation Act of 1973²⁵¹ (the Act) and

²⁴⁰ Pub. L. No. 89-333, 79 Stat. 1282, *repealed by* Rehabilitation Act of 1973, Pub. L. 93-112, 87 Stat. 355.

²⁴¹ Jeffers, *supra* note 238, at 46.

²⁴² *Id.*

²⁴³ NAT'L COMM'N ON ARCHITECTURAL BARRIERS TO REHAB. OF THE HANDICAPPED, *DESIGN FOR ALL AMERICANS* (1967).

²⁴⁴ Jeffers, *supra* note 238, at 46.

²⁴⁵ *Id.*

²⁴⁶ Pub. L. No. 90-480, 82 Stat. 718 (codified as amended at 42 U.S.C. §§ 4151–57 (2012)).

²⁴⁷ RICHARD K. SCOTCH, *FROM GOOD WILL TO CIVIL RIGHTS: TRANSFORMING FEDERAL DISABILITY POLICY* 29–30 (2d ed. 2001); Jonathan C. Drimmer, *Cripples, Overcomers, and Civil Rights: Tracing the Evolution of Federal Legislation and Social Policy for People with Disabilities*, 40 UCLA L. REV. 1341, 1378 (1993).

²⁴⁸ SCOTCH, *supra* note 247, at 31; Drimmer, *supra* note 247, at 1378 & n.151.

²⁴⁹ Jeffers, *supra* note 238, at 48.

²⁵⁰ See WILLIAMSON, *supra* note 2, at 115 (noting the law covered federal buildings but not “neighboring buildings or transportation networks”); Drimmer, *supra* note 247, at 1377–78, 1377 n.150 (arguing the Architectural Barriers Act mandate for new federal buildings was narrow, especially compared to the prohibitions on and acknowledgement of discrimination in the Civil Rights Act of 1964).

²⁵¹ Pub. L. No. 93-112, 87 Stat. 355 (codified as amended at 29 U.S.C. §§ 701–96 (2018)).

significantly reorienting federal disability law.²⁵² Several features of the Act are especially worthy of notice. First, the Act created the Architectural and Transportation Barriers Compliance Board and tasked it with ensuring compliance with the ABA.²⁵³ Although the Board was small, underfunded, and limited to responding to complaints brought to it, the Board was able to exert pressure on federal building projects to increase compliance with ANSI 117.1 standards.²⁵⁴ Next, the Act expanded the scope of regulated parties to include all those receiving federal funds, including universities, federal contractors, and municipal transportation programs, by virtue of Section 504's broad prohibition on discrimination by "any program or activity receiving Federal financial assistance."²⁵⁵

Perhaps most importantly, Section 504 explicitly adopted the language of antidiscrimination law, connecting access for people with disabilities to the other major civil rights movements of the era.²⁵⁶ The section (as currently codified) reads:

No otherwise qualified individual with a disability in the United States . . . shall, solely by reason of her or his disability, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance or under any program or activity conducted by any Executive agency or by the United States Postal Service.²⁵⁷

This language explicitly echoes that of Title VII of the Civil Rights Act of 1964.²⁵⁸ Yet while disability rights were placed on par with the civil rights claims of Black people and women, they were also placed on a different, and stronger, footing. Whereas as Title VII prohibited racial discrimination by means of a negative commandment ("Thou shalt not . . ."), the Rehabilitation Act was read to impose affirmative

²⁵² See SCOTCH, *supra* note 247, at 8–11 (listing the Rehabilitation Act of 1973 as one of the legislative achievements responsible for changing the view that people with disabilities were incapable of being self-sufficient).

²⁵³ Rehabilitation Act of 1973, Pub. L. No. 93-112, § 502, 87 Stat. 355, 391–93 (codified as amended at 29 U.S.C. § 701 (2018)).

²⁵⁴ See GUFFEY, *supra* note 2, at 143–44.

²⁵⁵ See generally Rehabilitation Act § 504, 87 Stat. at 394 (codified as amended at 29 U.S.C. § 794(a) (2018)).

²⁵⁶ Section 504 was not included in the initial draft of the bill. SCOTCH, *supra* note 217, at 49.

²⁵⁷ 29 U.S.C. § 794(a).

²⁵⁸ 42 U.S.C. § 2000e-2 (2018) ("It shall be an unlawful employment practice for an employer . . . to discriminate against any individual with respect to his compensation, terms, conditions, or privileges of employment, because of such individual's race, color, religion, sex, or national origin . . .").

obligations on regulated parties to take steps to eliminate access barriers.²⁵⁹

Over the course of the 1970s, the Department of Health, Education, and Welfare (HEW) began drafting and implementing regulations for the Rehabilitation Act.²⁶⁰ When the initial draft was published in 1975, it demanded substantial overhauls of existing buildings with the goal of total accessibility.²⁶¹ Regulated entities fought back, arguing that the standards were unnecessarily costly for such a small group of individuals.²⁶² When it looked like HEW was backsliding into compromises, activists from Berkeley's Center for Independent Living and other activists staged a twenty-six-day protest at HEW's building in San Francisco.²⁶³ Ultimately, HEW Secretary Joseph Califano agreed to approve the regulations without the compromises.²⁶⁴ The regulations required that all new facilities be barrier-free, while existing facilities requiring structural changes had three years to become compliant.²⁶⁵ For the first time, regulated entities would be responsible for spending money on accessibility in order to comply with federal law.²⁶⁶

Federal disability law leapt forward with the passage of the Americans with Disabilities Act of 1990,²⁶⁷ which built on the antidiscrimination framework established by the Rehabilitation Act and expanded it to an even larger range of parties. The list of covered entities under the ADA included employers with fifteen or more employees,²⁶⁸ public entities like local school systems,²⁶⁹ and places of public accommodation, including stores, hotels, restaurants, and a host of other privately run businesses that are held open to the public.²⁷⁰ In each case, the covered entity is prohibited from discriminating against people with disabilities,²⁷¹ and, as with the

²⁵⁹ Karlan & Rutherglen, *supra* note 236, at 9, 14.

²⁶⁰ See SCOTCH, *supra* note 247, at 60–61.

²⁶¹ See WILLIAMSON, *supra* note 2, at 131.

²⁶² See *infra* notes 312–16.

²⁶³ See WILLIAMSON, *supra* note 2, at 131–32.

²⁶⁴ *Id.* at 132.

²⁶⁵ Nondiscrimination on the Basis of Handicap in Programs and Activities Receiving or Benefiting from Federal Financial Assistance, 42 Fed. Reg. 22,676, 22,681 (May 4, 1977); SCOTCH, *supra* note 247, at 117.

²⁶⁶ There were, unsurprisingly, many lamentations about the underenforcement of Section 504. See, e.g., Bonnie P. Tucker, *Section 504 of the Rehabilitation Act After Ten Years of Enforcement: The Past and the Future*, 1989 U. ILL. L. REV. 845, 848.

²⁶⁷ Pub. L. No. 101-336, 104 Stat. 327 (1990) (codified as amended at 42 U.S.C. §§ 12101–213 (2018)).

²⁶⁸ *Id.* § 101(5)(A) (codified as amended at 42 U.S.C. § 12111(5)(A)).

²⁶⁹ *Id.* § 201(1) (codified as amended at 42 U.S.C. § 12131(1)).

²⁷⁰ *Id.* § 301(7) (codified as amended at 42 U.S.C. § 12181(7)).

²⁷¹ See *id.* §§ 102, 202, 302 (codified as amended at 42 U.S.C. §§ 12112, 12132, 12182).

Rehabilitation Act, the ADA imposes affirmative duties on these entities to make reasonable accommodations to provide access.²⁷²

Title I of the ADA prohibits employers from discriminating against people with disabilities, including by failing to make reasonable accommodations that would enable them to perform the job.²⁷³ The nature of the necessary accommodations varies considerably and can include changes to work schedules or assignment to different jobs.²⁷⁴ It can also mean that the employer is responsible for adapting the workplace environment to make it usable for the employee who has a disability.²⁷⁵ This might include lowering countertops, installing lifts, or otherwise altering the physical plant of the workplace.²⁷⁶ Both private individuals and the Equal Employment Opportunity Commission have the power to enforce Title I of the ADA via litigation.²⁷⁷

Although Title I has received the most attention in the courts and from scholars, Titles II and III are also important pieces of the ADA's approach to access. Title II, which was patterned after Section 504 of the Rehabilitation Act, prohibits discrimination by public entities, including state and local government services.²⁷⁸ It goes beyond the prior law by regulating all public entities, whether or not they receive federal funding.²⁷⁹ Part B of Title II applies to access to public transportation, and it grants the federal Department of Transportation rulemaking authority to implement the ADA.²⁸⁰ Individuals or the Department of Justice may sue to enforce Title II.²⁸¹ Individuals may receive damages for intentional discrimination but not for disparate impact discrimination, and they can obtain attorneys' fees but not punitive damages.²⁸²

Title III of the ADA prohibits discrimination in places of public accommodation, requiring them to make reasonable modifications of their physical establishments, as well as any policies, practices, or procedures that would not fundamentally alter the nature of their goods,

²⁷² See Emens, *supra* note 20, at 877 (“Unlike Title VII, the ADA defines discrimination in terms of accommodation.”).

²⁷³ 42 U.S.C. § 12112.

²⁷⁴ See, e.g., Emens, *supra* note 20, at 857 & n.40.

²⁷⁵ See *id.* at 878.

