July 2016

Curated Innovation

Lital Helman

CURATED INNOVATION

*Lital Helman**

I. INTRODUCTION

How should lawmakers go about regulating innovation-intensive industries? This question is critical for virtually all fields of law in industries where novel technologies and practices do not square well within the existing regulatory frameworks.[1] Examples include digital

* Law Lecturer, the Ono Academic College. This Article benefitted from thoughtful comments of Gideon Parchmovsky, Amichai Cohen, Ofer Tur-Sinai, Ittai Bar Siman Tov, Gabriel Hallevi, Adi Helman, and Jacob Bacon. The author is also thankful to the faculty forum of the Ono Academic College and the participants of the 2016 "Many Faces of Innovation" conference for helpful comments and discussion.

dissemination technologies, which challenge the regulation of both the Federal Communications Commission (FCC) and the Library of Congress,[2] computerized medical devices, which triggers inquiry by the Food and Drug Administration (FDA),[3] Carbon Capture and Storage (CCS) technology, which defies Environmental Protection Agency (EPA) regulation,[4] and many more.[5]

An industry becomes an innovation-intensive industry when newly invented technologies, processes, services, or business models penetrate existing markets and unsettle established practices in the industry.[6] Such

1. Innovation is defined broadly to encompass "any human idea that adds something important to what we already have." *See* CHRISTINA BOHANNAN & HERBERT HOVENKAMP, CREATION WITHOUT RESTRAINT: PROMOTING LIBERTY AND RIVALRY IN INNOVATION ix (2012). *See also* Richard R. Nelson & Sidney G. Winter, *In search of useful theory of innovation*, 6 RES. POL'Y 36, 37 (1977) (defining innovation as "a wide range of variegated processes by which man's technologies evolve over time").

2. *See* Formal Complaint of Free Press & Pub. Knowledge Against Comcast Corp. for Secretly Degrading Peer-to-Peer Applications, 23 FCC Rcd. 13,028, 13,059-61 (2008) (memorandum opinion and order), *vacated by* Comcast Corp. v. FCC, 600 F.3d 642 (D.C. Cir. 2010) (decision regarding interference of Comcast in BitTorrent traffic). *See also* Exemption to Prohibition on Circumvention of Copyright Protection Systems for Access Control Technologies, 77 Fed. Reg. 65260, 65264, 65265 (Oct. 26, 2012) (to be codified at 37 C.F.R. pt. 201) (creating an exemption within the DMCA (Digital Millennium Copyright Act, Pub. L. No. 105-304, 112 Stat. 2860 (1998)) that allowed consumers to unlock their cellphones via the jailbreaking process); Statement from the Library of Congress Regarding White House Statement Today in Response to a Petition on Section 1201 Rulemaking, Library of Congress (Mar. 4, 2013), http://www.loc.gov/today/pr/2013/13-041.html (removing said exemption).

3. *See, e.g.*, Draft Policy Guidance for Regulation of Computer Products, 52 Fed. Reg. 36,104 (Sept. 25, 1987). *See also* Nathan Cortez, *Regulating Disruptive Innovation*, 29 BERKELEY TECH. L.J. 175, 180 (2014) ("[C]omputerized medical devices have confounded the agency over the last twenty-five years, pushing the FDA far beyond its regulatory comfort zone.").

4. *See, e.g.*, Navajo Nation; Underground Injection Control (UIC) Program; Primacy Approval, 73 Fed. Reg. 65,556-01, at 65,556-65,560 (Nov. 4, 2008). For a list of federal regulatory programs regarding CCS, see http://www.epa.gov/climatechange/ccs/federal.html (last visited Feb. 17, 2015).

5. Consider, for example, the challenges Bitcoin presents to the Internal Revenue Service (IRS), the technology of 3D printing, which upset regulation by the Department of Homeland Security, and of the internet, which prompted regulation on various fronts. *See, e.g.*, Cortez, *supra* note 3, at 176 ("The quintessential example is the Internet, which rumpled not just one, but several regulatory frameworks . . . .").

6. Scholars use different terms to refer to innovation-intensive industries. Tim Wu discusses "dynamic" vs. "stable" industries. *See* Tim Wu, *Agency Threats*, 60 DUKE L.J. 1841, 1848 (2011) ("Industries can be divided into two states: stable and dynamic. In a stable industry, business models are relatively settled, and the facts relevant to regulation are therefore likely clearer. Conversely, in a dynamic industry, the agency confronts what economists call conditions of "high uncertainty."). Nathan Cortez prefers the term "disruptive innovation." *See* Cortez, *supra* note 3, at 177. Daniel Gervais analyzes the difference between "inchoate" and stable technologies. *See* Daniel Gervais, *The Regulation of Inchoate Technologies*, 47 HOUS. L. REV. 665, 671 (2010) ("I use the term inchoate in this Essay to reflect the fact that certain technologies are far from completely developed and suggest that this differentiates them from more stable ones.").

processes often undermine existing industry players, and disrupt the modus operandi of regulatory agencies themselves.[7]

Crafting policies for innovation-intensive industries is an intricate task. On the one hand, innovation can dramatically promote economic growth and prosperity,[8] and policymakers must refrain from stifling innovation due to excessive, erroneous, or premature regulation. On the other hand, innovation may jeopardize societal interests that appear to be relatively well-guarded under the existing regulatory frameworks, such as privacy,[9] safety,[10] and intellectual property.[11] Indeed, it appears that

7. *See* Cortez, *supra* note 3, at 177 (discussing "regulatory disruption": "innovations that disrupt existing regulatory schemes, not necessarily industry incumbents").

8. The connection between economic growth and innovation was first analyzed in 1957 by Cambridge University economist Nicholas Kaldor. *See* Nicholas Kaldor, *A Model of Economic Growth*, 67 ECON. J. 591 (1957). Today, the literature on this connection is too large to cite in full. *See, e.g.*, BOHANNAN & HOVENKAMP, *supra* note 1, at 239 ("[T]oday there is little doubt that innovation contributes far more to economic growth than does the movement of markets from less to greater amounts of price competition."); ROBERT D. COOTER & HANS-BERND SCHÄFER, SOLOMON'S KNOT: HOW LAW CAN END THE POVERTY OF NATIONS ix (2012) ("[S]ustained growth in developing countries occurs through innovations in markets and organizations by entrepreneurs . . . ."); Brent Skorup & Adam Thierer, *Uncreative Destruction: The Misguided War on Vertical Integration in the Information Economy*, 65 FED. COMM. L.J. 157, 180 (2013) ("What is most important to economic progress . . . is the ongoing process of constant experimentation and spontaneous discovery that allows new business models and organizational structures to emerge in response to market signals."). *See also* WENDY H. SCHACHT, CONG. RESEARCH SERV., RL33526, COOPERATIVE R&D: FEDERAL EFFORTS TO PROMOTE INDUSTRIAL COMPETITIVENESS 1-2 (2008); ORLY LOBEL, TALENT WANTS TO BE FREE 39 (2013); Robert Cooter et al., *The Importance of Law in Promoting Innovation and Growth*, *in* THE KAUFFMAN TASK FORCE ON LAW, INNOVATION AND GROWTH, RULES FOR GROWTH 1-2 (Kauffman Kansas City, 2011).

9. For example, innovation in the AdTech industry that optimizes tracking individuals' online behavior jeopardizes privacy interests in an unprecedented way. *See* Katherine J. Strandburg, *Free Fall: The Online Market's Consumer Preference Disconnect* (Oct. 2013), http://ssrn.com/abstract=2323961 (discussing the "take it or leave it" nature of transactions in online privacy contexts).

10. For example, autonomous vehicles, while expected to eventually enhance safety, are also vulnerable to deliberate hacking and design flaws that can increase the odds of accidents and raise tough questions of liability. *See* DANIEL J. FAGNANT & KARA M. KOCKELMAN, PREPARING A NATION FOR AUTONOMOUS VEHICLES: OPPORTUNITIES, BARRIERS AND POLICY RECOMMENDATIONS 4 TBL.1 (Eno Ctr. For Transp. 2013), https://www.enotrans.org/etl-material/preparing-a-nation-for-autonomous-vehicles-opportunities-barriers-and-policy-recommendations/ (predicting that with autonomous cars fatality rates could ultimately fall to 1% of current rates); Neal Katyal, *Disruptive Technologies and the Law*, 102 GEO. L.J. 1685, 1689 (2014) (discussing the benefits and costs of autonomous vehicles). It is not typically assumed that driverless cars are more prone to accidents, but rather that the types of accidents that they would be involved in would be different than the ones humans would engage in. For example, a human and a machine who encounter a situation where they need to hit either a shopping cart or a baby-carriage might react differently. And it is impossible to anticipate all those scenarios in the design stage of the technology. For example, the Federal Food, Drug, and Cosmetic Act authorizes the FDA to conduct cost-benefit analysis in order to pre-approve only new drugs that are safe and effective. *See* 21 U.S.C. § 355 (2012).

the more regulators are open to new innovation, the more they put protected interests at risk. Yet, the more protection policymakers provide for societal interests, the higher entry barriers for new innovation become.

As a result of this dilemma, the current regime has adopted a two-pronged approach for the regulation of innovation-intensive industries. Ex ante, the present regime strives to spur as much innovation as possible.[12] To achieve that, the current regime builds predominantly on patent law and on complementary mechanisms such as inducement prizes, grants, and tax incentives.[13] Ex post, when the innovation hits the market, regulation kicks in, in order to mitigate harms innovative solutions may pose to societal interests. Of course, regulation has a strong ex-ante effect, as it affects any new technology or business that would begin in its realm, as I further discuss below.

In this Article, I advance a new approach for the regulation of innovation-intensive industries. I propose that policymakers would actively promote innovative solutions that advance regulatory objectives and create incentives in the marketplace to adopt these solutions.[14] My

11. For example, 3D printing jeopardizes the intellectual property interests of the designers of the objects that would be printed. *See* Tyler Macik, Note, *Global Data Meets 3-D Printing: The Quest for a Balanced and Globally Collaborative Solution to Prevent Patent Infringement in the Foreseeable 3-D Printing Revolution*, 22 IND. J. GLOBAL LEGAL STUD. 149 (2015). 3D printing raises a few other concerns as well, such as safety (consider the printing of guns or drugs) and environmental risks (increased use of plastic, printing energy, and air pollution) and various other concerns (e.g., collapse of markets). Of course, 3D printing holds enormous promises, and is capable of diminishing scarcity of vital products and of increasing cost-effectiveness of production.

12. This goal is enshrined in the Constitution. *See* U.S. CONST. art. I, § 8, cl. 8: "to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and inventors the exclusive Right to their respective Writings and Discoveries."

13. *See, e.g.*, Brian D. Wright, *The Economics of Invention Incentives: Patents, Prizes, and Research Contracts*, 73 AM. ECON. REV. 691, 691 (1983) (comparing patents to other rewards for R&D); Joseph E. Stiglitz, *Economic Foundations of Intellectual Property Rights*, 57 DUKE L.J. 1693, 1719-24 (2008) (exploring alternatives to the patent system, including evaluating prizes and grants); Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When is It the Best Incentive System?*, *in* 2 INNOVATION POLICY AND THE ECONOMY 51 (Adam B. Jaffe et al. eds., 2002) (noting prizes and contract research as commonplace alternatives to patents in inducing research); Daniel J. Hemel & Lisa Larrimore Ouellette, *Beyond the Patents-Prizes Debate*, 92 TEXAS L. REV. 303, 307, 318, 320-21 (2013); Danielle Conway-Jones, *Research and Development Deliverables Under Government Contracts, Grants, Cooperative Agreements and CRADAs: University Roles, Government Responsibilities and Contractor Rights*, 9 COMPUTER L. REV. & TECH. J. 181 (2004) (surveying different forms of direct governmental funding of innovation). Innovations that were not covered by intellectual property law sometimes receive *sui generis* protection, such as the Semiconductor Chip Protection Act (SCPA), 17 U.S.C. §§ 901-914 (1994), which provided protection for integrated circuits.