²⁷⁶ See *id.* at 869 (describing various types of “reasonable accommodations” discussed in court cases).

²⁷⁷ 42 U.S.C. § 12117(a).

²⁷⁸ *Id.* §§ 12131–65; Michael Waterstone, *The Untold Story of the Rest of the Americans with Disabilities Act*, 58 VAND. L. REV. 1807, 1824 (2005).

²⁷⁹ See 42 U.S.C. § 12131(1).

²⁸⁰ *Id.* §§ 12161, 12162, 12164.

²⁸¹ Waterstone, *supra* note 278, at 1824.

²⁸² *Id.*

services, or facilities.²⁸³ Facilities constructed to be occupied after January 26, 1993 must comply with the ADA's Accessibility Guidelines,²⁸⁴ which model the updated ANSI 117.1 standards first drafted by Timothy Nugent in the 1960s.²⁸⁵ This requires accessible ramps, lifts, and bathrooms, among a variety of other technologies.²⁸⁶ Facilities that predate the ADA are obliged to remove architectural barriers to the extent that doing so is "readily achievable," but if older buildings are altered after the ADA, they must be accessible to the "maximum extent feasible."²⁸⁷ Interestingly, the Internal Revenue Service provides a tax incentive to small businesses to ease the burden of compliance.²⁸⁸ Unlike the prior titles, Title III does not provide individuals with a private damages remedy. While individuals can seek injunctive relief on their own behalf, damages are only available if the Attorney General intervenes and so requests.²⁸⁹

Over the course of three decades, federal legislation produced a sweeping reorganization of disability policy focused on antidiscrimination law, although social welfare law has remained important.²⁹⁰ From the Rehabilitation Act of 1973 onward, federal disability law did not just prohibit discrimination in a narrow sense (e.g., refusal to hire people with disabilities), but it also imposed affirmative obligations on regulated parties to undo some of the ways in which environmental structures were inaccessible. These laws encouraged the further dissemination of information about accessibility, pushing architects and designers to integrate new standards into their work. The next Section considers the ways in which the accommodation mandate succeeded and failed in its goal of promoting disabled access.

C. *The Successes and Failures of Antidiscrimination Innovation Incentives*

While scholars have debated the extent to which the accommodation requirements in federal disability law significantly distinguish dis-

²⁸³ 42 U.S.C. § 12182(b)(2)(A); Waterstone, *supra* note 278, at 1825.

²⁸⁴ Waterstone, *supra* note 278, at 1847.

²⁸⁵ See WILLIAMSON, *supra* note 2, at 244 n.4.

²⁸⁶ U.S. ARCHITECTURAL & TRANSP. BARRIERS COMPLIANCE BD. (ACCESS BD.), AMERICANS WITH DISABILITIES ACT (ADA): ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES §§ 4.8, 4.11, 4.23 (2003), <https://www.access-board.gov/attachments/article/1350/adaag.pdf>.

²⁸⁷ 42 U.S.C. §§ 12182(b)(2)(A)(iv), 12183(a)(2).

²⁸⁸ See Theodore P. Seto & Sande L. Buhai, *Tax and Disability: Ability to Pay and the Taxation of Difference*, 154 U. PA. L. REV. 1053, 1124 (2006).

²⁸⁹ Waterstone, *supra* note 278, at 1825.

²⁹⁰ See Bagenstos, *supra* note 9, at 4–5 (“[A]ctivists ‘on the ground’ have increasingly understood the importance of the social welfare system to achieving the goals of the disability rights movement.”).

ability from other forms of antidiscrimination law,²⁹¹ for our purposes, requiring regulated parties to adopt and pay for barrier-free access operates as a demand-side innovation incentive. Without the requirement, for example, a local transit authority might not be willing to pay to modify or replace its fleet of buses to make them accessible to wheelchair users.²⁹² After the passage of the Rehabilitation Act, though, the transit authority faces potential legal liability for its failure to do so. In theory, it will now be willing to pay any amount of money less than the expected liability that it faces in order to comply with the law. Thus, relative to the period before the Rehabilitation Act's passage, demand for disabled access is significantly greater.

Imagine, for example, that a restaurant operated in a building that is inaccessible to patrons using wheelchairs. The restaurant estimates that making the building accessible would cost one thousand dollars, but that it would only generate an additional five hundred dollars in revenue.²⁹³ Prior to the ADA, the restaurant would be unlikely to retrofit its building. After the ADA, however, the threat of legal liability could provide sufficient incentive for the restaurant to make the renovations. The restaurant might comply by altering its building in light of the regulations on national accessibility standards, or it might purchase new technology like a wheelchair lift that accomplishes the same goal.²⁹⁴

Moreover, regulated parties will want to comply with the Rehabilitation Act and the ADA in order to avoid liability, but given their limited budgets, they will want to do so as cheaply and efficiently as possible. This presents an opportunity for innovation.²⁹⁵ In the post-act period, regulated parties demand more accessible technology, and firms will compete to supply it. Those firms that can help regulated parties meet their obligations at the lowest cost will tend to win a

²⁹¹ See, e.g., Mary Crossley, *Reasonable Accommodation as Part and Parcel of the Antidiscrimination Project*, 35 RUTGERS L.J. 861, 862–63 (2004) (examining the extent to which the ADA's reasonable accommodation requirement is not foreign to established antidiscrimination law).

²⁹² But see Karlan & Rutherglen, *supra* note 236, at 24 (“Even before passage of the ADA, some employers found such expenditures to be profitable and hired the disabled . . .”).

²⁹³ For a discussion of the likely accuracy of parties' estimates of the costs and benefits of compliance, see Helen A. Schartz, D.J. Hendricks & Peter Blanck, *Workplace Accommodations: Evidence Based Outcomes*, 27 WORK 345, 347 (2006) (“Despite generally positive findings on the low cost and substantial benefits of accommodations, employers continue to report unsubstantiated concerns about types and costs of workplace accommodations.”).

²⁹⁴ See Berven & Blanck, *supra* note 16, at 79–80 (discussing the possibility of “induced innovation” in the disability context).

²⁹⁵ See *id.*

larger share of the market. We can expect to see firms invest in research that will lead to newer, cheaper solutions to disabled access. Returning to the example above, because firms know that restaurants will now demand technologies that improve the accessibility of their buildings, firms will compete to supply them. These innovations could drive down the cost of adapting the building. In this manner, federal disability law's antidiscrimination rules look like an innovation incentive.

Finally, it is worth pointing out that many accessibility innovations that are encouraged by federal disability policy operate at the environment level rather than the individual level.²⁹⁶ Whereas a wheelchair can only be used by a single person, a ramp can be used by many people. The same is true of curb cuts, accessible public buses, and the myriad other ways in which the environment is reshaped in order to comply with accessibility guidelines. In many cases, the innovations spurred by disability laws are relatively permanent and can be used by many people for many years. Of course, all of that is in theory. Now consider how it works in practice.

While federal disability laws have not generated all of the benefits that their proponents have desired, especially with respect to employment outcomes for people with disabilities,²⁹⁷ some areas of federal policy have had a substantial effect on access. Although change has been incremental, the aspects of the Rehabilitation Act and the ADA that focused on building codes for new construction have undeniably resulted in more governmental and privately owned spaces that are wheelchair accessible.²⁹⁸ In large part this has to do with the relatively clear standards established by ANSI 117.1 and the ADA Accessibility Guidelines.²⁹⁹ Moreover, many of the technologies involved, such as curb cuts and wheelchair ramps, are simple and inexpensive. While many spaces do not fully comply with the accessibility guidelines,³⁰⁰ many more buildings are now substantially more acces-

²⁹⁶ See Emens, *supra* note 20, at 846–47 (describing accommodations as existing along a spectrum of third-party benefits); Michael Ashley Stein, *The Law and Economics of Disability Accommodations*, 53 DUKE L.J. 79, 88 (2003) (contrasting types of accommodations that alter a physical space—which might also be used by other employees—with accommodations that alter the way in which a particular employee performs her job).

²⁹⁷ See Waterstone, *supra* note 278, at 1812 (“[T]he legal scholarship focused on Title I of the ADA views the ADA as disappointing. . . . The claim is often supported with employment statistics.”).

²⁹⁸ Satz, *supra* note 18, at 516.

²⁹⁹ See Waterstone, *supra* note 278, at 1847–48 (noting that the Accessibility Guidelines “provide an element of clarity that is missing elsewhere in Title III,” which “gives courts less room to impose a high-level access/content distinction to defeat accessibility”).

³⁰⁰ Stein, *supra* note 296, at 89 n.49.

sible than they were in the 1950s and more than they would have been in the absence of legislation.³⁰¹

In addition to incentivizing the creation and distribution of information about accessible design, antidiscrimination laws have also influenced the creation of new products that enable compliance. A 1998 study by Heidi M. Berven and Peter D. Blanck found that growth in patents for assistive technologies outpaced overall growth in patenting between 1975 and 1995, including 125 patents that explicitly referenced the ADA.³⁰² My most recent search of Google's patent database yields over seven hundred patents that reference the ADA.³⁰³ These include inventions for pedestrian walkways,³⁰⁴ a stand-alone restroom,³⁰⁵ and an amusement park ride designed for people with disabilities.³⁰⁶ There have also been many patents on chair lifts for swimming pools.³⁰⁷ It is impossible to say that none of these inventions would have come about without the ADA, but it seems likely that inventors were responding to the sizable market for accessible design.³⁰⁸

Importantly, the benefits created by federal disability policy do not just flow to people with disabilities. As Elizabeth Emens has documented, many accessible designs create substantial positive externalities for nondisabled people.³⁰⁹ This is especially true when the designs are permanent fixtures of the environment.³¹⁰ It is not just people in

³⁰¹ See Satz, *supra* note 18, at 516 (providing examples of the positive effects of the ADA); see also Waterstone, *supra* note 278, at 1832 & n.118. Some evidence suggests that the tax credit for small businesses has been less successful than might have been thought. See Seto & Buhai, *supra* note 288, at 1126.

³⁰² Berven & Blanck, *supra* note 16, at 60, 62–64.

³⁰³ Patents for Search Mentioning ADA, GOOGLE PATENTS, <https://patents.google.com> (enter “(“americans with disabilities act”) status:GRANT” into search bar).

³⁰⁴ U.S. Patent No. 8,544,222 (issued Oct. 1, 2013).

³⁰⁵ U.S. Patent No. 5,682,622 (issued Nov. 4, 1997).

³⁰⁶ U.S. Patent No. 8,079,916 (issued Dec. 20, 2011).

³⁰⁷ See, e.g., U.S. Patent No. 8,646,119 (issued Feb. 11, 2014) (and patents cited therein).

³⁰⁸ To be clear, counting patents is not an especially strong proxy for innovation, because it can be both underinclusive and overinclusive. Pierre Desrochers, *On the Abuse of Patents as Economic Indicators*, 1 Q.J. AUSTRIAN ECON. 51, 52 (1998) (“[T]aken as a whole, what comes out of a patent office is at best representative of the technological potential of a given number of innovations, but certainly not of their technological actuality.”). Lots of innovation occurs that is either unpatentable or for which inventors choose not to seek patents. The stories above about user innovation demonstrate this point. In addition, some of the “inventions” that receive patents may not represent meaningful innovation that actually advances science or satisfies a market demand. Despite these limitations, I include the above data as a suggestive proxy for innovation.

³⁰⁹ Emens, *supra* note 20, at 841 (“[T]he simple request for an accommodation by a disabled person often benefits other people.”).

³¹⁰ See *id.* at 846–47 (describing how generalizability, durability, and visibility increase third-party benefits of accommodations).

wheelchairs who benefit from wheelchair ramps, elevators, and curb cuts; parents pushing strollers, delivery people with hand trucks, and anyone for whom climbing stairs may present a challenge is better off. Moreover, by improving employment opportunities for people with disabilities, accessible designs contribute to a larger workforce with a more robust tax base and fewer people in need of governmental support. Accordingly, the spillover benefits to nondisabled people must be included when estimating the benefits that accrue from antidiscrimination law.³¹¹

But even these successes did not come without contestation. The accommodation requirements of the Rehabilitation Act and the ADA create benefits for people with disabilities (and others), but they do so by imposing costs on (typically nondisabled) parties, such as municipalities and private landowners.³¹² To some, the added costs seem economically unjustified.³¹³ If businesses will not gain enough revenue to offset the costs of accommodation, then forcing them to accommodate is an inefficient use of resources, absent government subsidies.³¹⁴ This is especially true for smaller businesses.³¹⁵ Others view regulatory demands that they build differently or alter aspects of their private property as violations of their autonomy as property owners.³¹⁶ Similar complaints were heard from designers themselves, who often objected to accessible design as mandating ugly and cluttered

³¹¹ See generally Brett M. Frischmann & Mark A. Lemley, *Spillovers*, 107 COLUM. L. REV. 257 (2007) (exploring the positive impact of spillovers in intellectual property).

³¹² See Emens, *supra* note 20, at 880 (“[O]nly people who consider themselves to have disabilities are likely to see this statute as having been enacted *for* them. For everyone else, the statute is either irrelevant or a potential cost to them, as employers or as coworkers to whom costs may be shifted.”).

³¹³ See WILLIAMSON, *supra* note 2, at 137–38 (describing backlash against accessible public transportation after the Department of Health, Education, and Welfare issued Section 504 regulations); Mark A. Schuman, *The Wheelchair Ramp to Serfdom: The Americans with Disabilities Act, Liberty, and Markets*, 10 ST. JOHN’S J. LEGAL COMMENT. 495, 506 (1995) (arguing that the ADA’s reasonable accommodation requirement sets an inefficient price floor resulting in fewer jobs); Waterstone, *supra* note 278, at 1818 (“Some commentators have suggested that the ‘accommodation mandate’ is economically flawed.”).

³¹⁴ See STEPHEN L. PERCY, *DISABILITY, CIVIL RIGHTS, AND PUBLIC POLICY: THE POLITICS OF IMPLEMENTATION* 230 (1989) (“The big gripe of the regulated clients was that the federal government neither helped fund accommodations nor allowed compliance timetables that would spread costs over a long period of time.”).

³¹⁵ GUFFEY, *supra* note 2, at 158.

³¹⁶ See WILLIAMSON, *supra* note 2, at 4 (“From the start, conversations about access touched a sensitive nerve in American political discourse—namely, the bias against collectivism and shared resources, rather than private property and individual economic power.”); Langdon Winner, *Is There a Right to Shape Technology?*, 10 ARGUMENTOS DE RAZÓN TÉCNICA 199, 210 (2007) (Spain) (describing the conflict between technological development and a strong property right).

design.³¹⁷ Despite these complaints, the built environment in the United States has become substantially more accessible over the past half century.

Other areas of federal disability policy have been far less successful in improving accessibility. Employment of people with disabilities is a major example and one explored at length in other work.³¹⁸ Under Title I's reasonable accommodation mandate, the rules about who is covered and what accommodations are reasonable are far less clear than the guidelines provided by ANSI 117.1 and the ADA Accessibility Guidelines.³¹⁹ And certainly some attempts at creating accessible spaces have failed in disastrous ways.³²⁰ These failures can often be attributed to the way in which federal disability law makes nondisabled parties the purchasers of designs for people with disabilities.³²¹ As with the wheelchairs and intermediaries discussed above, when people with disabilities do not get to choose which designs and products they interact with, innovation incentives will often be distorted.³²²

In addition, federal disability policy has generally operated at the environmental level, focusing on creating accessible physical spaces, but it has done much less for individual-level products that might diminish the effects of impairment.³²³ In Title I employment cases, the ADA may create incentives for firms to invest in products that enable their employees with disabilities to work, and some scholars have found that there are some innovations that are explicitly responsive to

³¹⁷ GUFFEY, *supra* note 2, at 158; RAYMOND LIFCHEZ & BARBARA WINSLOW, *DESIGN FOR INDEPENDENT LIVING: THE ENVIRONMENT AND PHYSICALLY DISABLED PEOPLE* 150 (1979).

³¹⁸ See, e.g., Daron Acemoglu & Joshua D. Angrist, *Consequences of Employment Protection? The Case of the Americans with Disabilities Act*, 109 J. POL. ECON. 915 (2001) (discussing the varied effects of the ADA on employment); Thomas DeLeire, *The Wage and Employment Effects of the Americans with Disabilities Act*, 35 J. HUM. RESOURCES 693 (2000); Waterstone, *supra* note 278, at 1812–13 (describing studies of employment statistics for people with disabilities).

³¹⁹ See, e.g., Jennifer Bennett Shinall, *What Happens When the Definition of Disability Changes? The Case of Obesity*, 5 IZA J. LAB. ECON. 1, 2 (2016), <https://izajole.springeropen.com/articles/10.1186/s40172-016-0041-0>.

³²⁰ See, e.g., Paul Richoux, *Five Ridiculously Bad Attempts at Wheelchair Ramps*, BESPOKEN (Jan. 26, 2016), <http://www.bespoken.me/forum/topics/5-ridiculously-bad-attempts-at-wheelchair-ramps>.

³²¹ Given the high percentage of the population that has a disability, not all of the non-user purchasers will be nondisabled people. But they often will not have the same disability as those for whom they are making purchasing decisions.

³²² See *supra* notes 191–95 and accompanying text.

³²³ See, e.g., HAMRAIE, *supra* note 2, at 212 (noting the ADA Accessibility Guidelines did close to nothing for consumer product markets).

the ADA's demands.³²⁴ By and large, however, federal disability laws leave the creation and distribution of accessibility products to the private market. This is also true of the other innovation incentives that the federal government provides in the context of healthcare.³²⁵

Although it has not provided everything that activists desire, federal disability policy's demand-side incentive has transformed the American landscape. Entities that would not have adopted accessible designs in the absence of legal regulation were spurred to do so by the threat of legal liability. The scope of innovations for disabled access to the built environment varies considerably. Some, like ramps and curb cuts, would hardly be considered innovations at all. Others, like wheelchair lifts and new interior designs, utilize the most advanced technology. Yet focusing on manufactured products and technologies misses a large part of the picture. The standards that Nugent and his followers produced about the needs of people with disabilities are hugely valuable new information that may not have been disseminated as widely or as rapidly without the incentives created by antidiscrimination laws.

V

LESSONS FOR DISABILITY INNOVATION INCENTIVES

From this history, it is possible to draw some lessons about innovation policy both for access for people with disabilities and more generally. The first lesson to be drawn from this context is that innovation policy is never easy or straightforward. Policymakers face a range of options for incentivizing innovations, and each option will have its own costs and benefits.³²⁶ Moreover, the options may interact with

³²⁴ See Berven & Blanck, *supra* note 16, at 18 (describing findings of study on the ADA's economic stimulus effect on the assistive technology market).