14. This part of the work builds both on theories of innovation and on the paragon of "Minimalism" which is broadly prominent in the administrative law scholarship in recent years. *See*,

proposal is a four-stage model, which I term "Curated Innovation." In the first stage, lawmakers would set a standard that would represent the optimal outcome the regulation seeks to achieve. Second, policymakers would launch a competition, where innovative technologies or methods would race to reach the optimum point the agency has defined. Third, the regulator would select the methods or technologies that meet or come closest to meeting the standard and create an incentive in the marketplace to adopt them.[15] Such incentives can come in various forms, such as safe harbors from liability, prizes or grants, expedited patent paths, licenses, or tax incentives. In the fourth and final stage of this model, the regulator would convene periodically to update the standard and examine new technologies or methods based on the new standard.[16]

The advantages of this model are substantial. First, this model would improve the effectiveness of regulation because it would induce market-players to aim at the standard policymakers would set. Second, this model would spur innovation in the market by creating a path to the diffusion of the innovative solutions into the market. Hence, this model would ensure that innovative technologies and processes that have social value are not only produced but also adopted in the marketplace. Finally, this model would lead to the evolvement of legal standards: it provides a dynamic process where regulatory standards are constantly examined and updated to meet societal goals in an increasing rate of efficiency.

This model is intended to exist alongside the current regime and not to replace it. Thus, it would obviously be possible to innovate and create new technologies without participating in this four-pronged regulatory process. What is more, regulation in the current form is likely to still be needed in order to oversee industry activities. Successful implementation of this model would, however, align the incentives of innovators with the interests of society ex ante and in a much more effective way, thus alleviating many of the current difficulties in the regulatory process in innovation-intensive industries.

This Article proceeds as follows: In Part II, I discuss the current regime and its shortcomings with respect to the regime's underlying goals of protecting societal interests and spurring innovation. In Part III, I delineate the Curated Innovation framework and explain its four-pronged framework. This Part then explicates the model's benefits and

e.g., Charles F. Sabel & William H. Simon, *Minimalism and Experimentalism in the Administrative State*, 100 GEO. L.J. 53 (2011). *See also infra* note 99 and accompanying text.

15. Clearly, incentives might be needed in order for the technology to be developed before it is adopted in the market. *See infra* Part II.A.

16. *See infra* Part II.A.

implications. In Part IV, I contend with potential drawbacks to this proposal and explore limitations where this framework should *not* be implemented. Part V concludes that the proposed model can ensure that societal interests and the public welfare are appropriately promoted.

II. THE CURRENT REGULATORY REGIME FOR INNOVATION-INTENSIVE INDUSTRIES

Innovation is the new talisman of modern society. The economic and social benefits of innovation are virtually indisputable nowadays, and governments all over the world strive to spur innovation in order to promote growth, competition, and efficiency.[17] At the same time, however, innovation presents a material challenge for regulators. Innovation upsets settled equilibria, undermines entrenched incumbents, and disrupts markets in unforeseen ways. As a result, innovative endeavors may present severe risks to important societal interests that are under the regulator's domain.[18]

For example, while 3D printing is capable of diminishing scarcity of vital products and of increasing cost-effectiveness of production, it also presents safety and environmental risks, jeopardizes intellectual property interests, and raises various other concerns.[19] Similarly, autonomous vehicles promise to enhance safety, reduce waste, and increase mobility, but they also produce risks to privacy and security and raise unprecedented questions of liability.[20] Ultimately, the utility of these endeavors may very well outweigh their costs. But even then, the concerns they entail evidently need to be addressed.[21]

17. *See supra* note 8. *But see* Margaret Chon, *Postmodern "Progress": Reconsidering the Copyright and Patent Power*, 43 DEPAUL L. REV. 97 (1993) (objecting to the prevalent understanding of progress); Estelle Derclaye, *Eudemonic Intellectual Property: Patents and Related Rights as Engines of Happiness, Peace, and Sustainability*, 14 VAND. J. ENT. & TECH. L. 495, 508-19 (2012) (same); Simone A. Rose, *The Supreme Court and Patents: Moving Toward a Postmodern Vision of 'Progress'?*, 23 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 1197 (2013) (same).

18. *See, e.g.*, Peter Huber, *The Old-New Division in Risk Regulation*, 69 VA. L. REV. 1025 (1983) (discussing flaws in regulators' treatment of new, unknown risks); Gregory N. Mandel, *History Lessons for a General Theory of Law and Technology*, 8 MINN. J.L. SCI. & TECH. 551 (2007) (discussing flaws in regulators' responses to new technologies in the past); Thomas O. McGarity & Karl O. Bayer, *Federal Regulation of Emerging Genetic Technologies*, 36 VAND. L. REV. 461 (1983) (considering whether genetic engineering technologies were adequately covered by the existing regulatory frameworks); Monroe E. Price, *The Newness of New Technology*, 22 CARDOZO L. REV. 1885 (2001) (examining how legal institutions address "the threat of the new").

19. This goal is enshrined in the Constitution. *See* U.S. CONST. art. I, § 8, cl. 8: "to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and inventors the exclusive Right to their respective Writings and Discoveries."

20. *See supra* note 10 and accompanying text.

21. Other examples of negative externalities that novel technologies, processes, or business

Under the current paradigms, these two goals—protecting societal interests and spurring innovation—appear to come at the expense of each other.[22] An innovation-friendly environment appears to invite compromise on societal interests because it removes constraints to new innovation, including constraints that are there to protect societal interests.[23] On the other hand, preventing novel technologies and processes from challenging the status quo on public interest protection can stifle innovation and raise entry barriers to new industry players.[24]

The extant regime addresses this dilemma by forming a two-pronged system: ex ante, the present regime endeavors to spur as much innovation as possible—without gauging the expected effects of each project. Indeed, the patent system, which is the main instrument to incentivize innovation,[25] broadly pertains to *all* novel, nonobvious, useful, and adequately disclosed inventions,[26] and is blind to the social effects the inventions are expected to yield.[27] Other instruments, such as grants, prizes, or tax incentives,[28] can better address the social impact of

models may impose include environmental hazards and unfair competitive advantage to the innovator or to potential partners of the innovator.

22. As Nathan Cortez has put it, "[N]ew technologies often present unforeseen risks if under-regulated and dramatic opportunity costs if overregulated." Cortez, *supra* note 3, 201.

23. The best recent example for that is probably the report of the Financial Crisis Inquiry Commission (FCIC) in the aftermath of the 2008 financial collapse. According to this report, the tolerance of the Securities Exchange Commission (SEC) towards innovative mortgage lending practices that developed in early 2000s was a key cause for the 2008 crisis.

24. For example, the risk-averse attitude of the FDA regulation has been cited as a barrier for innovation to "regain . . . footing in the United States." Richard A. Epstein, *Can Technological Innovation Survive Government Regulation?*, 36 HARV. J.L. & PUB. POL'Y 87, 104. *See also* W. Nicholson Price II, *Making Do in Making Drugs: Innovation Policy and Pharmaceutical Manufacturing*, 55 B.C. L. REV. 491, 492 (2014) ("Pharmaceutical manufacturing lags far behind the innovative techniques found in other industries due to high regulatory barriers and ineffective intellectual property incentives.").

25. *See, e.g.*, Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1576 (2003) ("Patent law is our primary policy tool to promote innovation . . . ."); Hemel & Ouellette, *supra* note 13, at 319 (noting patents' prominent role in U.S. innovation policy). *See also* Amy Kapczynski, *The Cost of Price: Why and How to Get Beyond Intellectual Property Internalism*, 59 UCLA L. REV. 970, 975 (describing the current focus on IP rights as a key to induce research). *But see* Sofia Ranchordás, *Does Sharing Mean Caring? Regulating innovation in the sharing economy*, 16 MINN. J.L. SCI. & TECH. 413, 453 (2015) ("Gone are the days when patents were regarded as the only legal mechanism to incentivize innovation.").

26. 35 U.S.C. §§ 101-103, 112, 154(a)(2) (West, Westlaw through P.L. 114-112 (excluding 114-92, 114-94 and 114-95) 2015). This broad definition excludes only "laws of nature, physical phenomena, and abstract ideas." *See* Bilski v. Kappos, 561 U.S. 593, 601 (2010).

27. Clearly patents incentivize inventors to examine the marketability of their ideas, which provides some input on the social value the innovation is creating. For a discussion of this point, *see infra* note 51 and accompanying text.

28. *See, e.g.*, Robert D. Atkinson, *Expanding the R&E Tax Credit to Drive Innovation, Competitiveness and Prosperity*, 32 J. TECH. TRANSFER 617 (2007); Calvin H. Johnson, *Capitalize*

projects through eligibility criteria. Yet such instruments are not only secondary to patents, but they are also sporadic and saved for specific contexts, such as where research and development (R&D) efforts in the free market seem unlikely.[29]

Ex-post, once an innovative technology or process has entered the market, regulatory agencies are tasked with ensuring that the project does not imperil societal interests that are under their domain. This is not to say that regulation has no ex ante function. Rules that regulators make may apply to new products as well as to existing ones. Yet, regulation can only address innovative products if they fit into an existing regulatory framework, which is often times not the case with innovation-intensive industries. The more innovative a technology or process, the less likely it is to fit to any existing regulatory framework. In many cases, then, regulators would need to formulate a response to an innovative product ex post.

The ex ante and ex post systems operate independently of each other. There is little, if any, connection between the ex ante system for encouraging innovation and the ex post system of regulating its potential adverse effects.[30] Whether an innovative project produces an overall social gain or social loss has no effect on its eligibility for patents. It does not even have an effect on the eligibility of the project for grants, prizes, or tax credits.[31] Similarly, whether an innovator was granted a patent, awarded a grant or a prize, or enjoyed tax credits has no effect on the regulatory scrutiny their project will be subject to ex post.[32]

Costs of Software Development, 124 TAX NOTES 603 (2009); William Natbony, *The Tax Incentives for Research and Development: An Analysis and a Proposal*, 76 GEO. L.J. 347 (1987); Evan Wamsley, Note, *The Definition of Qualified Research Under the Section 41 Research and Development Tax Credit: Its Impact on the Credit's Effectiveness*, 87 VA. L. REV. 165 (2001).

29. For example, the government may offer a grant to incentivize the development of a medication to treat a rare disease because the low number of patients renders it unlikely that the innovator will be able to recoup the R&D costs of the medication in the free market. Orphan drugs can be a case in point. Few individuals are affected by such diseases, and revenues will then likely be lower than the R&D expense. *See* Orphan Drug Act of 1983, Pub. L. No. 97-414, 96 Stat. 2049 (1983) (codified as amended in scattered sections of 21 U.S.C. and 42 U.S.C.). *See also* Hemel & Ouellette, *supra* note 13, at 316 ("The U.S. federal government currently uses prizes, patents, grants, and tax credits to incentivize the invention and commercialization of new technologies."); Arti K. Rai, *Pharmacogenetic Interventions, Orphan Drugs, and Distributive Justice: The Role of Cost-Benefit Analysis*, 19 SOC. PHIL. & POL'Y 246, 258, 261 (2002). For a discussion of grants and prizes under the Curated Innovation model, see *infra* Part II.A.2.b.

30. Note that for some institutions, such grants and prizes may turn on the effect the technology or process is causing, albeit only via a limited prism. *See also infra* Part II.A.2.b.

31. *See infra* Part II.A.2.b.

32. The tax system is a flexible framework that can actually include different incentive mechanisms. The U.S. system has been using tax incentives mainly in the form of tax credits on the basis of R&D expenditures, but with conflicting estimates as to their effectiveness. Federal research

As I elaborate below, this dualist regime inadequately addresses both its ex ante goal—to promote innovation—and its ex post goal—to provide protection for social interests that are jeopardized by innovation. In Part II.A, I discuss the inefficient way the extant regime protects societal interests. Specifically, I explore how the current regime creates suboptimal incentives for innovators to aim at enhancing societal welfare, and discuss the inefficiencies in ex post regulation. In Part II.B, I analyze the costs the current regime imposes on innovators, and show that encouraging innovation at the idea stage and regulating it later is harmful for innovation.

A. Inefficient Protection of Societal Interests

The current regime provides deficient protection of societal interests against innovative endeavors that may sabotage it. The current regime produces little incentive for innovators to internalize the societal effects of their projects ex ante, except for the part of the effect that is likely to be reflected in the market for the innovation. Regulation at the ex post stage is also wasteful and often ineffective in innovation-intensive industries.[33]

First things first. Naturally, there is no perfect overlap between the interests of society in innovation and the interest of profit-maximizing innovators. Profit-maximizing individuals or firms would engage in a project when *their* expected value from it appears greater than *their* cost of pursuing the project.[34] From a societal point of view, however, innovation is desired when its *overall* social gain is higher than its

and development tax incentives total more than $10 billion annually. *See* Staff of Joint Comm. on Taxation, 113th Cong., Estimates of Federal Tax Expenditures for Fiscal Years 2012-2017, at 30 tbl.1 (Joint Comm. Print 2013). *See also* Hemel & Ouellette, *supra* note 13, at 309 (2013) (noting that "the United States and other industrialized economies dole out tens of billions of dollars' worth of tax credits each year for research and development"). *See also* Shawn P. Mahaffy, *The Case for Tax: A Comparative Approach to Innovation Policy*, 123 YALE L.J. 812 (2013); Christian Köhler et al., *The Impact and Effectiveness of Fiscal Incentives for R&D* 29 (Nat'l Endowment for Sci., Tech. & the Arts, Working Paper No. 12/01, 2012), http://www.nesta.org.uk/library/documents/wp12-01v2.pdf ("Evaluations of output additionality of tax incentives are rather scarce . . . little is yet known about the welfare effects in the long run.").