³²⁵ Sachs, *Administering Health Innovation*, *supra* note 14, at 2005 n.65 ("By contrast, there are far fewer special innovation incentives for companies seeking to make medical devices or diagnostics.").

³²⁶ To the extent that policymakers apply some version of cost-benefit analysis to accessibility innovation laws, they should use the procedures outlined in John Bronsteen, Christopher Buccafusco & Jonathan S. Masur, *Well-Being Analysis vs. Cost-Benefit Analysis*, 62 DUKE L.J. 1603 (2013). Well-being analysis is especially valuable in the context of disability, because evaluating the effects of disability merely by asking people how much they would be willing to pay to avoid disabilities will produce systematic distortions. See Samuel R. Bagenstos & Margo Schlanger, *Hedonic Damages, Hedonic Adaptation, and Disability*, 60 VAND. L. REV. 745 (2007) (arguing that damages to compensate for loss of enjoyment in life should not be awarded for disability); John Bronsteen, Christopher Buccafusco & Jonathan S. Masur, *Hedonic Adaptation and the Settlement of Civil Lawsuits*, 108 COLUM. L. REV. 1516 (2008) (suggesting that time for

others, producing outputs that are unforeseeable and undesirable. As noted in the introduction, this Article makes no normative assertions about the right amount of innovation for accessibility. It takes as given that some amount of innovation is valuable, and it offers a comparative analysis of the various means for producing that innovation.³²⁷

The range of legal regimes that have influenced the pace and direction of design for disability access is enormous. The expected players are all here: intellectual property law, grants, and prizes.³²⁸ But other fields that are not typically associated with innovation also show up, including social welfare law,³²⁹ tort law,³³⁰ health law,³³¹ administrative law,³³² and, perhaps most importantly, antidiscrimination law.³³³ Finally, many of the innovations that affected access for people with disabilities were made by innovators who were entirely indifferent to innovation law. The user innovators at Toomey, and even the Everests and Jennings, were not motivated by legal incentives but rather by the recognition of a basic personal need that demanded filling.³³⁴ It would be unwise to ignore innovators who create without regard to the law.

Innovations can be beneficial, but they are also costly to produce. Each of the different innovation incentives affects who bears the costs and who obtains the benefits of innovation. Thus, the first Section of this Part addresses which parties bear the costs and benefits of the different innovation incentives discussed in this paper: intellectual property, user innovation, social welfare laws, and antidiscrimination laws.³³⁵ In doing so, it is particularly helpful to consider the role of enforcement costs, the salience of costs and benefits, and the possible spillover benefits that different regimes produce.

Next, this Part considers the various ways in which different legal regimes can distort innovation incentives. Some of the distortions

adaptation to injuries may increase plaintiffs' willingness to settle civil lawsuits, reducing the costs of lengthy litigation processes).

³²⁷ See Samaha, *supra* note 21, at 1306 (“Once we move beyond the admittedly formidable question of normative objective, the institutional issues begin to crystallize.”).

³²⁸ See *supra* notes 33–42 and accompanying text.

³²⁹ See *supra* note 83 and accompanying text; see also Section III.C.2 (discussing government health insurance influence on wheelchair innovation).

³³⁰ See *supra* Section III.C.1 (discussing products liability law).

³³¹ See *supra* notes 231–34 and accompanying text.

³³² See *supra* notes 260–66 and accompanying text.

³³³ See *supra* Part IV.

³³⁴ See *supra* Section II.C; see also *supra* Part III.

³³⁵ I focus particularly on the questions of “who benefits” and “who pays.” Hemel and Ouellette note that innovation policy levers may also be analyzed from the perspectives of “when the reward will be provided” and “who decides.” Hemel & Ouellette, *supra* note 4, at 307–08. I drop these questions from the analysis for simplicity.

caused by innovation regimes have been thoroughly discussed in the prior literature, but this study adds new insights to this issue.³³⁶ In particular, I focus on the distortions that arise when the purchasers of innovations are not their ultimate consumers.

A. *Who Benefits and Who Pays?*

1. *Intellectual Property Law*

The obvious place to begin analyzing innovation incentives is with the principal mechanism the federal government uses to spur innovation—intellectual property law and, in particular, utility patents.³³⁷ Patents grant inventors exclusive rights to make, use, and sell their inventions for a twenty-year period after which the invention enters the public domain and is free for all.³³⁸ The standard economic account of patent protection suggests that this exclusivity is an important incentive to encourage creators to invest in costly R&D and, once their inventions have been made, to share them with the public.

As in all of the regimes discussed, users are the chief beneficiaries of the innovations created in response to these incentives. When an inventor creates and patents a new product—for example, a new steering system for a motorized wheelchair—the products' users are made better off. To the extent that patented innovations for disabled access may be narrowly tailored to a specific need, they are likely to be most beneficial to people with disabilities themselves. It is possible, however, that nondisabled people may obtain various positive externalities because either the invention turns out to be useful for them as well or the invention unlocks a stream of research that produces other products that will be valuable for nondisabled users.³³⁹

The other main beneficiaries of the patent regime are the inventors and owners of patent rights. As E&J's wheelchair patents attest, owning the exclusive right to make a desirable product can allow the owner to charge prices far in excess of the marginal cost of producing the goods.³⁴⁰ This is, of course, the whole point of the regime.³⁴¹ Ide-

³³⁶ See, e.g., Wendy Netter Epstein, *The Health Insurer Nudge*, 91 S. CAL. L. REV. 593 (2018) (discussing how to structure insurance to disincentivize unnecessary care); Hemel & Ouellette, *supra* note 4, at 340 (discussing optimism bias and risk aversion); Kapczynski & Syed, *supra* note 24, at 1942–50 (discussing two kinds of ideal-type distortion).

³³⁷ Although this Article is about accessible design, design patents have not played a substantial role in this area. For a discussion of the distinction between design and utility patents, see Buccafusco, Lemley & Masur, *supra* note 33.

³³⁸ See *supra* note 34.

³³⁹ See Emens, *supra* note 20, at 846–47, 850–59.

³⁴⁰ See *supra* note 167 and accompanying text.

³⁴¹ See LANDES & POSNER, *supra* note 4, at 294–96 (discussing the economic rationale behind patent law).

ally, the rents that patent owners can charge would be optimally tailored to allow them to recoup their R&D investments and no more, but the patent system does not work that way, and owners can often obtain revenues far in excess of their costs.³⁴²

The patent system tends to look costless, at least from the government's perspective.³⁴³ Other than the administrative costs of running the system, the government does not have to invest substantial money for patents, unlike grants, prizes, and tax incentives.³⁴⁴ But patents do impose substantial costs, primarily in the form of higher prices for consumers—and their insurance companies.³⁴⁵ Again, the inventor's ability to charge more than the marginal cost of production is the way the patent system creates an incentive for innovation.³⁴⁶ Those higher costs are borne by those who pay for the protected products, whether they are users who are disabled, insurance companies, the state, or third parties installing accessible technology on their property. In all of these contexts, the existence of patent protection shifts consumer surplus to producer surplus, making producers richer at the expense of purchasers.

Moreover, some would-be consumers cannot afford products at the prices generated by patent law's exclusive rights.³⁴⁷ They would have been willing to buy a sports wheelchair at a competitive price based on the costs of production, but they will not or cannot buy one at the monopoly price. These consumers are a deadweight loss, and they represent another cost of the patent system.³⁴⁸ Medicaid, Medicare, and private insurance companies cover some of the costs of purchasing accessible technology for people with disabilities, but, just like patented pharmaceuticals, patented technologies may become so expensive that insurance companies will not cover them or will cover them at lower rates.³⁴⁹ Thus, many of the higher costs of patented

³⁴² See Frischmann & Lemley, *supra* note 311, at 292 (explaining how spillovers allow value to “accrue to outsiders who tinker with or repurpose” inventions).

³⁴³ See Hemel & Ouellette, *supra* note 4, at 371 (“[P]atent rewards—unlike grants, credits, and prizes—are ‘off-budget.’” (quoting William M. Sage, Commentary, *Funding Fairness: Public Investment, Proprietary Rights and Access to Health Care Technology*, 82 V.A. L. REV. 1737, 1750 (1996))).

³⁴⁴ *Id.* at 312.

³⁴⁵ *Id.* (“We can think of the higher price of patented products as a ‘shadow’ tax and the patent system as a ‘shadow’ government expenditure . . .”).

³⁴⁶ See LANDES & POSNER, *supra* note 4, at 294–96.

³⁴⁷ See Amy Kapczynski, *The Cost of Price: Why and How to Get Beyond Intellectual Property Internalism*, 59 UCLA L. REV. 970, 982 (2012) (describing the short-term inefficiencies resulting from placing a positive price on intellectual property).

³⁴⁸ INNOVATION AND INCENTIVES, *supra* note 30, at 36; Kapczynski, *supra* note 347.

³⁴⁹ See Jennifer L. Wolff, Emily M. Agree & Judith D. Kasper, *Wheelchairs, Walkers, and Canes: What Does Medicare Pay for and Who Benefits?*, 24 HEALTH AFF. 1140 (2005) (results of a study examining acquisition of mobility devices through Medicare).

technologies will fall on people with disabilities who may not be able to afford them.

Finally, patent law imposes costs on downstream creators of further innovations.³⁵⁰ If a new innovator develops an improvement for an existing patented product, she cannot simply make the improvement. She will likely have to either negotiate with the patent holder and pay a license fee or wait until the patent has expired. Either way, sequential innovation is costlier.³⁵¹

Of course, firms bear some of the costs of the patent system. They still must engage in expensive R&D which may not result in an invention.³⁵² Even if the R&D efforts generate a patent, the IP right alone does not guarantee a market for the product, so innovators run a risk of not recouping their upfront costs.³⁵³ In addition, patent owners are largely responsible for the enforcement costs of patent protection.³⁵⁴ If competitors are using the patented technology without a license, it is the patent owner who is responsible for tracking them down and filing lawsuits.³⁵⁵ Thus, detection and litigation costs will fall on patent owners, impacting the effectiveness of the innovation incentive.³⁵⁶

That users bear many of the costs of the patent regime creates a number of important implications for deciding whether and how to adopt it, especially in the context of disability policy. First, as a matter of efficiency and social welfare, patent law may not be appropriate when users represent a small group of people with heterogeneous desires and limited ability to pay for innovations. As numerous scholars have pointed out, patent incentives operate in response to markets.³⁵⁷ Innovators are encouraged to develop products that are

³⁵⁰ See Buccafusco, Bechtold & Sprigman, *supra* note 185, at 20.

³⁵¹ *Id.*

³⁵² INNOVATION AND INCENTIVES, *supra* note 30, at 40 (noting that “some research efforts do not pay off with certainty”).

³⁵³ See Mark A. Lemley & Carl Shapiro, *Probabilistic Patents*, 19 J. ECON. PERSP. 75, 75 (2005) (noting that most issued patents have little or no commercial value).

³⁵⁴ See INNOVATION AND INCENTIVES, *supra* note 30, at 197 (providing an overview of patent litigation and enforcement). The government must still pay for the administrative costs of the patent system, and some federal agencies will engage in patent infringement detection. See Lemley & Shapiro, *supra* note 353, at 90 (“The government can and does challenge some issued patents when the PTO re-examines a patent . . .”).

³⁵⁵ See 35 U.S.C. § 281 (2018) (“A patentee shall have remedy by civil action for infringement of his patent.”).

³⁵⁶ See Christopher Buccafusco & Jonathan S. Masur, *Innovation and Incarceration: An Economic Analysis of Criminal Intellectual Property Law*, 87 S. CAL. L. REV. 275, 322–24 (2014) (describing the economics of detection in IP).

³⁵⁷ See, e.g., Kapczynski & Syed, *supra* note 24, at 1942 (describing distorted incentives in the patent market); Rachel E. Sachs, *Prizing Insurance: Prescription Drug Insurance as Innovation Incentive*, 30 HARV. J.L. & TECH. 153, 169 (2016) [hereinafter *Prizing Insurance*] (explaining the role of consumers’ willingness to pay in the drug market).

likely to generate the widest possible demand in order to increase sales. Yet while people with disabilities represent a large and growing proportion of the population, their impairments and, thus, their needs are likely to vary greatly. Thus, innovators might not find it sufficiently appealing to sell a product to a limited group of buyers when there are broader markets available.³⁵⁸ This problem is further exacerbated by the relative poverty of people with disabilities.³⁵⁹ Because many experience difficulty in obtaining and keeping high-paying jobs, people with disabilities tend to be poorer than the average American.³⁶⁰ Accordingly, people with disabilities may disproportionately fall into the group of consumers who would be willing to pay for products if they were available at market prices, but who cannot afford them at patent prices. Although innovations for disabled access will often increase net welfare, the patent system may not succeed in providing them.

Beyond efficiency, there are reasons to think that making people with disabilities solely bear the costs of access is unfair.³⁶¹ Arguments about the distributional unfairness of the patent system have been made in a number of contexts, especially those related to pharmaceuticals, where the benefits of the system run to wealthy populations and the costs to poorer ones.³⁶² These arguments may be even stronger in the disability context. From the perspective of the social model of disability, where disabilities are caused by factors largely outside of the control of people with disabilities,³⁶³ requiring them to pay for technologies that overcome barriers may be viewed as especially distributionally unfair.

2. *User Innovation*

User innovation has played an important role in the development of new technologies for disabled access. People with disabilities have produced a wide variety of innovations, from mouthsticks and spoon

³⁵⁸ See Kapczynski & Syed, *supra* note 24, at 1942.

³⁵⁹ Michael Palmer, *Disability and Poverty: A Conceptual Review*, 21 J. DISABILITY POL'Y STUD. 210, 213 (2011); Pam Fessler, *Why Disability and Poverty Still Go Hand in Hand 25 Years After Landmark Law*, NPR (July 23, 2015, 3:38 PM), <https://www.npr.org/sections/health-shots/2015/07/23/424990474/why-disability-and-poverty-still-go-hand-in-hand-25-years-after-landmark-law>.

³⁶⁰ Palmer, *supra* note 359, at 213.

³⁶¹ See Hemel & Ouellette, *supra* note 4, at 349 (“The consensus of IP commentators is that the user-pays principle of patents is in tension with distributive values.”).

³⁶² See Daniel J. Gifford, *How Do the Social Benefits and Costs of the Patent System Stack Up in Pharmaceuticals?*, 12 J. INTEL. PROP. L. 75, 82 (2004).

³⁶³ See Samaha, *supra* note 21, at 1277–78 (discussing causation in the social model of disability).

grips to wheelchairs and iron lungs.³⁶⁴ Some of these innovations have then been patented, and, in some cases, they may have been supported by social welfare funding.³⁶⁵ But the vast majority of innovations were created solely out of a recognition of an unfilled personal need.³⁶⁶ Again, the principal beneficiaries of user innovation are users of the technology that have disabilities. With the benefits of publications like the *Toomeyville Gazette* and *Paraplegia News*, these technologies could be shared with a wide group of readers to enable them to adapt it to their own lives.³⁶⁷

In addition, nondisabled users can also benefit from innovations of users who have disabilities. For example, one of the most successful recent product innovations is the OXO Good Grips line of kitchen tools.³⁶⁸ Betsey Farber, an architect with arthritis, and her husband Sam, the owner of a housewares business, created the wide rubber grips on peelers and can openers to help Betsey cook.³⁶⁹ And while these tools have certainly aided many people with arthritis and other difficulties with gripping, they have also made cooking less physically taxing for millions of people who are not disabled or who have impairments that do not rise to the level of a disability.³⁷⁰ As OXO touted in one of their advertisements: “a universal design makes Good Grips easy for everyone to hold on to and easy for everyone to use.”³⁷¹

Because people with disabilities have to invest in the trial and error that goes into any innovative activity, they are the ones who principally bear its costs. Users with disabilities must invest in the necessary hardware and any specialized tools needed to create new technologies. And they must spend their own time conceiving of, testing, and redesigning their ideas. The firms that engage in R&D in response to patent law’s incentives also have substantial upfront innovation costs. But, to a much greater extent than user innovators, firms can rely on the possibility of two decades of selling products at higher than marginal costs to recoup those expenses.³⁷² Certainly, some users do patent their inventions, as E&J’s story illustrates. But many user innovations are too simple to pass patent law’s novelty and nonobvious-

³⁶⁴ See *supra* notes 102–11 and accompanying text.

³⁶⁵ For example, the payments to veterans to modify their homes probably helped spur user innovations in home design. See WILLIAMSON, *supra* note 2, at 19.

³⁶⁶ See *supra* Sections II.C, III.B.

³⁶⁷ See, e.g., *supra* notes 109–11 and accompanying text.

³⁶⁸ See WILLIAMSON, *supra* note 2, at 176–78; see also Jackson, *supra* note 99.

³⁶⁹ WILLIAMSON, *supra* note 2, at 176–77; Jackson, *supra* note 99.

³⁷⁰ See WILLIAMSON, *supra* note 2, at 176–78.

³⁷¹ *Id.* at 178 (emphasis and citation omitted).

³⁷² See VON HIPPEL, *supra* note 12, at 110–11 (discussing user innovations made available for free).

ness hurdles,³⁷³ and many user innovators simply have no inclination to go into business producing and selling their innovations.

Moreover, some user innovators object to the exclusivity that is at the heart of the patent system.³⁷⁴ The examples from Toomey illustrate an ethic of sharing that is characteristic of many user communities.³⁷⁵ Innovations that can make people's lives better are not supposed to be locked away and sold for a profit.³⁷⁶ Other user innovators have seen the effects of the patent system on accessibility design and are wary of the whole enterprise. Ralf Hotchkiss, mentioned above, was one of the disabled activists who worked as one of the Nader's Raiders to take down E&J's monopoly in the 1970s.³⁷⁷ Afterward, he became an innovator, creating wheelchair designs that could be made locally in developing countries.³⁷⁸ The company that he founded, Whirlwind, explicitly avoids filing patents and it prevents others from doing so. He explains:

We put things in the public domain. We publish them, and one year after publication, nobody can patent it. It becomes public property. . . . [We want] to prevent anybody from monopolizing the ideas at any time. . . . We want as much technology to be in the public domain as possible, because we want progress.³⁷⁹

This response emerges directly from Hotchkiss's experience with E&J. He notes that the patent system "was instrumental in the creation of the 30-year monopoly of the Everest & Jennings wheelchair, and that's an example of the problems of the patent system, especially in an area where you have captive consumers, where the user is not necessarily the purchaser."³⁸⁰

User innovation is another area in which users with disabilities are primarily responsible for bearing the costs of access innovations. As with patent rights, policymakers should consider both the welfare and fairness consequences of this distribution of costs and benefits.