33. As Daniel Gervais puts it, "[T]he risk of failure (that is, the absence of correlation, let alone a match, between the regulatory objective and the actual outcome once the regulation is implemented) is much higher when dealing with an inchoate technology." *See* Gervais, *supra* note 6, at 682.

34. Innovation costs would generally include R&D costs and opportunity costs. *See also* Mahaffy, *supra* note 32, at 819. Carol M. Rose, *Scientific Innovation and Environmental Protection: Some Ethical Considerations*, 32 ENVTL. L. 755 (2002) (noting that there is an under-incentive to engage in research when profit is not forthcoming).

overall social cost.[35] As a result, innovators are likely to eschew projects that enhance the societal value in favor of projects that maximize their own profit.

Envision, for example, a project that would cost $1,000,000 to an innovator in R&D (assume this is the only relevant cost) and that is expected to yield to the innovator $1,500,000 at a fifty percent probability. This endeavor yields an overall expected loss of $250,000 to the innovator and is not in her interest to pursue. Assume, however, that the value that this project could produce to society exceeds that $250,000 loss.[36] The current regime provides no incentive for the innovator to pursue such innovations and may materially "exacerbate the problem by drawing resources away from such innovations."[37] To the detriment of society, such an endeavor would rationally be abandoned. The only exception for this conclusion would be if the innovator wins a prize or grant to pursue the innovation, which would tip their cost-

35. The costs and benefits of society needs of course, to be examined in the broad sense, and take into account long term effects, the societal value of expression via innovation itself etc.. In the long run, even if a newly developed technology, process or business model do not balance well between the competing interests in the industry, they may become the building blocks of a solution that will.

36. This broader societal value may not be reflected in the market for the invention—and thus not internalized by the innovator—for several reasons. For example, the innovation may concern credence goods, thus information gaps prevent buyers from observing the full value of the innovation. (*See* Michael R. Darby & Edi Karni, *Free Competition and the Optimal Amount of Fraud*, J. LAW & ECON. 16 (1973). *See also* Uwe Dulleck, Rudolf Kerschbamer & Matthias Sutter, *The Economics of Credence Goods: On the Role of Liability, Verifiability, Reputation and Competition*, WORKING PAPERS IN ECONOMICS AND STATISTICS, 1 (2009) ("Generally speaking, credence goods have the characteristic that though consumers can observe the utility they derive from the good ex post, they cannot judge whether the type or quality of the good they have received is the ex ante needed one. Moreover, consumers may even ex post be unable to observe which type or quality they actually received."), http://www.uibk.ac.at/economics/bbl/cv_papiere/2009-03%5B1%5D.pdf. *See also* Daniel Carpenter, *Confidence Games: How Does Regulation Constitute Markets?*, *in* GOVERNMENT AND MARKETS: TOWARD A NEW THEORY OF REGULATION 164, 174 (Edward J. Balleisen & David A. Moss eds., 2010) ("[Credence] goods . . . create 'lemons problems.' Because of informational shortcomings, consumers will continually purchase or consume inferior products when superior alternatives are available . . . ."). The innovation may also produce other spillovers that the innovator cannot capture. For example, the output of the R&D could be used by the firm's competitors, or have broad spectrum of applications, beyond what the innovator can capture, and could be used by other firms. Alternatively, the R&D process itself may save R&D expenses to that firm's competitors that are pursuing the same invention. *See* Mark Lemley & R. Anthony Reese, *Reducing Digital Copyright Infringement Without Restricting Innovation*, 56 STAN. L. REV. 1345, 1387 (2004) ("Economic evidence strongly suggests that those unanticipated future benefits, or 'spillover' effects, often exceed the immediate value of most new technologies.").

37. Amy Kapczynski & Talha Syed, *The Continuum of Excludability and the Limits of Patents*, 122 YALE L.J. 1900, 1904, 1951 (2013) (referring to the patent system).

benefit analysis.[38] But grants and prizes are sporadic, irregular, and clearly cannot cover the whole range of spillover innovations.[39]

Consider, for example, the case of privacy-enhancing technologies, such as cookie-blockers or browser modifications. These technologies potentially have enormous societal values in preventing privacy harms. Yet, due to various failures in privacy-related markets, the adoption rate of these technologies is probably lower than the actual value they provide.[40] Because the market cannot reflect the full value that these technologies generate, innovators are less likely to invest in creating such solutions, despite the societal value such products can yield.

Likewise, innovative projects can be worthwhile for the innovator yet detrimental for society. This condition occurs when the innovation externalizes more costs to society than the overall benefit it yields. The best recent example for such an innovation is probably the innovative mortgage lending practices that led to the 2008 financial collapse. The innovators of these lending practices were able to internalize the benefits of those transactions while externalizing most of the costs.[41] Other examples may include computer viruses, malicious software, and some aggressive spying technologies that enable the gathering of excessive information on third parties without their consent.[42] Under the extant

38. Prizes are monetary awards given *ex post* to the first inventors of a specific invention upon the successful completion of the task. Grants are monetary support given *ex ante* to enable an inventor to engage in the innovation. *See* Gallini & Scotchmer, *supra* note 13, at 53; Hemel & Ouellette, *supra* note 13, at 307-08, 318, 320-21. *See also infra*, Part II.A.2.b.

39. For a survey of different forms of direct governmental funding of innovation, see, in general, Conway-Jones, *supra* note 13.

40. *See* Lital Helman and Sharon Hannes, *Tying Executive Compensation to Privacy Performance* 2015 (unpublished manuscript, on file with author) (analyzing market failures in the market for personal data).

41. The decision not to regulate the derivative market was a conscious decision. In the 1990s, the Commodities Futures Trading Commission (CFTC) identified systemic risks in this market and considered regulating it. Congress, however, warned that "financial services regulatory policy must be flexible to account for rapidly changing derivatives industry business practices." *See* Commodity Futures Modernization Act of 2000, Pub. L. No. 106-554, 114 Stat. 2763 (codified as amended in scattered sections of 7, 11, 12, and 15 U.S.C. § 126, 114 Stat. at 2763A-412). The objection to regulation stemmed also from the anti-regulation position of key regulators at the time, including Federal Reserve chairman Alan Greenspan and Treasury Secretary Robert Rubin, who promoted the paradigms of deregulation and self-regulation. *See* Gary Gensler, *History of Derivatives Regulation, Culprit OTCs*, COMMODITY ONLINE (July 2, 2010, 3:35 PM), http://www.commodityonline.com/news/Historyof-derivatives-regulation-culprit-OTCs-29636-2-1.html. *See also* Brooksley Born, *Foreword: Deregulation: A Major Cause of the Financial Crisis*, 5 HARV. L. & POL'Y REV. 231 (2011). *See also* Cortez, *supra* note 3.

42. *See, e.g.*, DANIEL J. SOLOVE, UNDERSTANDING PRIVACY 101-06 (2008). On the market of online advertising that is based on users' data, see generally David S. Evans, *The Online Advertising Industry: Economics, Evolution, and Privacy*, J. ECON. PERSP. 37, 42-43 (2009); Catherine Tucker, *The Economics of Advertising and Privacy* (Elsevier, Nov. 19, 2011)

regime, such innovations would be pursued to the benefit of the innovators, and perhaps potential buyers of their products, while externalizing costs on third parties and on society as a whole.

While the phenomenon of under-production of desired innovations has some partial solutions through grants and prizes,[43] over-production of harmful innovation is not addressed ex ante at all.[44] In fact, the assumption under the current regime is that ventures with overall negative social value will fail in the marketplace and that this fact alone is a disincentive to engage in pursuing them.[45] As Peter Menell and Suzanne Scotchmer explain, "[I]ntellectual property rewards reflect the social value of the contribution, since the profit is determined by demand."[46]

This assumption only holds, however, when the harms that the innovation inflicts are expected to affect market transactions. This is often not the case. Market transactions may be misinformed[47] or self-disinterested,[48] and they very often inflict negative externalities on third

http://cetucker.scripts.mit.edu/docs/econ_summary_2011.pdf; Howard Beales, *The Value of Behavioral Targeting*, NETWORK ADVER. INITIATIVE, 6-17 (Mar. 24, 2010), http://www.networkadvertising.org/pdfs/Beales_NAI_Study.pdf (discussing a study on behaviorally targeted advertising); Avi Goldfarb & Catherine Tucker, *Online Advertising*, *in* 81 ADVANCES IN COMPUTERS 289, 292-94 (Marvin V. Zelkowitz ed., 2011).

43. *See supra* notes 38-39 and accompanying text.

44. Clearly, general laws—including statutes and court decisions—that forbid certain activities would apply to innovation as well. *See, e.g.*, *infra* note 90 for an example of the development of the law regarding the innovative (at the time) phenomenon of file-sharing.

45. Patents consists of the right to exclude others for twenty years from selling or otherwise using the innovation. But this right is rather useless if the innovation has no market value. Thus, patents only form an incentive to innovate if the innovator can sell the innovation in the marketplace (in supra-competitive prices) and recoup her R&D costs. The outcome is that patents incentivize innovators to estimate the market value of their invention in order to decide whether the expected monetary reward justifies the costs of pursuing the innovation. *See also* Peter Lee, *Social Innovation*, 92 WASH. U. L. REV. 1, 6 (2014) ("Among its other virtues, the patent system is often extolled as a neutral platform in which the market—rather than a government entity—determines the allocation of resources for technological development"). *See also* Wright, *supra* note 13, at 694-95. Also, commercial success has become in courts an important factor to determine patentability (through a secondary consideration for obviousness. *See* Robert P. Merges, *Commercial Success and Patent Standards: Economic Perspectives on Innovation*, 76 CALIF. L. REV. 803, 823 (1988) ("[C]ommercial success often proves decisive in establishing nonobviousness.").

46. *See* Peter S. Menell & Suzanne Scotchmer, *Intellectual Property Law*, *in* 2 HANDBOOK OF LAW AND ECONOMICS 1471, 1499 (A. Mitchell Polinsky & Steven Shavell eds., 2007). *See also* Kapczynski, *supra* note 25, at 974-75 ("Price links the production of information to consumer demand, and, by extension, to social welfare."). *See, e.g.*, Kapczynski & Syed, *supra* note 37, at 1904 (2013) (same).

47. For example, the problem of credence goods can also cause buyers to under-value an invention. *See supra* note 37.

48. *See, e.g.*, MATTHEW D. ADLER & ERIC A. POSNER, NEW FOUNDATIONS OF COST-BENEFIT ANALYSIS 28-39 (2006) (rejecting the equation of wellbeing and preference-satisfaction,

parties or on society at large.[49] Harms that do not affect sales will rationally be ignored by innovators who would pursue the innovation nonetheless.[50]

There is, of course, a caveat to this conclusion. This caveat involves private enforcement. Specifically, in cases where private lawsuits are likely to be filed against the innovator, innovators will rationally calculate this probability in the equation when planning the product.[51] In other cases though, innovators have an incentive to externalize costs to society.

To a large extent, innovators are not only expected to fail to consider the effects of their innovation on the public interest, but under the extant regime they are often discouraged from engaging in such considerations. Innovative spaces are competitive, and innovators are under constant pressure to turn profits.[52] Innovators that would pursue

based, among other things, on the fact that preferences may not be self-interested).

49. *See, e.g.*, *supra* note 41 and accompanying text.

50. Other examples may include innovations in areas that are prone to systematic consumer mistakes, such as "behavioral market failure," defined by Oren Bar-Gill as "a persistent consumer mistake that causes substantial welfare loss." Oren Bar-Gill & Franco Ferrari, *Informing Consumers about Themselves*, 3 ERASMUS L. REV. 93 (2010); *See* Oren Bar-Gill, *Competition and Consumer Protection: A Behavioral Economics Account*, *in* THE PROS AND CONS OF CONSUMER PROTECTION 12 (Swedish Competition Auth. 2012), *available at* http://www.konkurrensverket.se/globalassets/english/publications-and-decisions/the-pros-and-cons-of-consumer-protection.pdf). For example, in the privacy realm, scholars contend that market failures prevent the objects of tracking to act upon such harms. *See, e.g.*, Jeff Sovern, *Opting In, Opting Out, or No Options at All: The Fight for Control of Personal Information*, 74 WASH. L. REV. 1033 (1999) (discussing problems consumers face in assessing the costs of data collection); Daniel Solove, *Privacy Self-Management and the Consent Paradox*, 126 HARV. L. REV. 1880 (2013) (discussing issues consumers face in assessing privacy risks and the difficulties with the privacy self-management paradigm); JAMES P. NEHF, OPEN BOOK: THE FAILED PROMISE OF INFROMATION PRIVACY IN AMERICA (2012) (discussing reasons for failure of the self-policing model for privacy); Richard Warner, *Undermined Norms: The Corrosive Effect of Information Processing Technology on Informational Privacy*, 55 ST. LOUIS L.J. 1047 (2011) (raising questions about the viability of using consent to limit mass surveillance). *But see* PAUL H. RUBIN & THOMAS M. LENERD, PRIVACY AND THE COMMERCIAL USE OF PERSONAL INFORMATION (2002) (finding no failures in the market for personal information and recommending against government intervention). Other examples may include products that damage the consumer herself, including her financial situation or mental health. *See, e.g.*, Andrew Hough, *Student 'Addiction' to Technology 'Similar to Drug Cravings', Study Finds*, THE TELEGRAPH (April 8, 2011), http://www.telegraph.co.uk/technology/news/8436831/Student-addiction-to-technology-similar-to-drug-cravings-study-finds.html); Jyoti Ranjan Muduli, *Addiction to Technological Gadgets and Its Impact on Health and Lifestyle: A Study on College Students* (MA Thesis, 2014), http://ethesis.nitrkl.ac.in/5544/1/e-thesis_19.pdf.

51. *See, e.g.*, A. Mitchell Polinsky and Steven Shavell, *The Uneasy Case for Product Liability*, 123 HARV. L. REV. 1437 (2010) (discussing private enforcement as an alternative to public enforcement in the context of product liability).

52. *See, e.g.*, Paul M. Schwartz, *Privacy and Democracy in Cyberspace*, 52 VAND. L. REV. 1609, 1682-83 (1999) (describing "one-sided bargains that benefit data processors").

social value that they cannot capture would lose in competition to providers who do not spend resources on such concerns. As a result, innovators have a strong incentive to externalize costs on society—be it the environment, privacy, labor conditions, or other interests—in the quest for market-efficient production and revenues.

The misalignment of interests between innovators and society under the extant regime is troubling.[53] It under-incentivizes the production of innovations that can boost overall societal welfare, and over-incentivizes innovation that merely shifts wealth from society to innovators without furthering social welfare or even shrinks overall social welfare. It also stifles the incentive for researchers and firms to come up with new technologies, processes, or business models that would have better effects on social welfare.

The current regime, by not compelling innovators to enhance societal efficiency, also enhances the need for top-down regulation later on. Yet, entrepreneurs are better situated than regulatory agencies to minimize potential harms of their innovation to societal values at a relatively low cost. Innovators have superior information on the product and on its market and would be able to tackle potential harms to the public interest much more effectively.[54] Unlike regulators, innovators can also attend to those harms ex ante.

Altogether, regulation is incapable to effectively fix the situation ex post. The first reason for that is that regulation takes time.[55] During the time it takes to finalize and implement the regulation, innovation would

53. Note, however, the limited exception of grants and prizes. *See supra* notes 38-39 and accompanying text.

54. *See, e.g.*, Daniel F. Spulber, *Prices versus Prizes: Patents, Public Policy and the Market for Inventions* 46 (September 1, 2014) (Northwestern Law & Econ Research Paper No. 14-15), http://ssrn.com/abstract=2488095 (noting that "central planners necessarily lack the detailed private information of inventors, innovators, producers, and consumers that generate prices in the market for inventions"). *See* also Gallini & Scotchmer, *supra* note 13, at 54-55 ("[T]he costs and benefits of R&D investments are known only to firms, and not to government sponsors."); Wright, *supra* note 13, at 695 ("The special advantage of patents arises . . . from ex ante researcher information relating to the value of the invention.").

55. JOHANNA GIBSON, THE LOGIC OF INNOVATION: INTELLECTUAL PROPERTY, AND WHAT THE USER FOUND THERE 47 (ASHGATE 2014) ("The innovator is always in credit . . . [p]roduct cycles [will always be] faster than justice"). More generally, Ranchordás, *supra* note 25 ("Regulation has been traditionally thought of as an obstacle to innovation and creativity: law is about routine and regulation, defining boundaries and standardizing procedures, whereas innovation emerges from freedom, room for new ideas and openness to diversity . . . . Even worse, laws often impose costly burdens on innovators that stifle innovation, impede entrepreneurship, or influence innovators to shop for jurisdictions offering innovation friendly legal conditions."). *See also* EDWARD ELGAR, CREATIVITY, LAW AND ENTREPRENEURSHIP 3 (Shubba Ghosh & Robin Paul Malloy eds., 2006).

be free from scrutiny or subject to outdated rules. Harms that ventures would inflict on society during that time may be irreversible.[56] For example, the FDA has been looking into the issue of electronic cigarettes since the technology emerged in 2003, but regulation is yet to be issued.[57] In the meantime, electronic cigarettes can be used by minors and may contain whatever chemicals and flavors manufacturers wish it to contain.[58] Similarly, the AdTech industry has been collecting data about users for over a decade, as regulators waver over the desired standard of privacy regulation.[59] As Tim Wu warns, the time spent in anticipation of regulation "surrenders any public oversight or input during what may be a critical period of industry development."[60]

Harms that have materialized in the formative age of the industry will not be mended once regulation steps in.[61] In the above examples, people may have already become addicted to e-smoking,[62] or personal information of individuals may already be in the hands of untrusted entities.[63] What is more, by the time regulation is issued, industry

56. *See, e.g.*, Lars Noah, *Assisted Reproductive Technologies and the Pitfalls of Unregulated Biomedical Innovation*, 55 FLA. L. REV. 603, 614-24 (2003) (discussing evidence of risks associated with the relatively unregulated field of assisted reproductive technology); Robert L. Rabin, *Federal Regulation in Historical Perspective*, 38 STAN. L. REV. 1189, 1304-05 (1986) (noting that, in the realm of health and safety regulation, "inaccurate, insufficiently protective, administrative decisions might lead to irreversible long-term risks to society of devastating magnitude"); Nicholas Bagley & Richard L. Revesz, *Centralized Oversight of the Regulatory State*, 106 COLUM. L. REV. 1260, 1296-300 (2006) (suggesting reasons why regulators might err on the side of under-regulation).

57. *See* Michael Felberbaum, *E-cigarette tech takes off as regulation looms*, THE WASH. TIMES (Dec. 8, 2014), http://www.washingtontimes.com/news/2014/dec/8/e-cigarette-tech-takes-off-as-regulation-looms/?page=all.

58. *Id*.

59. *See* Marc Rotenberg, *Fair Information Practices and the Architecture of Privacy: (What Larry Doesn't Get)*, 2001 STAN. TECH. L. REV. 1, 27-30 (2001) (detailing the history of the privacy debate in the United States, and specifically the law between self-regulation and market solutions on the one hand and privacy rights or regulation on the other).

60. *See* Wu, *supra* note 6, at 1841-44 (discussing lack of regulation in innovation-intensive industries).

61. See, for example, the vast literature on the costs firms incur by bureaucratic delays on environmental regulation. *See, e.g.*, Lea-Rachel D. Kosnik, *Sources of Bureaucratic Delay: A Case Study of FERC Dam Relicensing*, 22 J.L. ECON. & ORG. 258 (2005); Hilary Sigman, *The Pace of Progress at Superfund Sites: Policy Goals and Interest Group Influence*, 44 J.L. & ECON. 315 (2001); Amy Whritenour Ando, *Waiting to be Protected Under the Endangered Species Act: The Political Economy of Regulatory Delay*, 42 J.L. & ECON. 29 (1999).

62. *See* World Health Organization, *Tobacco Free Initiative (TFI)* (July 9, 2013). Evidence of ongoing use among those who have never smoked, however, is yet to be found. *See* Peter Hajek et al., *Electronic cigarettes: review of use, content, safety, effects on smokers and potential for harm and benefit*, 109 ADDICTION 1801-10 (2014).

63. Privacy risks may also place a lasting chilling effect on speech and of the adoption of new technologies, as users would know their online speech is tracked and stored. The FTC has argued that new privacy protections "not only will help consumers but also will benefit businesses

practices may already adopt norms or private arrangements that would not be easy to uproot later on. Private arrangements or self-regulation are likely to externalize costs on nonmembers of the arrangement.[64]

Finally, enforcement of ex post regulation is tricky. First, by the time regulation is ready, the practices that regulators seek to regulate are probably more in line with social norms than the regulation is going to be.[65] Regulation that is not supported by social norms is hard to enforce.[66] What is more, it is difficult to enforce regulation on an assortment of newcomers, single entrepreneurs, and start-up companies that are not accustomed to regulation.[67]

---

by building consumer trust in the marketplace. Businesses frequently acknowledge the importance of consumer trust to the growth of digital commerce and surveys support this view." *See* Federal Trade Commission, *Protecting Consumer Privacy in an Era of Rapid Change: recommendations for businesses and policymakers* (2012), http://www.ftc.gov/sites/default/files/documents/reports/federal-trade-commission-report-protecting-consumer-privacy-era-rapid-change-recommendations/120326privacyreport.pdf. *See also* Leslie Harris, *The Best Practices Act of 2010 and Other Federal Privacy Legislation*, CTR. FOR DEMOCRACY & TECH., 1 (July 22, 2010), https://cdt.org/files/pdfs/CDT_privacy_bill_testimony.pdf (arguing that "[p]rivacy is an essential building block of trust in the digital age").

64. As Eric Posner observed, "Groups have a stronger incentive to adopt or develop norms that externalize costs than those that merely maximize joint welfare without producing negative externalities." *See* Eric A. Posner, *Law, Economics, and Inefficient Norms*, 144 U. PA. L. REV. 1697, 1723 (1996). A telling example in this regard in the 2007 agreement between copyright holders to the big webhosts, according to which the latter would filter out copyrighted content from their services. The agreement included little safeguards to ensure the freedom of speech of users is not unduly compromised. *See Principles for User Generated Content Services*, *available at* http://www.ugcprinciples.com (last visited Mar. 5, 2015). *See also* Lital Helman & Gideon Parchomovsky, *The Best Available Technology Standard*, 111 COLUM. L. REV. 1194, 1210 (2011) (discussing the inefficiencies of this private arrangement).

65. For example, quite a few scholars argue that some attempts to regulate privacy are in fact inconsistent with the public's conscious willingness to trade their personal data in return for free online services—a willingness that represents a change in social norms. *See supra* note 50. *See also* Robert Cooter, *Innovation, Information, and the Poverty of Nations*, 33 FLA. ST. UNIV. L. REV. 373, 379 (2005) (noting that regulators generally lack information to make a good innovation policy).

66. *See* Gervais, *supra* note 6, at 673 ("[T]he difficulty of the moving technological target is compounded by social norms that may try to circumvent the regulation, especially for mass use technologies."). *See generally* LAWRENCE LESSIG, CODE AND OTHER LAWS OF CYBERSPACE (1999) (arguing that laws are most effective when the market, the law, code (or architecture), and social norms—as four regulatory forces—are aligned). From the attempts to criminalize soft-drug use, to the laws and regulation surrounding unauthorized use of copyrighted materials on the internet, social norms that are conflicted with the law usually win over it. It is of course possible to rebut this argument, because in the context of new innovation there might not be social norms at all, so that social norms would also not be against it. *See, e.g.*, Christopher Jensen, Note, *The More Things Change, the More They Stay the Same: Copyright, Digital Technology, and Social Norms*, 56 STAN. L. REV. 531, 564 (2003) (pointing out the DMCA's unintended effect of "widen[ing] the existing gap between copyright law and copyright norms, further weakening the law's norm-reinforcing function").

67. *See* Gervais, *supra* note 6, at 673 ("A constellation of unknown start-ups seems to present a greater regulatory challenge than asking already highly regulated companies to adapt to

Enforcement of regulation is also costly. Innovators, who strive to pursue market gains, rationally attempt to work around regulations that place hurdles in their pursuits. Regulators, on their side, work to seal up holes in the regulatory scheme that allow firms to evade its rules. This enforcement "cat-and-mouse" game can be administratively costly and perpetuate a cycle of inefficiency and waste. For the same reason, even when enforcement is forthcoming, it is likely to yield only a moderate effect. Under the extant regime, innovators have a strong incentive to keep compliance to a minimum because compliance would reduce market performance.[68] Innovators would thus rationally treat the regulatory requirements as a ceiling and not only a floor.