³⁷³ This is not a normative judgment of their worth but rather a statement about the complexity of the technology. See Loomer, *supra* note 113, at 30 (explaining why people with disabilities need "simplified" equipment).

³⁷⁴ Compare VON HIPPEL, *supra* note 12, at 9–10 (providing an overview of the benefits of freely revealing innovations), with RAUSTIALA & SPRIGMAN, *supra* note 27, at 6 (describing the moral importance of exclusivity to some).

³⁷⁵ See, e.g., Christopher J. Buccafusco, *On the Legal Consequences of Sauces: Should Thomas Keller's Recipes Be Per Se Copyrightable?*, 24 CARDOZO ARTS & ENT. L.J. 1121, 1151–55 (2007) (explaining the culture of sharing in the culinary world).

³⁷⁶ See Hemel & Ouellette, *supra* note 4, at 355.

³⁷⁷ HOTCHKISS, *supra* note 153, at 12, 14–16.

³⁷⁸ *Our History*, WHIRLWIND WHEELCHAIR, <https://whirlwindwheelchair.org/our-history> (last visited May 30, 2020).

³⁷⁹ HOTCHKISS, *supra* note 153, at 53.

³⁸⁰ *Id.* at 54.

3. *Social Welfare*

As Part II demonstrated, social welfare payments to people with disabilities can provide an important demand-side innovation incentive for accessible technology. The government's payments to people with disabilities, and to veterans with disabilities in particular, increased their ability to pay for innovations like improved prostheses and manually controlled automobiles.³⁸¹ This then meant that firms had a greater likelihood of finding a market for new products and, thus, the incentive to produce them. The benefits for innovation from social welfare payments are widely distributed. The users who receive the payments are better off because they can now afford technologies that they otherwise could not. If the technology is patented, social welfare payments can move some number of people with disabilities out of the group of deadweight losses, because the payment allows them to afford the product at its patent price.³⁸²

The firms that produce goods purchased by people with disabilities who receive government subsidies also stand to gain from those payments. Again, E&J offers a clear example. The government subsidy for wheelchair purchases during the period of E&J's monopoly allowed them to sell substantially more wheelchairs at a much higher price than they would have in the absence of the subsidy.³⁸³ Because the subsidy boosts demand, suppliers will have a bigger market and can get a higher price for their product. There may also be spillover effects for nondisabled people, depending on whether the technologies that get produced have substantial value for them as well.

The starkest difference between social welfare payments and the incentive regimes that have been discussed above is on the costs side. Unlike patents and user innovation, where disabled users bear most of the costs of innovation, social welfare payments are primarily paid for by taxpayers. Social welfare payments come from federal or state governments' general tax revenue, so the entire tax base, disabled and nondisabled alike, will bear the burden.³⁸⁴ It is possible to raise the revenue from a smaller tax base in order to reduce the incidence of the tax, but so far, at least, governments do not seem to have experi-

³⁸¹ See *supra* notes 74–77, 87–89 and accompanying text.

³⁸² See *supra* note 348 and accompanying text.

³⁸³ See *supra* notes 161–62.

³⁸⁴ See Carolyn L. Weaver, *Incentives Versus Controls in Federal Disability Policy*, in *DISABILITY AND WORK: INCENTIVES, RIGHTS, AND OPPORTUNITIES* 3, 95 n.2 (Carolyn L. Weaver ed., 1991) (estimating that \$30 billion in public funds were spent in 1989 on disability insurance and supplemental security income, and the same amount was spent through Medicare and Medicaid for people with disabilities).

mented with this option.³⁸⁵ The wide incidence of taxes that benefit people with disabilities will tend to make the costs of social welfare payments especially salient to people who have to bear them. This was the case in the decades following the Civil War where the size of pension payments to veterans became a major political issue.³⁸⁶ While people with disabilities have been portrayed as the most “deserving” welfare beneficiaries, to some people the payments they receive may appear “special” or “extra” and thus frivolous and unnecessary.³⁸⁷ This is likely to be true when those payments are spent on technologies that go beyond mere functionality, such as more aesthetically designed wheelchairs or ones that are only used for sports.³⁸⁸

The welfare effects of social welfare payments to people with disabilities are difficult to specify and likely depend on the assumptions one makes about the welfare effects of redistributive taxation generally. This Article is not the place to reproduce those debates.³⁸⁹ The fairness and distributional effects of social welfare payments are somewhat more straightforward, at least for proponents of the social model of disability.³⁹⁰ If nondisabled Americans are getting the benefits of living in a world that has been designed for them, then perhaps it is only fair that they compensate people with disabilities for the challenges that the world produces. Social welfare payments that

³⁸⁵ It is not entirely clear what grounds for minimizing the incidence of the tax might exist. Perhaps if the government thought that some parties were particularly responsible for causing disabilities, it might want to tax them most heavily to encourage them to internalize the effects of their behavior.

³⁸⁶ See LINKER, *supra* note 47, at 100 (providing that by 1870 the government had spent \$500,000 on replacement limbs for veterans and describing public suspicion about how veterans spent the money); *id.* at 12, 21–34 (documenting the general anti-pension sentiment after the Civil War); Blanck & Millender, *supra* note 65, at 3–4 (noting that following the Civil War, war pensions amounted to as much as forty-two percent of the federal budget).

³⁸⁷ This was the concern of some in the VA about the provision of automobiles to some disabled veterans. See WILLIAMSON, *supra* note 2, at 33; see also Crossley, *supra* note 291, at 892 (providing that, within the workplace context, some people see accommodations requested by persons with disabilities as a petition for an “extra” benefit).

³⁸⁸ Cf. WILLIAMSON, *supra* note 2, at 146 (noting that opposition to accessibility regulations and proposed futuristic accessible designs “left a lasting impression of access as excess, or a demand over and above ‘regular’ design”). For a discussion of modern developments in the aesthetics and athletic use of mobility aids, see *id.* at 191–99.

³⁸⁹ See, e.g., Bagenstos, *supra* note 9, at 15–16 (broadly describing the debates concerning disability welfare); Manasi Deshpande, *Does Welfare Inhibit Success? The Long-Term Effects of Removing Low-Income Youth from the Disability Rolls*, 106 AM. ECON. REV. 3300 (2016).

³⁹⁰ But see generally Samaha, *supra* note 21 (critiquing the normative and policy limitations of the social model of disability).

come from general revenue are one way of accomplishing this redistribution.³⁹¹

4. *Antidiscrimination Law*

Federal disability policy in the last quarter of the twentieth century adopted a different approach to encouraging access innovations—antidiscrimination laws that mandate the provision of reasonable accommodations and accessible environments.³⁹² Like social welfare payments, antidiscrimination laws operate on the demand side of the market, but antidiscrimination laws make governments and property owners the consumers of accessible technology rather than people with disabilities.³⁹³ Antidiscrimination laws increase regulated entities' willingness to pay for assistive technologies by raising the costs of noncompliance.³⁹⁴

Once again, the chief beneficiaries of antidiscrimination laws' incentive effects are people with disabilities. Because regulated parties are more likely to invest in providing accessibility, people with disabilities will find a world that is more accommodating of their needs. They can seek employment and leisure with greater confidence that their impairments will not be a hindrance. Some firms may also benefit from antidiscrimination laws, either if they are selling products that aid compliance³⁹⁵ or if the adaptations they make to their environments generally improve productivity and employee welfare.³⁹⁶

Importantly, antidiscrimination laws may have the largest spillover benefits of any of these regimes for nondisabled people. Most of the innovations generated by patent law, user innovation, and social welfare benefits are individual-level technologies that are used by a single person at a time. By contrast, when regulated entities create accessible buildings, buses, and public spaces, they are typically through environment-level technologies. Everyone is free to use curbs or ramps whether they need them or not.³⁹⁷ And many people without disabilities may still obtain benefits from accessible bathroom

³⁹¹ See Bagenstos, *supra* note 9, at 4 (calling for “direct and sustained government interventions such as the public funding and provision of benefits”).

³⁹² See *supra* Section IV.B.

³⁹³ See *supra* notes 291–95.

³⁹⁴ See *supra* note 202 and accompanying text.

³⁹⁵ See Berven & Blanck, *supra* note 16, at 18–19 (“These core findings suggest that ADA implementation is affecting the AT consumer market in economically positive ways and is creating profit-making opportunities for inventors and manufacturers in the sector.”).

³⁹⁶ Emens, *supra* note 20, at 849 (discussing how accessible work environments may lead to lower turnover).

³⁹⁷ *Id.* at 861.

stalls or reorganizations of the workplace.³⁹⁸ By reshaping the environment, antidiscrimination laws can generate positive externalities for people other than those they intend to benefit. Nonetheless, many of these benefits may go unnoticed by nondisabled people. As Elizabeth Emens notes, because nondisabled people do not see the ADA as having been enacted “*for them*,” they may not appreciate the many ways in which it aids them.³⁹⁹

The costs of antidiscrimination laws’ incentive effects fall largely on regulated entities, including state and local governments (i.e. taxpayers) and private businesses.⁴⁰⁰ They are responsible for building or rebuilding accessible spaces, and these changes may impose additional costs.⁴⁰¹ Governments may be responsible for paying for changes to their transport systems, either by altering their existing fleets of buses and trains or by supplying paratransit options.⁴⁰² Beyond these economic costs, regulated entities have argued that antidiscrimination laws impose costs on their autonomy by limiting the ways in which they spend their money, use their property, and associate with others.⁴⁰³ Even if the laws make economic sense, the argument goes, they should not coerce parties into taking actions that they do not prefer.

Although regulated entities bear the costs of complying with antidiscrimination laws, people with disabilities and the government bear the costs of enforcing them. If a municipal government or local business is not complying with its legal obligations to remove barriers to access, either individual parties or a governmental agency must bring suit to demand a change.⁴⁰⁴ In some cases, this means that a regulated entity may not comply with the law until it receives notification of a pending legal action.⁴⁰⁵ Monitoring for violations is difficult and time consuming, and legal actions are expensive, complicated, and

³⁹⁸ See *id.* at 861–63.

³⁹⁹ *Id.* at 880.

⁴⁰⁰ See, e.g., Shinall, *supra* note 319, at 3–4 (discussing the costs of complying with the ADA for employers).

⁴⁰¹ Many accessible designs for newly constructed buildings will be no more costly than inaccessible designs. Ramps do not necessarily cost more than stairs, for example.

⁴⁰² See RICHARD A. EPSTEIN, FORBIDDEN GROUNDS: THE CASE AGAINST EMPLOYMENT DISCRIMINATION LAWS 480 (1992) (stating that the ADA requires “major expenditures” out of general revenue funds to pay for accessible transit systems).

⁴⁰³ *Id.* at 487; Schuman, *supra* note 313.

⁴⁰⁴ See *supra* notes 279, 281 and accompanying text.

⁴⁰⁵ See Stein, *supra* note 296, at 89 n.49 (noting, for example, the “Empire State Building complied with the ADA’s regulations only after being targeted for litigation by the Department of Justice”).

often simply not worth it.⁴⁰⁶ The returns to individual plaintiffs and their attorneys are typically small, because the outcome of even successful litigation may only be injunctive relief.⁴⁰⁷ Finally, as Bess Williamson argues, “[i]n the post-ADA world, when the primary means of enforcement for access regulations has been individual or class action lawsuit, the perception of access as excess has merged with public skepticism about personal litigation.”⁴⁰⁸ Thus, there may be substantial underenforcement of the innovation incentives that federal disability law creates.

Determining the precise welfare or fairness outcomes of antidiscrimination policy is futile, but some generalizations are possible. Some scholars have found that the ADA’s reasonable accommodation provision in Title I has actually reduced employment for people with disabilities, meaning firms have found ways to avoid hiring them without generating liability.⁴⁰⁹ If a firm can avoid having employees with disabilities, it will not have to expend resources on accommodations. But Titles II and III do not work in the same way. A place of accommodation, like a restaurant or store, cannot avoid legal obligations by claiming that no people with disabilities patronize the establishment. These titles apply to all businesses and, thus, do not create perverse incentives to avoid accommodating people with disabilities.⁴¹⁰

There are also reasons to believe that antidiscrimination laws have had a positive impact on net social welfare by requiring accessibility measures that are good for businesses but that the businesses might not make on their own. Business owners may believe that the costs of accommodations are far higher than they actually are and that the number of patrons who will benefit from them is much lower.⁴¹¹ Legal regulation may drive them to take actions that are self-serving but about which they are mistaken.

⁴⁰⁶ Jack Achtenberg, “Crips” Unite to Enforce Symbolic Laws: Legal Aid for the Disabled: An Overview, 4 U. SAN FERNANDO VALLEY L. REV. 161, 175–78 (1975) (showcasing complications and barriers that persons with disabilities face to bring a legal action).

⁴⁰⁷ See Karlan & Rutherglen, *supra* note 236, at 19–20 (discussing employment actions).

⁴⁰⁸ WILLIAMSON, *supra* note 2, at 190.

⁴⁰⁹ See, e.g., Acemoglu & Angrist, *supra* note 318 (noting that employment rates for workers with disabilities fell after the enactment of the ADA); DeLeire, *supra* note 318 (same).

⁴¹⁰ See *supra* notes 283–86 and accompanying text.

⁴¹¹ See GUFFEY, *supra* note 2, at 156 (noting the discomfort of business owners, architects, and designers with the ADA after it was passed); Schartz, Hendricks & Blanck, *supra* note 293, at 347 (reporting that employers’ belief of high costs is inconsistent with empirical evidence).

Finally, antidiscrimination laws may help solve collective action problems by focusing on environment-level innovations. Many of the people who use the supermarket would be better off if the supermarket introduced ramps and curb cuts, and the benefits that those people receive might far exceed the implementation costs. But because the value to any individual user is small, and because users are not typically allowed to make their own curb cuts or install their own ramps, compelling the supermarket to make the change may be the only way to generate the welfare enhancing result. When combined with the tax credits to businesses for installing accessible features, the accommodation may no longer even prove to be a loss for the supermarket.⁴¹²

B. Innovation Distortions

One of the principal lessons from this analysis is that various legal regimes can distort innovation incentives. Of course, some legal regimes, like patent law, are intended to distort innovation incentives in particular ways. This does not mean to imply that any or all of these distortions are normatively unjustifiable. Nonetheless, policymakers must not only focus on the relative costs and benefits of different legal regimes but also on how those regimes may affect the direction of innovation. Here I consider three different ways in which these regimes may have distorting effects, including the role of intellectual property rights on investment, the role of intermediaries, and the salience of costs and benefits.

1. IP and Investment

The distortive effects of patent law have become commonplace in IP scholarship,⁴¹³ and the narrative of accessible design reinforces these arguments. Patent law provides a supply-side incentive to producers of new technology, but the size of the incentive varies according to the size of the relevant market.⁴¹⁴ Thus, inventors will tend to direct their innovative activity towards problems that promise to be lucrative.⁴¹⁵ This typically means being able to sell a single product to a lot of relatively wealthy consumers. Innovations for

⁴¹² Seto & Buhai, *supra* note 288, at 1126 (referencing a Government Accountability Office report noting the generally positive perception from business representatives of a barrier removal deduction).

⁴¹³ See, e.g., Kapczynski & Syed, *supra* note 24, at 1944–45; Sachs, *Prizing Insurance*, *supra* note 357, at 160–70 (regarding innovation distortions concerning patents and FDA regulations).

⁴¹⁴ See Hemel & Ouellette, *supra* note 4, at 320.

⁴¹⁵ See Kapczynski & Syed, *supra* note 24, at 1942.

accessibility, however, do not usually fit this model. People with disabilities often have heterogeneous needs and low ability to pay for innovations. Even the E&J wheelchair, the most successful patented product in the Article, would not have been affordable to many of them without subsidies.⁴¹⁶

Moreover, the availability of exclusive rights for patented inventions will tend to direct innovators' efforts towards the sorts of designs that can receive patent protection and away from those that cannot.⁴¹⁷ If a firm has a set amount of money for R&D, it will tend to pursue innovation pathways that may lead to patents rather than to technologies that are not excludable.⁴¹⁸ Alice Loomer, writing in the *Toomeyville Gazette*, expressed exactly this concern, noting that while people with disabilities often need simple and cheap devices, firms tend to create complicated ones that are eligible for patent protection.⁴¹⁹ Firms might also be less interested in developing the innovations that Timothy Nugent produced.⁴²⁰ Nugent's studies of the physical needs of people with disabilities would not be protectable by either patent or copyright law.⁴²¹ Although they were enormously valuable for clarifying the requirements of accessible design, profit-seeking firms might not see much value in creating them. It is worth noting that Nugent was a university professor, one of the groups of people who are generally tasked with producing "open science" knowledge rather than functional inventions.⁴²²

These factors imply that patent law's basis in market value can drive producers' incentives away from activities that are socially optimal and towards ones that are privately beneficial. This is not to suggest that patents are an inappropriate tool for incentivizing accessible design. Grants, prizes, and taxes all produce their own relative

⁴¹⁶ See SHEPARD & KAREN, *supra* note 144, at 4 (noting that nearly all wheelchair purchases are at least partly subsidized by the government and private insurers).

⁴¹⁷ Kapczynski & Syed, *supra* note 24, at 1945–46.

⁴¹⁸ *Id.*

⁴¹⁹ Loomer, *supra* note 113, at 30.

⁴²⁰ Kapczynski and Syed note that sometimes patent holders might affirmatively fight non-patent solutions to problems: "[W]e can expect those who specialize in the use of exclusive rights to recoup their investment to exhibit competitive hostility to inventions that solve the same problem through nonexcludable means." Kapczynski & Syed, *supra* note 24, at 1946.

⁴²¹ In the copyright context, these would probably count as ideas rather than expressions. See *Baker v. Selden*, 101 U.S. 99, 104 (1879) (noting that the copyright on a book does not secure the exclusive right to use the ideas presented in it, as "[t]he use of the art is a totally different thing from a publication of the book explaining it").

⁴²² Bhaven N. Sampat, *Patenting and US Academic Research in the 20th Century: The World Before and After Bayh-Dole*, 35 RES. POL'Y 772, 774 (2006).

distortions as well.⁴²³ Policymakers need to be aware of these distortions when making decisions about which regimes to use.