As discussed below, the extant regime does not yield more success in its attempt to foster innovation.

B. Regressive Innovation Policy

The second cost the current regime entails pertains to its implications on innovation. As elaborated below, post hoc regulation generates obstacles for innovation to leap from the idea phase to successful diffusion into the market. Such regulation also increases uncertainty for innovators and investors and injects unnecessary costs into the innovative process.

The innovation policy under the current regime puts the premium of innovation on the idea phase. The present innovation philosophy focuses on opening the floor to as many ideas as possible[69] and qualifies to patents "anything under the sun that is made by man."[70] The literature on innovation has traditionally emphasized the role of ideas and basic R&D in innovation-based growth, and has relied on patent statistics to measure innovation.[71]

Yet, this view reflects a romantic and rather unfounded view of innovation. In reality, innovation is a multi-staged and quite complex

regulation."). Huber, *supra* note 18, at 1035 ("Standard-setting agencies tend to focus on large regulatory targets so as to promulgate regulations with the broadest possible effect at the least cost to the agency.").

68. *See supra* notes 34-54 and accompanying text.

69. *See supra* note 12 and accompanying text.

70. *See* Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980).

71. From the early days of technology, most analyses of innovation levels in society are based on quantitative measurements of patents issued to innovators in that society. *See* Kaldor, *supra* note 8. *See also* Charles I. Jones & Paul M. Romer, *The New Kaldor Facts: Ideas, Institutions, Population, and Human Capital* 8 (Nat'l Bureau of Econ. Research, Working Paper No. 15094, 2009) (exemplifying the usage of patent statistics over Kaldor's growth theory and offering cross-country patent statistics alongside other factors as key facets for economic growth).

phenomenon. It initiates with an idea, continues with a long experimental stage with quite a few iterations, and progresses to diffusion into the market, continuous adaptation to competition, and changing market trends. Most innovative endeavors do not struggle in the idea phase. The "valley of death" for innovation occurs in the search for funding and at the market penetration stage.[72] Yet, under the current regulatory regime, while early stages of innovation are generally free from scrutiny, the market diffusion stage may be heavily regulated.[73] This duality renders it cheap to come up with new ideas but presents a hurdle for innovators to leap from the idea phase of their innovation to successful diffusion into the market.

Encouraging innovation at its earliest stage and regulating it at later, tougher stages, is inefficient. Such a policy imposes boundaries on companies exactly when they need breathing room in order to advance and grow. Regulation at a later stage also produces waste because it often forces companies to revert features of the product post facto for compliance. Such a policy also entails opportunity costs because innovators who have invested in the idea phase, but end up dropping because of heavy regulation in the execution stage, could have invested in higher-value, foregone activities.

The inefficiency of ex post regulation is exacerbated because of the uncertainty of regulation under the current regime.[74] Indeed, the standard for regulatory intervention in innovation is extremely unclear. Regulators may implement anything from full-scale regulation of innovation-intensive industries to no regulation at all. This vagueness is also reflected in regulatory scholarship. While some scholars, such as David Super, have called to regulate innovation-intensive industries the

72. *See* Albert C. Lin, *Lessons From the Past for Assessing Energy Technologies for the Future*, 61 UCLA L. REV. 1814, 1819 (2014) ("The so-called valley of death describes the struggle of some innovators to obtain funding to advance a technological breakthrough from the research stage to proof of concept, and ultimately to full-scale commercialization."). *See also* Jesse Jenkins & Sara Mansur, *Breakthrough Inst., Bridging the Clean Energy Valleys of Death* 5-6 (2011).

73. *See supra* Part I.A.

74. *See, e.g.*, *Public Workshop-Mobile Medical Applications Draft Guidance*, U.S. FOOD AND DRUG ADMINISTRATION (Sept. 12-13, 2011), http:// www.fda.gov/MedicalDevices/NewsEvents/WorkshopsConferences/ucm267821.htm (last visited Feb. 21, 2015) (transcripts available at http://www.fda.gov/MedicalDevices/NewsEvents/ WorkshopsConferences/ucm275908.htm and http:// www.fda.gov/MedicalDevices/NewsEvents/ WorkshopsConferences/ucm275909.htm) (statement of Dean Kross, M.D.) (citing a decade of experience with unregulated electronic health records (EHRs) and prescribing software, which produced "ancient, hostile" applications with very little transparency as to how they operate). *See also* Gervais, *supra* note 6, at 668-69 (noting inverse correlation between regulation and beneficial innovation).

same way regulation is carried out in other, more stable, industries,[75] other scholars, such as Daniel Gervais, have advocated for minimal regulation of innovation-intensive spaces.[76] Yet others, such as Tim Wu and Peter Strauss, have called for middle grounds, where regulators proceed via "soft law,"[77] i.e., informal ways that communicate the regulatory position to regulated entities, such as informal guidance and "threats."[78] At the end of the day, under the current state of affairs, policymakers enjoy "policymaking pluralism,"[79] where they have a menu of choices at their disposal to select from ad hoc and have full discretion to choose which regulatory method to pursue.[80]

What is more, in recent years, regulatory agencies have shifted from rule-based regulation to a soft-law regime. As Melissa Wasserman notes, "Agencies are increasingly relying on guidance documents to offer their legal constructions of statutes."[81] This shift to "nonrule

75. *See* Cortez, *supra* note 25. *But see* Wu, *supra* note 6. (This way is "likely to last a long time based on poorly developed facts, and it invites long periods of uncertainty created by the judicial review process.").

76. *See* Gervais, *supra* note 6 (arguing that the case of inchoate technology does not raise the accepted rationales for regulation, as described in Justice Breyer's six reasons to regulate). *See* Stephen Breyer, *Regulation and Deregulation in the United States: Airlines, Telecommunications and Antitrust*, *in* DEREGULATION OR RE-REGULATION? REGULATORY REFORM IN EUROPE AND THE UNITED STATES, 7, 9-11 (1990)). *See also* Skorup & Thierer, *supra* note 8, at 197-78 (arguing that fast-moving industries are "the last sectors regulators should be preemptively micromanaging since they lack the requisite knowledge of whether a market development will harm or benefit consumers in the long-term").

77. Jacob E. Gersen & Eric A. Posner, *Soft Law: Lessons from Congressional Practice*, 61 STAN. L. REV. 573, 578-79 (2008).

78. *See* Wu, *supra* note 6, at 1849 (arguing that this regime is justified "[in] periods surrounding a newly invented technology or business model, or a practice about which little is known"); Peter L. Strauss, *Publication Rules in the Rulemaking Spectrum: Assuring Proper Respect for an Essential Element*, 53 ADMIN. L. REV. 803, 804 (2001); David Zaring, *Best Practices*, 81 N.Y.U. L. Rev. 294, 301 (2006) (arguing that regulatory threats "should be cautiously tolerated so long as Congress provides some supervision or regulators take care to ensure that best practices are publicized, and, when necessary, subject to informal comment by interested parties").

79. Cortez, *supra* note 3, at 213. *See also* M. Elizabeth Magill, *Agency Choice of Policymaking Form*, 71 U. CHI. L. REV. 1383, 1388 n. 11, 1405-42 (2004) (noting that agencies are authorized to choose between methods of regulation and that this choice is virtually immune from judicial review).

80. Cortez, *supra* note 3, at 213. *See also* Magill, *supra* note 79.

81. *See* Melissa F. Wasserman, *Deference Asymmetries: Distortions in the Evolution of Regulatory Law*, 93 TEX. L. REV. 625, 652. *See also* Zaring, *supra* note 78. Robert A. Anthony, *Interpretive Rules, Policy Statements, Guidances, Manuals, and the Like—Should Federal Agencies Use Them to Bind the Public?*, 41 DUKE L.J. 1311, 1332-56 (1992); Lars Noah, *Administrative Arm-Twisting in the Shadow of Congressional Delegations of Authority*, 1997 WIS. L. REV. 873, 874-75; Wu, *supra* note 6, at 1841 ("Over the last two decades, agencies have increasingly favored the use of . . . statements of best practices, interpretative guides, private warning letters, and press releases.").

rulemaking,"[82] which is frowned upon by most scholars,[83] further increases uncertainty and instability.[84]

Uncertainty is further intensified because a broad overlap exists between different regulatory agencies, and governmental agencies constantly increase in number.[85] Different federal and state agencies thus govern the same industry, and regulation can be issued by one or more of them simultaneously.[86]

Regulation of innovation-intensive industries is also more likely to be challenged in court, which further exacerbates the uncertainty entrepreneurs are facing. Jerry Mashaw has demonstrated in the context of regulation in the car industry that regulation that is not based on clear information and evidence (which is characteristic of regulation in innovation-intensive industries) is likely to be challenged and stricken down in court.[87] As Tim Wu explains more recently, regulation in innovation-intensive spaces is more likely to trigger litigation and leave the industry confused for extended periods of time.[88] The nature of judicial decision-making, including its long processes, lack of broad view of the subject-matter,[89] and the multiple jurisdictions, is likely to

82. *See* Thomas O. McGarity, *Some Thoughts on "Deossifying" the Rulemaking Process*, 41 DUKE L.J. 1385, 1393 (1992) (noting the "increasing tendency of agencies to engage in 'nonrule rulemaking' through relatively less formal devices such as policy statements, interpretative rules, manuals, and other informal devices").

83. *See* Cortez, *supra* note 3, at 190 (describing a "threat regime" as "a procedural end-run around the APA, an amplification of statutory authority, a way to skirt judicial review, or even an affront to the rule of law itself"). *See also* Lars Noah, *The Little Agency That Could (Act with Indifference to Constitutional and Statutory Strictures)*, 93 CORNELL L. REV. 901, 907 (2008) (describing the modus operandi of the FDA, which at times issues "warning letters" and advises the government not to deal with the recipient until the matter is addressed). *See also* James B. Speta, *The Shaky Foundations of the Regulated Internet*, 8 J. ON TELECOMM. & HIGH TECH. L. 101, 124-26 (2010) (describing an investigation of the FCC against Madison River under section 201(b) of the Communications Act).

84. *See* McGarity, *supra* note 82, at 1393-94; *See also*, Anthony, *supra* note 81.

85. *See* Cortez, *supra* note 3, at 184 ("Today, there are hundreds of federal agencies, departments, and commissions, many of which enjoy sweeping jurisdiction.").

86. Travis H. Brown, *50 States of Chaos: Patchwork Regulation is Crippling Tech Innovation*, FORBES (Nov. 12, 2014, 9:00 AM), http://www.forbes.com/sites/travisbrown/2014/11/21/50-states-of-chaos-patchwork-regulation-is-crippling-tech-innovation/ (discussing drone example).

87. *See* Jerry L. Mashaw, *Regulation and Legal Culture: The Case of Motor Vehicle Safety*, 4 YALE JOURNAL OF REGULATION 257 (1987).

88. *See* Wu, *supra* note 6, at 1849 ("Given the inevitability of a judicial challenge to an important adjudication or rulemaking, the industry must try to predict which parts of the rule will survive a lengthy judicial review process that may include several remands.").

89. *See, e.g.*, 1 RICHARD J. PIERCE, JR., ADMINISTRATIVE LAW TREATISE §§ 6.8-6.9 497-508 (5th ed. 2010).

foster even more uncertainty.[90]

Regulatory uncertainty is innovation-regressive. It amplifies legal costs and compliance costs and is time-consuming and bureaucratic.[91] Regulatory uncertainty also incentivizes a risk-adverse attitude of investors and signals to them that their money may be safer elsewhere.[92] Uncertainty regarding regulatory standards also gives rise to strike suits, where powerful industry players can threaten smaller players who do not have the financial ability to withstand a lengthy legal process.[93] The fear of strike suits may generate a chilling effect on innovation, especially in industries that are controlled by entrenched incumbents who are more likely to sue.[94] This is unfortunate because such industries are often especially ripe for disruption by innovation.[95] Uncertainty costs would

90. Litigation will have additional inefficiencies. A prominent example for that is the attempts to regulate the technology of file sharing in the early 2000s. The law has attempted to fight the file-sharing phenomenon in various ways, including via regulatory measures. The main role belonged, however, to the judiciary. The result of these efforts, however, have not only proved futile, but also had the unintended consequence of change in design and in operation of the file-sharing market. Thus, the first file-sharing technologies were designed with a central server that indexed the content that was shared among peers. When the law cracked down on these technologies based on this central management, the next generation of file-sharing technologies was designed without central indexing at all, and became ever more elusive and fragmented. *See* Lital Helman, *When Your Recording Agency Turns into an Agency Problem: The True Nature of the Peer-to-Peer Debate*, 50 IDEA 49 (2009).

91. Legal uncertainty results in high transaction costs and barriers to entry, while certainty promotes investment and progress in technology and business models. For example, after the Veoh cases (*See infra* note 127), it was harder to get investments in the field of digital dissemination. This is also cited as a reason the peer-to-peer file sharing world was developed in the way it has developed. *See id.*

92. Helman, *supra* note 90. Many commentators have pointed out that it is typically more cost-effective for the regulated entity to comply with regulatory order or unjustified fines even if it was issued without authority than to risk a dispute or reputational harm. Agencies also employ adverse publicity to induce "voluntary" compliance with agency requests. *See* Nathan Cortez, *Adverse Publicity by Administrative Agencies in the Internet Era*, 2011 BYU L. REV 1371 (2011); Ernest Gellhorn, *Adverse Publicity by Administrative Agencies*, 86 HARV. L. REV. 1380 (1973). *See also* Jessica Roy, *At the Command of the State Department, Defense Distributed Pulls Its 3D Printed Gun Blueprints*, NYSTARTUPHUB, http://nystartuphub.com/at-the-command-of-the-state-department-defense-distributed-pulls-its-3d-printed-gun-blueprints (last visited Jan. 28, 2016) (reporting that the 3D gun printing company Defense Distributed "voluntarily" complied with an order by the Department of State to halt production despite the company's belief in the legality of its actions). Negative statements by government officials, even if unfounded, are potentially very damaging to a business, thus making voluntary compliance potentially less than voluntary.

93. *See, e.g.*, Lucian Arye Bebchuk, *Suing Solely to Extract a Settlement Offer*, 17 J. LEGAL STUD. 437, 440 (1988) (noting imperfect information as a primary incentive to bringing frivolous lawsuits); Avery Katz, *The Effect of Frivolous Lawsuits on the Settlement of Litigation*, 10 INT'L REV. L. & ECON. 3, 4 (1990) (presenting "a model that explains strike suits as a result of defendant uncertainty regarding the merit of plaintiffs' claims").

94. *See e.g. infra* note 136.

95. *Id.*

be aggravated in heavily regulated industries. In such industries, firms may know that regulation is probably forthcoming, but they would not necessarily know what to expect and how to prepare for it.

Having explained the shortcomings of the current regime both for innovation policy and social interest protection, the next Part will introduce the Curated Innovation model. As demonstrated below, the Curated Innovation model can alleviate many of the inefficiencies that pertain to the current legal regime.

III. THE CURATED INNOVATION MODEL

This Part of the Article advances the Curated Innovation model. I demonstrate that this model can not only fix the problems discussed in Part I, but also create an overall more efficient regulatory framework for innovation-intensive industries. Part III.A below delineates the mechanism for the implementation of the Curated Innovation model. Part III.B analyzes the benefits this model would provide both for innovation policy and for enhancing societal interests through the innovative process.

A preliminary remark is in order before delving into the discussion of the proposed regime. A dynamic, goal-based role of the government has some manifestations in our present regime, as well as in the existing scholarship and popular policy discourse.[96] For example, this paradigm is manifested in the instruments of grants and prizes, albeit on a markedly limited scale.[97] In policy discourse, the Obama Administration recommended regulatory agencies to adopt regulation that would boost innovation, although little was implemented in reality.[98] In the scholarship, the paragon of "Minimalism," which is prominent in

96. *See infra* notes 99-100 and accompanying text.

97. *See infra* Part II.A.2.a. Some scholars have also proposed injecting dynamism into the process by setting the prize based on sales. Michael Abramowicz, *Perfecting Patent Prizes*, 56 VAND. L. REV. 115, 175-77 (2003) (discussing the advantages of basing prize rewards on sales). *See also* Nat'l Acad. of Eng'g, *Concerning Federally Sponsored Inducement Prizes in Engineering and Science*, THE NAT'L ACADEMIES PRESS 5-6 (1999), *available at* http://www.nap.edu/read/9724/chapter/1 (discussing a case in which an inducement prize was awarded incrementally based on actual sales).

98. *See, e.g.*, Exec. Order No. 13,563, Improving Regulation and Regulatory Review, 76 Fed. Reg. 3821, 3822 (Jan. 21, 2011) (calling for federal agencies to identify ways to achieve regulatory goals "that are designed to promote innovation"). Sabel & Simon, *supra* note 14, at 55 ("President Obama frequently invoked minimalist ideas in his campaign, and he appointed Cass Sunstein, a leading minimalist, as Administrator of the White House Office of Information and Regulatory Affairs. Yet the Administration's most important initiatives—in fiscal policy, bank solvency, healthcare, food safety, education, and offshore oil drilling—have reflected these ideas only occasionally or dimly.").

contemporary Administrative Law scholarship, seeks to ground policy design in market practices and spur desired actions by market actors.[99]

A. The Mechanism

In this Part, I explore the mechanism of the Curated Innovation framework. The Curated Innovation regime would manifest through a four-pronged model: In the first stage, lawmakers would set a standard that would represent the optimal outcome the regulation seeks to achieve in that specific industry. They would also define the reward to be allotted to players that come closest to meeting this optimum point.

Second, the regulator would launch a competition, where innovative technologies, processes, or methods would race to reach the optimum point the agency has defined. Innovators and firms that operate in this space would submit to review technologies or methods they have developed as solutions for this space and demonstrate how these solutions fare in comparison to the optimal standard the regulator has defined.

Third, the regulator would assess the competing innovations, and select the technologies, processes, or methods that meet or come closest to meeting the standard. The winning solutions would be rewarded. The rewards can be direct or indirect: direct rewards would be allotted to the winners themselves, while indirect rewards would distribute the benefits not (or not only) to the innovator herself, but rather to market players that implement her solution. Rewards that are allotted to industry players other than the innovator would serve as an incentive for market actors to adopt the selected solutions, and would generate constant demand for such solutions.

In the fourth and final stage of this model, the regulator would reconvene periodically to update the standard and examine new technologies or methods based on the new standard. The regulator would then issue updates to the list of selected technologies and, if needed, to the standard itself. The update process would ensure that the industry is constantly incentivized to create better technologies that improve social

99. *See* CASS R. SUNSTEIN, RISK AND REASON: SAFETY, LAW, AND THE ENVIRONMENT x-xii (2002); Robert Kuttner, *The Radical Minimalist*, THE AM. PROSPECT 28 (Mar. 19, 2009), http://prospect.org/article/radical-minimalist; BRUCE ACKERMAN & ANNE ALSTOTT, THE STAKEHOLDER SOCIETY 8 (1999) (applying the concept to the welfare system); MASHAW, *supra* note 87. Minimalism prescribes regimes of marketable, tradable duties and rights and "nudges" such as opt-out regimes. *See, e.g.*, ADLER & POSNER, *supra* note 48, at 2-8; RICHARD L. REVESZ & MICHAEL A. LIVERMORE, RETAKING RATIONALITY: HOW COST-BENEFIT ANALYSIS CAN BETTER PROTECT THE ENVIRONMENT AND OUR HEALTH 131-43 (2008).

welfare.

The ensuing discussion explores the steps that are necessary for the model to operate and discusses the most efficient way for the implementation of each of these steps.

1. Setting the Standard

At the first stage of the model, policymakers would issue a substantive standard for the industry under their domain. The standard would represent the optimal state in the industry from a societal point of view, i.e., what industry players should aspire to achieve in order to maximize societal well-being.[100] To achieve this, policymakers would first denote the interests that positively affect well-being (and that should be maximized) and the factors that adversely affect well-being (and that should be minimized).

For example, the Department of Transportation can resolve that an optimal autonomous car would be one that perfects safety, maximizes mobility,[101] and eliminates harms to the environment, privacy interests, and any security concerns.[102] Likewise, the EPA can define a technology or process as an optimal energy solution, which eradicates pollutants completely and also maintains the ability and ease of society to use energy.[103]

After denoting the gains and losses at play, regulators would need to weigh and prioritize them. The reason for the prioritization is that solutions that would be developed in the market would never equal the optimal standard; no solution would equally maximize *all* the gains a

100. Congress, of course, may require agencies to pursue goals other than overall wellbeing, such as distributive considerations. In these cases, those goals and objectives should obviously prevail. *See also* Cass R. Sunstein, *The Limits of Quantification*, 102 CAL. L. REV. 1369, 1378 (2014) ("Social welfare is of course the guiding concept, but it can be specified in different ways; distributional effects and dignity certainly deserve careful attention and may well matter to regulatory decisions."); Steven Kelman, *Cost-Benefit Analysis: An Ethical Critique*, 5 REGULATION 33, 33 (1981) ("In areas of environmental, safety, and health regulation, there may be many instances where a certain decision might be right even though its benefits do not outweigh its costs.").

101. Mobility would be most important for the young, the elderly, and the disabled who cannot drive themselves. *See* Katyal, *supra* note 10, at 1689.

102. It has been proposed that a new agency is required in the context of Utomonous vehicles. *See* Ryan Cao, *A New Regulatory Agency Required for Autonomous Technology is Needed First*, N.Y. TIMES (Jan. 29, 2015), http://www.nytimes.com/roomfordebate/2015/01/29/are-we-ready-for-driverless-cars/a-new-regulatory-agency-for-autonomous-technology-is-needed-first.

103. *See* Lital Helman, Gideon Parchomovsky & Endre Stavang, *Dynamic Regulation and Technological Competition: A New Legal Approach to Carbon Capture and Storage*, *in* THE LAW OF ENERGY UNDERGROUND (D. Zillman ed., Oxford University Press, 2014).

technology or method can produce and minimize *all* their losses. In fact, many of the interests that affect well-being involve an inherent tradeoff between them.[104] For example, the more accurate facial recognition software is, the bigger its privacy implications.[105] Similarly, the more widespread access to cultural works is, the more copyright interests are harmed.[106] As a result, some market solutions would be better on one front and worse on others, and the regulator would need to be able to compare these solutions to decide which one of them produces overall greater welfare.

The standard can be represented mathematically in a polynomic way or epitomized as an ordinary differential equation.[107] To illustrate, using the example above, the Department of Transportation can decide to allocate triple weight to vehicle safety (S) than to environmental concerns (E), an equal weight to environmental concerns (E) and privacy (P), and a double weight for mobility (M).[108] The standard for the autonomous vehicle industry (AV) would then equal:

$$v(AV) = 3S+E+P+2M$$

The standard would serve as the standard for firms that would, at the next stage of the model, participate at the race to maximize v(AV). Thus, for example, other things being equal, a solution that optimizes safety at the expense of mobility would be considered better than a solution that produces the opposite balance.[109]

104. *C.f.* John Bronsteen et al., *Well-Being Analysis vs. Cost-Benefit Analysis*, 62 DUKE L.J. 1603, 1605 (2013) ("Virtually every law makes people's lives better in some ways but worse in others.").

105. Luke Dormehl, *Facial recognition: is the technology taking away your identity?*, THE GUARDIAN (May 4, 2014, 3:00 PM), http://www.theguardian.com/technology/2014/may/04/facial-recognition-technology-identity-tesco-ethical-issues (discussing privacy issues with face recognition technology).

106. *See, e.g.*, WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 73 (2003) (aiming to arrive at an optimal level of copyright protection in order to provide space for both previous and later artists in order to optimize creativity).

107. The author thanks Gabriel Hallevi and Adi Helman for advice on the mathematical representation of this part of the model.

108. Clearly, regulators can apply a more complex calculation in needed areas, such as thresholds, calculations of marginal utility, etc. If the agency uses a polynomic representation, it can apply these criteria for each of the parameters it identifies for the standard. If the agency selects a differential equation, such determinations can already be included in the function.