2. *Intermediaries*

Perhaps the most important innovation distortion disclosed by this analysis is the one that arises when intermediaries between producers and users get to choose which products are made and which are not. As we have seen, the intermediaries' preferences often do not match up with those of users, driving innovation towards products that do not maximize user value.⁴²⁴ Early twentieth-century rehabilitation specialists demanded that people with mobility impairments learn to walk with crutches or prostheses, even though many people found these objects uncomfortable and inefficient.⁴²⁵ Automobile subsidies for World War II veterans often did not allow them to purchase cars that actually worked for their needs.⁴²⁶ Healthcare payers like the VA, Medicaid, and Medicare influenced consumers' options for wheelchairs and the opportunities for E&J's competitors to release products.⁴²⁷ Consumers were not allowed to shop for the products that would suit them best, because intermediaries would only sanction payments for some models. And once E&J had worked with the intermediaries to narrow the specifications to products that resembled its own chairs, other firms had difficulty entering the market.⁴²⁸ Finally, because governments and firms stand between producers and users of accessible spaces, the ADA's reasonable accommodation requirement can mean that chosen designs are not the ones that are most helpful or convenient for people with disabilities.⁴²⁹

These distortions can create challenges for optimizing innovation incentives, whether for disabled access or more broadly. On one hand, consumers may not have perfectly rational preferences for the products and technologies they use.⁴³⁰ And the private value that people

⁴²³ See *supra* notes 361–62.

⁴²⁴ See *supra* notes 78–81 and accompanying text.

⁴²⁵ See *supra* notes 78–81 and accompanying text.

⁴²⁶ See *supra* notes 93–95 and accompanying text.

⁴²⁷ See *supra* notes 191–95 and accompanying text.

⁴²⁸ See *supra* Section III.C. For evidence that payers can sometimes have salutary effects on healthcare innovation, see Eisenberg & Price, *supra* note 14, at 5.

⁴²⁹ See Bagenstos, *supra* note 9, at 23 (“Antidiscrimination requirements can prohibit employers from discriminating against qualified people with disabilities who apply for jobs, but they cannot put people with disabilities in a position to apply and be qualified for jobs in the first place.”).

⁴³⁰ Christopher Buccafusco & Jonathan S. Masur, *Intellectual Property Law and the Promotion of Welfare*, in 1 RESEARCH HANDBOOK ON THE ECONOMICS OF INTELLECTUAL PROPERTY LAW 98, 103 (Ben Depoorter & Peter S. Menell eds., 2019); Wendy Netter Epstein, *Nudging Patient Decision-Making*, 92 WASH. L. REV. 1255, 1274–76 (2017)

obtain from a technology does not always match its social value.⁴³¹ Policymakers might want to be especially cautious about paternalistically or self-interestedly substituting their judgments for those of people with disabilities. Even if they are doing their best, the literature on affective forecasting errors and hedonic psychology suggests that nondisabled people often do a poor job of understanding what it is like to live with a disability.⁴³² Of course, in many situations, the intermediaries will not even try to choose what is best for people with disabilities, instead choosing options that are best for their own interests. Accordingly, policymakers should be wary of incentive regimes where users with disabilities are not the purchasers of innovations.

3. *Saliency Biases*

Different innovation regimes can vary according to how salient their tradeoffs are. With respect to costs, both social welfare payments and antidiscrimination laws may appear to produce salient costs for the people who have to pay them. Citizens whose taxes must fund welfare payments directly or municipal renovations indirectly may be aware of those costs. In particular, they may see these taxes as helping other people.⁴³³ Those citizens may bring their concerns to bear on elected officials. When regulated businesses must make accommodations or alterations for people with disabilities, the requirements may also be highly salient, and they may view them as burdensome. Ultimately, however, data suggest that compliance costs are often much lower than regulated entities anticipate, leading to salient but skewed cost estimates.⁴³⁴

(explaining how outside factors affect a patient's ability to choose what is best for him or her).

⁴³¹ For example, while users might prefer an innovation that generates \$2000 of value and costs \$1500, a social planner might prefer an innovation that generates \$1800 of value at a cost of \$500. For purposes of this paper, I take no position on which of these outcomes is normatively preferable.

⁴³² See, e.g., Bagenstos & Schlanger, *supra* note 326, at 760 (stating that “research demonstrates that people without disabilities tend to view the prospect of life with a disability as far less enjoyable than people with disabilities themselves report”); Peter A. Ubel, George Loewenstein, Norbert Schwarz & Dylan Smith, *Misimagining the Unimaginable: The Disability Paradox and Health Care Decision Making*, 24 HEALTH PSYCHOL. S57 (2005).

⁴³³ See Crossley, *supra* note 291, at 892; Emens, *supra* note 20, at 880.

⁴³⁴ One survey indicates that more than half of accommodations were costless to employers, while the median expenditure on the costly ones was only five hundred dollars. Shinall, *supra* note 319, at 4 (citing JOB ACCOMMODATION NETWORK, WORKPLACE ACCOMMODATIONS: LOW COST, HIGH IMPACT 2 (2013), <http://AskJAN.org/media/downloads/LowCostHighImpact.pdf>).

By contrast, the patent system's costs tend to be much less salient, even to those who have to pay them. Monopoly prices are often hard to see because there may not be other products against which a consumer can compare patented products. And from a legislator's perspective, patents have almost no costs because they require so little revenue.⁴³⁵ All of the costs are paid by users and downstream innovators. Similarly, the costs of user innovation are fully veiled to everyone except the users engaging in R&D. From the perspective of government finances, the most important access innovation of the twentieth century, the E&J wheelchair, cost absolutely nothing.

Salience distortions can also arise on the benefits side of innovation regimes. Many nondisabled people benefit from accessible design, but they often will not appreciate it.⁴³⁶ And the benefits of many accessibility innovations may be hard to see before the design exists. Thus, people's perception of the value of investing in innovation is likely to be skewed. The Rehabilitation Act and the ADA are most likely to produce these distortions, because they operate on both the costs side and the benefits side. Nondisabled people and firms will find the costs that they pay for access to be especially salient, and they may be prone to exaggerating their magnitude.⁴³⁷ But they will tend to ignore the benefits that they themselves receive from access. They may not notice the ways in which ramps and curb cuts make life easier for everyone or how universally designed kitchen tools improve their lives as well. Moreover, they may ignore the relatively high probability that they will one day acquire a temporary or permanent disability.⁴³⁸

The foregoing discussion has offered a comparative analysis of the various means by which policymakers can stimulate accessible design. The toolbox is far larger than scholars have previously imagined. In many ways, these added features may help policymakers shape accessible innovations in a more tailored fashion. But in other ways, they will cause challenges, as one regime interacts with another in unpredictable ways. This Article does not attempt the challenging normative analysis of which regimes should be favored and how much society should be willing to invest in encouraging accessible design.

⁴³⁵ Hemel & Ouellette, *supra* note 4, at 371.

⁴³⁶ See *supra* notes 396–99.

⁴³⁷ See Schartz, Hendricks & Blanck, *supra* note 293, at 347 (arguing that firms often overestimate the costs of accessibility renovations).

⁴³⁸ While the actual odds of experiencing disability for insurance purposes are unclear, see Ron Lieber, *The Odds of a Disability Are Themselves Odd*, N.Y. TIMES (Feb. 5, 2010), <https://www.nytimes.com/2010/02/06/your-money/life-and-disability-insurance/06money.html>, disability can come from many experiences, such as breaking a bone, cancer, or mental illness.

Doing so requires specifying and arguing about underlying normative commitments about welfarism, fairness, and the value of autonomy, among others.

There are several important takeaways from this analysis. First, demand-side innovation incentives can be as important as supply-side innovation incentives, and they address some issues with distribution and collective action that supply-side incentives produce. Next, policymakers should attend to whether they are encouraging individual-level innovations or environmental-level innovations. These will vary in their effectiveness depending on the circumstances. Sometimes it may be easier to install ramps and curb cuts than to provide people with stair-climbing wheelchairs. Other times, assisting a person with a disability by providing a particular prosthesis may prove to be the better approach. Finally, policymakers should be aware of the distortions and salience biases that influence the pace and direction of innovation and the public's commitment to providing incentives for it.

CONCLUSION

I hope that scholars and policymakers will find the above analysis valuable, both as they think about the accessibility of the physical world and as they increasingly turn towards the accessibility of the digital world. Scholars are doing important work on the digital access front,⁴³⁹ and the tradeoffs between different innovation regimes can provide insight for that discussion.

These findings also apply to innovation policy more broadly. As policymakers consider how best to incentivize new developments in environmental protection,⁴⁴⁰ autonomous vehicles,⁴⁴¹ and data privacy,⁴⁴² they must be aware of the interplay between multiple legal regimes. In each of these and many more cases, regulators face a panoply of choices among legal mechanisms. This Article calls for

⁴³⁹ See, e.g., Bradley Allan Areheart & Michael Ashley Stein, *Integrating the Internet*, 83 GEO. WASH. L. REV. 449 (2015) (arguing that the internet is a place of public accommodation); Blake E. Reid, *Internet Architecture and Disability*, 95 IND. L.J. 591 (2020) (proposing a framework that would better account for the internet in disability law); Caterina Sganga, *Disability, Right to Culture and Copyright: Which Regulatory Option?*, 29 INT'L REV. L. COMPUTERS & TECH. 88 (2015) (offering a framework that reconciles copyright law with increased access to knowledge for people with disabilities).

⁴⁴⁰ See Cary Coglianese, *The Limits of Performance-Based Regulation*, 50 U. MICH. J.L. REFORM 525 (2017).

⁴⁴¹ See, e.g., Matthew T. Wansley, *Regulation of Emerging Risks*, 69 VAND. L. REV. 401 (2016).

⁴⁴² See Daniel J. Solove & Woodrow Hartzog, *The FTC and the New Common Law of Privacy*, 114 COLUM. L. REV. 583 (2014).

scholars to look beyond their standard sub-disciplinary boundaries in order to recognize the fuller range of policy levers that are available and the costs and benefits that they create.