109. Note that unlike regulatory cost-benefit analysis (CBA) and the other methods of systematic analysis for evaluating government policy currently used, where the analysis is conducted regarding a certain policy the agency considers, in the Curated Innovation model this methodology would be used as an ex ante mechanism to determine an industry standard rather than

Clearly, a critical question is what interests should be included in the analysis.[110] For example, should regulators consider the effects on job security and potentially declining wages of employees in the sectors that would be affected by the expected innovation? Should they count the effects of the forthcoming innovation on secondary market players such as lawyers and accountants as costs? This question is especially challenging given that some interests may be abstract, vague, and in many cases subjective.[111]

While it is obviously impossible to define the specific contours for each and every regulatory agency in the abstract, I believe it would generally be more efficient to adopt a small scope approach, as advocated by Matthew Adler and Eric Posner with regards to the methodology of cost-benefit analysis, unless the agency's process is likely to have an irregularly substantial impact across the board.[112]

---

a specific policy. Cost-benefit analysis is the prominent way for regulatory decision-making, followed by the methodology of cost-effective analysis, as enshrined in Exec. Order No. 13,563, 3 C.F.R. 215 (2012); Exec. Order No. 12,866, 3 C.F.R. 638 (1994), reprinted as amended in 5 U.S.C. § 601 note at 745 (2006); Economic Analysis of Federal Regulations Under Executive Order 12866, OFFICE OF MGMT. & BUDGET (Jan. 11, 1996), http://www.whitehouse.gov/omb/inforeg_riaguide, reaffirmed in Exec. Order No. 12,866, 3 C.F.R. 638; Exec. Order No. 13,563, 3 C.F.R. 215. CBA has raised fierce objection from inception, and even its supporters admit its many flaws. So far, however, the CBA has offered the most rigorous, quantitative, and workable model for commensurating the good and bad effects of a regulatory policy. *But see, e.g.*, Bronsteen et al., *supra* note 104 (offering as an alternative to CBA that agencies should rely on welfare measures rather than on cost-benefit analysis); *See* Sinden A. Kysar, *Cost–Benefit Analysis: New Foundations on Shifting Sand, in* REGULATION & GOVERNANCE 3 (2009) (proposing "feasibility analysis" in the context of environmental regulation, namely, that regulators should aim at maximizing the reduction of pollutants but that this aim will be subject to external constraints).

110. At first blush, the "Kaldor-Hicks criterion" might appear to be a neutral formula for measuring the interests at play. Under this criterion, social reallocations are superior to the status quo if the losers could be fully compensated and the gainers would still retain some net gain. *See* John R. Hicks, *The Foundations of Welfare Economics*, 49 ECON. J. 696 (1939); Nicholas Kaldor, *Welfare Propositions of Economics and Interpersonal Comparisons of Utility*, 49 ECON. J. 549 (1939). In reality, however, the Kaldor-Hicks formula cannot identify the gains and losses in play, and cannot measure them against each other. It can only apply *after* those interests are identified and given weight.

111. The solution to the subjectivity and vagueness of these interests would probably be "to fall back on a principle derived from democratic theory: policymakers must promote only those goals specified by the politically responsible legislature." *See* Colin S. Diver, *Policymaking Paradigms in Administrative Law*, 95 HARV. L. REV. 393, 398-99, n. 29 (1981). Clearly, all policymaking methods—and not only the Curated Innovation model—would raise these very problems in deciding and comparing different costs and benefits.

112. Matthew Adler & Eric A. Posner, *New Foundations of Cost-Benefit Analysis: A Reply to Professors Sinden, Kysar, and Driesen*, 3 REGULATION & GOVERNANCE 72, 77 (2009) ("*New Foundations* therefore endorses the approach embodied in the CBA executive orders since their inception in 1981, namely to require full-blown analysis only for policies above an expected impact threshold."). What is more, it should be made clear that this proposal does not exceed the authority regulatory agencies have today. Decisions that exceed agencies' authority or have a broad societal

Otherwise, setting the standard would become impractical, and it may not serve to spur competition in the desired directions.

Importantly, the standard-setting process should be inclusive, meaning it should actively seek public input in order to minimize externalities on under-represented groups and reach a balanced decision.[113] Including parties in the process ex ante would also reduce the likelihood of litigation later on.[114]

Next, I examine how agencies should set the reward for the solutions that would come closest to meeting the best standard.

2. Setting the Rewards

Once regulators define where they want the industry to aim, the challenge would be to design the right mechanism to induce market actors to work towards this standard. To achieve this, policymakers would need to design a reward that would be distributed to innovative projects that would come closest to meeting the standard.

Setting an effective reward system would require two determinations. First: what kind of reward should be awarded? Rewards under the Curated Innovation framework can come in various forms, including mechanisms that have traditionally been used as R&D inducements (such as prizes or grants, expedited patent paths, licenses, contracts, or tax incentives) and mechanisms that have not yet been applied for that purpose (such as safe harbors from liability). Other rewards can be ones that do not yet exist in our system. For example, in a recent article, Gideon Parchomovsky and Mike Mattioli propose to complement the patent system with mechanisms that they term "semi-patents" and "quasi-patents."[115] Second: who should be the beneficiary

---

impact should be pushed to the legislators, as done under the present regime.

113. Much has been written about the need to involve the public in regulatory processes. *See, e.g.*, Peta Ashworth & Craig Cormick, *Enabling the Social Shaping on CCS Technology*, *in* CARBON CAPTURE AND STORAGE—EMERGING LEGAL AND REGULATORY ISSUES 251-75 (Havercroft, Macrory & Stewart, eds., 2011). In the context of environmental projects, states have in fact done so quite frequently but usually in the context of involving local communities before issuing permits and not at the outset as hereby suggested. The EU CCS directive (Directive 2009/31/EC on the geological storage of CO_2 [2009] OJ L140/114) allows participation by anybody who holds expertise in the area, and Directive 2011/92/EU of December 13, 2011 on the assessment of the effects of certain public and private projects on the environment explicitly encourages public involvement.

114. *See* Les Lo Baugh, *Legal and Regulatory Challenges of Geological Carbon Capture and Sequestration: US Hurdles to Reducing CO_2 Emission*, *in* CARBON CAPTURE AND STORAGE—EMERGING LEGAL AND REGULATORY ISSUES 67-80 (Havercroft, Macrory & Stewart, eds., 2011) (discussing possible grounds for litigation under US law for CCS).

115. *See* Gideon Parchomovsky & Michael Mattioli, *Partial Patents*, 111 COLUM. L. REV. 207

of the reward? The first option is to offer direct incentives to innovators that would win the contest.[116] The more interesting option is to offer those incentives not (or not only) directly to the innovator but rather to market players that would adopt this innovator's solution.

The criteria to decide between those options should be an analysis of the difference between the stage of the industry and the optimal standard the agency has set in the previous stage. This difference would represent the gaps that the industry needs to close in order to maximize well-being. The wider the gap, the more it makes sense to select rewards that incentivize further development of the technology or process. The narrower the gap, the sounder it is to distribute rewards that would help the innovation penetrate the market. In the latter case, the reward would depend on an analysis of the entry barriers the technology or process faces in diffusion into the industry.[117]

Below I demonstrate how regulators should use these considerations in order to choose between three main inducement tools. This discussion is intended to delineate a general heuristic on how to make decisions in this realm and is not intended to serve as a complete decision-making algorithm for regulators in this regard.

a. Prizes or Grants.

Prizes and grants are monetary awards that can be granted by regulatory agencies in order to incentivize investments in R&D projects.[118] Grants or prizes may be an efficient reward under the Curated Innovation regime in cases where the industry is rather far from the standard the regulator envisions for it because the technology is not yet ready for implementation in the market. Indeed, when the gap is substantial between even the best technology or process that exists and

(2011).

116. *See infra* Part II.A.3 for a discussion of the selection process.

117. In crafting this part of the model, regulators would also be able to rely on a vast amount of scholarship that compares the costs and benefits of different incentives for innovation. *See supra* note 13.

118. *See supra* note 13. These mechanisms are also in use under the extant regime. Today, direct federal R&D spending (grants and prizes) is about $130-140 billion annually. Slightly more than half of which is defense related. *See* OFFICE OF MGMT. & BUDGET, THE BUDGET FOR FISCAL YEAR 2014, HISTORICAL TABLES 202-03, table 9.7 (2013) (tracing the increase in nondefense R&D outlays in fiscal year 2005 dollars from $1.2 billion in 1949 to $37.6 billion in 1967). Towards the end of the first decade of the Millennium, over $35 million dollars were offered in prizes by the Department of Defense, Department of Energy, and NASA, ranging from one quarter to ten million dollars per award. *See* DEBORAH D. STINE, CONG. RESEARCH SERV., R40677, FEDERALLY FUNDED INNOVATION INDUCEMENT PRIZES 3-5, table 1 (2009); Hemel & Ouellette, *supra* note 13, at 318 (2013).

the optimal standard the regulator had defined, even if the regulator picked the innovation that is closest to the optimal standard it would still be inadequate to operate within the market. For example, even the most efficient Carbon Capture and Storage (CCS) process that exists today is not safe enough to use on power plants.[119] In this case, the reward should be allotted to the innovator herself, to develop the technology or process further.[120]

There is another reason prizes and grants are efficient inducement rewards for technologies or processes that are far from the regulatory standard. This reason is that potential innovators at this stage will probably be more responsive to ex ante mechanisms that provide an immediate, certain, monetary reward. Ex post mechanisms that would provide a speculative payout in the future, such as patent-related rewards, or that would help them enter the market at an unclear point in the future—would be less appealing to early stage innovators. In complex industries, regulators may also (or instead) be able to grant the winning technologies or processes a license or permit to conduct a demo project in order to improve the underlying technology of the invention.[121]

Grants and prizes may also be effective when granted not to the innovator, but to market players who use her product. This would be the case when the desired technology has not been adopted in the market. For example, it may make sense to grant hospitals monetary awards if they implement a new procedure that was selected in the regulatory selection process that is otherwise too expensive to use.[122]

---

119. *See Carbon Capture and Storage: Model Regulatory Framework*, INT'L ENERGY AGENCY (2010), http://www.iea.org/publications/freepublications/publication/model_framework.pdf.

120. The decision between the prize or grant mechanisms may depend on the stage of the technology and its expected R&D costs, to estimate the probability that the innovator would be able to fund the project without ex ante governmental monetary assistance. Effectively, grants and prizes decrease R&D costs for the investors ex ante (for grants) or ex post (for prizes). Gallini & Scotchmer, *supra* note 13, at 53. The sum of prizes (and obviously grants) is typically fixed ex ante (although commentators have recently proposed market-based or performance-based prizes). The institutions of grants and prizes, however, are not cost-free. Not only are they sporadic, implemented ad-hoc, and very specific, but they are also bureaucratic, time consuming, and often times come with strings attached. As a result, they fall short of solving the problem on a large scale.

121. The NER 300 process in Europe (pursuant to Article 10a(8) of the Revised Emissions Trading Directive), for example, created 300 million allowances to support commercial CCS and innovative RES demonstration projects. Seven CCS projects competed with RES on allowances and funding (none was selected). *See also* Chris Littlecott, *New year, new resolve for carbon capture and storage?*, GREENPEACE UK (Jan. 3, 2013), http://www.greenpeace.org.uk/newsdesk/energy/analysis/new-year-new-resolve-carbon-capture-and-storage.

122. This measure, although sometimes used in reality, is not free from concerns. One of the

The main difference between the way grants and prizes are used today and the way they would be used under the Curated Innovation model concerns the terms and manner in which they are used. Under the extant regime, the prize process is a sporadic tool that is granted without necessarily conducting a broad analysis regarding where the industry should be headed or any broader effects of the technology or process on welfare. Under the Curated Innovation model, however, a complete impact analysis would be performed before setting the terms of a prize or a grant, and such instruments could be allotted not only to incentivize R&D but also to enhance the innovation's diffusion in the market.

b. Expedited Patent Paths

Patents are the most prominent tool to encourage innovation, and this predominance need not change under the Curated Innovation regime. In light of this concept, expedited patent paths should be the default reward granted to winning innovations under the Curated Innovation model. This reward is likely to be most effective in most cases. Under the current regime, patents can be a long and expensive process.[123] Much has been written about the harms the lengthy patent process inflicts. It can jeopardize R&D and investments in desired innovative endeavors and increase costs to firms and innovators. For this reason, an expedited patent can be an effective inducement tool under the Curated Innovation model.

A system of expedited patent processing already exists under the extant regime.[124] It is done, however, according to the paradigms of the current regime. They are industry-specific and do not regard the overall expected impact of the invention on social welfare. For example, the Green Technology Pilot Program enables an accelerated patent process

concerns is that this measure may cause hospitals to over-prescribe certain treatments. These concerns should be considered by regulators prior to setting the award.

123. The average time a patent applicant waits to receive a first office action from the United States Patent and Trademark Office is estimated at 18.9 months. The total pendency for a patent application (before a final disposition is achieved, e.g., notice of allowance, request for continued examination, or abandonment) is estimated at 27.5 months. This number jumps to 37.9 months when applications in which RCEs are filed are included.

124. See Advancement of Examination, 37 C.F.R. § 1.102(a) (2010), according to which a petition for expedited patent path may be filed without an extra filing fee if based on: "(1) [t]he applicant's age or health; or (2) [t]hat the invention will materially: (i) [e]nhance the quality of the environment; (ii) [c]ontribute to the development or conservation of energy resources; or (iii) [c]ontribute to countering terrorism." *See* 37 C.F.R. § 1.102(c). *See also* U.S. PATENT & TRADEMARK OFFICE, U.S. DEP'T OF COMMERCE, MANUAL OF PATENT EXAMINING PROCEDURE § 708.02 (9th ed., Rev. 7, Nov. 2015), *available a*t http://www.uspto.gov/web/offices/pac/mpep/mpep-0700.pdf.

to innovation in the areas of alternative energy.[125] Under the Curated Innovation model, however, expedited patent process should be an option for technologies or processes that were selected under the Curated Innovation competition, regardless of specific industries.[126]

The expedited patent path would in most cases be granted to the innovator herself. There might be cases, however, where it could be also indirectly granted to firms that incorporate the selected product into their additional products, if they create a patentable invention in the process of incorporating the product.

c. Safe Harbors from Liability

Safe harbors are defenses from liability that are granted to market actors if they satisfy the requirement the safe harbor sets forth. Safe harbors are not typically used as tools to encourage innovation. It is about time that they become so. Potential liability has been known to place a chilling effect on innovation in cases where firms may refrain from innovation or from integrating innovative solutions into their products because they are afraid of getting sued by incumbents or by other industry players for using such solutions.[127] Safe harbors granted to innovative endeavors that meet the regulatory standard can alleviate this concern and induce market players to create and adopt novel solutions.

To be most effective, the safe harbor might need to cover not only the innovator but also the entities that would use the innovator's solution in the market. This would apply if potential users of the innovation are also exposed to liability under the existing law. Otherwise, market players may be discouraged from using the innovation; the demand for the innovation would be reduced and with it the incentive to create it in the first place.

An example for the use of the safe harbor mechanism indirectly in

125. *Id. See also* Antoine Dechezleprêtre & Eric Lane, *Fast-Tracking Green Patent Applications*, WIPO MAGAZINE (June 2013), http://www.wipo.int/wipo_magazine/en/2013/03/article_0002.html.

126. Other considerations may apply, such as how desirable disclosure is.

127. *See supra* note 91. *See also* Helman & Parchomovsky, *supra* note 64, at 1208 (discussing the effects cases like *Io Group, Inc. v. Veoh Networks, Inc*. 586 F. Supp. 2d 1132 (N.D. Cal. 2008) and *UMG Recordings, Inc. v. Veoh Networks Inc.*, 665 F. Supp. 2d 1099 (C.D. Cal. 2009) may have on new innovation in the area of webhosting). For other examples, see Louis Lasagna, *The Chilling Effect of Product Liability on New Drug Development*, *in* THE LIABILITY MAZE 1, 343-45 (Peter W. Huber & Robert E. Litan eds. 1991); Michael A. Carrier, *SOPA, PIPA, ACTA, TPP: An Alphabet Soup of Innovation-Stifling Copyright Legislation and Agreements*, 11 NW. J. TECH. & INTELL. PROP. 21, 27-31 (2013).

an innovation-inducing way can be found in an Article written by Professor Gideon Parchomovsky and myself in the copyright arena.[128] There, we proposed to replace the existing safe harbor for copyright infringement by webhosts under the Digital Millennium Copyright Act[129] with a regime that would exempt webhosts from liability if they use a copyright filtering system that has been preapproved by the regulator as a "Best Available Technology."[130] The principle we proposed was designed to create an incentive for webhosts to use new and improved filtering technologies that appear on the market and, as a result, to boost the incentive of technology companies to engage in the creation of better-quality filtering technologies.[131]

Safe harbors would be most effective in litigious industries, such as the music and film industries during the early 2000s, and in industries where fears of liability may cause a chilling effect on innovation, such as when entrenched incumbents who may be harmed by innovation threaten to fight via courts against innovation in the industry. Safe harbors would reduce the chances lawsuits would be filed and decrease the cost of handling the lawsuit in case it is filed.

3. Competition

Once the regulator sets on the goal and finalizes the reward for the selected innovator or innovators, it would turn to seeking solutions from the market that come closest to meeting the standard.[132]

The selection process would launch with the publication of the standard and the reward and a call out for researchers, innovators, and firms to submit projects for review by the agency.[133] Participants would need to explain the proximity of their innovation to the agency standard, namely, explain how and to what degree their technology or process

128. *See* Helman & Parchomovsky, *supra* note 64.

129. Pub. L. No. 105-304, 112 Stat. 2860 (1998) (codified as amended in scattered sections of 5, 17, 28, and 35 U.S.C.).

130. Helman & Parchomovsky, *supra* note 64, at 1217.

131. *Id*. at 1228.

132. Unlike in the patent system, the review under this model would maintain the secrecy of the procedures in order not to interfere with the ability of firms to rely on trade secrecy or to file patents and to negate a disincentive to participate in the review process.

133. The solutions can be suggested for review by firms that produce them for their own internal use as well as by firms that produce and sell such solutions to other firms. The reason is that the decision whether to use a technology that was developed in house rather than outside-developed technology is an economic decision that the proposed model should not skew. *See* Ronald H. Coase, *The Nature of the Firm*, 4 ECONOMICA 386, 390-92 (1937). For other factors affecting the boundaries of the firm, see Sanford J. Grossman & Oliver D. Hart, *The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration*, 94 J. POL. ECON. 691, 693-95 (1986).

affect each of the gains and losses that the standard has defined. The agency would then rank each of these innovations for each of the parameters of the standard for gains or losses and compare them to each other in order to select the winner.

The agency can decide on one of two ways to select winners between the competing innovators. One way would be to limit the number of innovators that can win the reward, similar to the mechanism that exists today regarding prizes and grants.[134] This path would be most efficient if the competition's reward consists of prizes and grants.[135] The other way is to comprise a list of eligible solutions, which all come closest to the pre-defined standard. All of the technologies, processes, or methods that would be included in the list would qualify the innovator for the reward. This path would be especially adequate for rewards such as tax credits, expedited market paths, or safe harbors, which can be allocated to all winning solutions.

The most important component of the competition stage would be its dynamic and recurrent nature. Indeed, the regulatory standard would be dynamic and self-adjusting. The agency would reconvene periodically in order to run a new session of the competition, or to select new technologies or methods to qualify for the reward. As better solutions are developed, the regulatory selection processes would replace older and less efficient ones. As the standard develops, rewards that were already granted would generally not be revoked. However, some rewards should be affected. For example, beyond a grace period, firms would need to retrofit or implement the newly-selected technology or process in order to maintain their safe harbor from liability.

Over time, this process would lead to the emergence of better technologies and processes, and to the implementation of these technologies and processes in the marketplace. This dynamic standard would evolve with the industry: agencies would constantly promote the use of new solutions that have a superior societal impact. As the industry improves, industry players would adopt these superior solutions on an ongoing basis.

B. The Advantages of the Curated Innovation Model

The Curated Innovation model is designed to ensure that the best innovation arrives on the market faster for the benefit of all. Adoption of the Curated Innovation model would yield dramatic improvements over

134. *See supra* Part II.A.2.a.

135. Other mechanisms that call for one winner would be licenses or procurement contracts.

the extant regime in three critical areas: protection of the public interest, innovation policy, and the regulatory process itself.

Consider first the effect the Curated Innovation model would have on the way the public interest is protected in innovation-intensive industries. The proposed model would provide innovators with a strong motivation to take into account the regulatory standard ex ante, because doing so could qualify them for government rewards.[136] As a result, industry players would be encouraged to invest in measures that would improve their impact on welfare and reduce harms to society. Even market-players who would not take part in any specific competition under the proposed model are likely to use the information this process yields as a signal of regulatory intentions and internalize it when making new products. [137] The model would yield a dynamic efficiency as well: the adoption of the Curated Innovation model would spur competition over the development of improved technologies, providing industry players with an incentive to come up with superior solutions to those we currently have on the market.[138]

Consider now the advantage this model would have on innovation. This model creates incentives in the market to adopt innovative technologies and processes that are welfare-enhancing rather than merely incentivize their creation. As a result, this model would tackle the real struggle innovators have: not to come up with ideas and inventions, but rather to be able to fund those ideas and inventions and to successfully penetrate the market.[139] An ex ante regulatory resolution would also serve as a signal to private investors in firms that they can

136. This incentive would be the strongest in cases where the government reward is not exclusive for one company. Yet, optimism bias of entrepreneurs would increase this incentive even if the regulator only gives one prize or one reward. Optimism bias concerns underestimation of risks, even compared to other individuals in similar situations. *See, e.g.*, TALI SHAROT, THE OPTIMISM BIAS: A TOUR OF THE IRRATIONALLY POSITIVE BRAIN (2011); Neil D. Weinstein, *Optimistic Biases About Personal Risks*, 246 SCIENCE 1232 (1989). Neil D. Weinstein, *Unrealistic Optimism About Future Life Events*, 39 J. PERSONALITY & SOCIAL PSYCHOL. 806 (1980); Christine Jolls et al., *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471 (1998); Barbara Luppi & Francesco Parisi, *Beyond Liability: Correcting Optimism Bias Through Tort Law*, 35 QUEEN'S L.J. 47 (2009).

137. Clearly, the current mechanisms, such as prizes or grants, cannot provide this information advantage. These mechanisms are too concrete and specific. Prizes and grants would be allotted to the winner even if the winner creates a bad impact on other societal interests that were not defined in the competition outline and even if its overall societal impact, had it been measured, would have been negative.

138. While cost is an important parameter to determine the desirability of new solutions that enter the market, the model need not be concerned with them. This is because firms would still need to sell the product in the market, and price competition would curb costs.

139. *See supra* notes 72-73.

use when screening investment opportunities and would reduce their legal risks and uncertainty in the process.

The third salutary effect of this model pertains to the efficiency of the regulatory process itself. The alignment of interests between market players and society would dramatically enhance the efficiency of enforcement because the interests of industry players would be more aligned with the regulator's objective at the outset.[140] The model would also reduce waste as a result of industry players reverting features post-facto due to top-down regulatory mandates. Even when regulation is forthcoming, it would reduce its number, complexity, and detail level, because industry players would have an incentive to implement new knowledge without a top-down regulatory mandate.[141] Thus, this model would lead to the evolvement of legal standards: it would provide a dynamic process where the regulatory standard is constantly examined and updated to bring better solutions to the market.

IV. POTENTIAL CRITICISMS OF THE CURATED INNOVATION MODEL

In this Part, I address three important critiques that can be raised against the Curated Innovation model. Part IV.A introduces the first potential criticism, which would be that this model is interventionist and places the keys to innovation in the hands of the government. Part IV.B discusses the second criticism—that this proposal would complicate the work of regulatory agencies and be impractical. Further, this sub-Part acknowledges that there are some situations where the Curated Innovation model should not be applied. Finally, Part IV.C discusses the third claim, which is that by defining the interests ex ante, this proposal may work against change in social values.

A. Interventionism

The first critique against this model is that this proposed regime would unduly increase the government's involvement in innovation and in the market generally. What is more, it can be argued that if the government is indeed inefficient in regulating technology—as discussed in Part I—why should it be trusted in regulating technology even more under the Curated Innovation model?

140. *Compare supra* note 68 and accompanying text.

141. Wasserman, *supra* note 81, at 625 (stating "an administrative agency's decision that overly favors its regulated entities is either less likely to be subjected to judicial reexamination, or if it is subjected to judicial challenge, will be afforded a more deferential standard of review than a decision that overly disfavors its regulated entities.").

While this criticism may appear sound at first blush, in reality the Curated Innovation model is not more interventionist than the existing situation—and, in fact, it allocates to regulators a task that they are better equipped to perform than does the current regime. To be sure, the idea that innovation can operate without regulation is mostly a myth today. A long time has passed since the economic orthodoxy was claiming that innovation happens only in the private sector and that the government's best way to support innovation is to "get out of the way."[142] Modern approaches acknowledge the contribution of government to innovation in encouraging private innovation, investment, and in subsidizing foundational research and development.[143] It is estimated that approximately thirty percent of research in the United States is funded by the government. This number excludes tax credits and other ways the government may be intervening in innovation.[144]

Indeed, regulation cannot, and should not be avoided in innovation-intensive industries.[145] First, lack of regulation is a de facto regulatory position. Consider, for example, the regulatory decision of the FCC not to intervene in the over-the-counter derivatives market throughout the 1990s and 2000s.[146] The non-intervention position the FCC adopted in effect constituted an implicit license to carry on with such activities. The same is true for many other regulatory challenges. For example, regulators who would refrain from deciding whether Bitcoin is taxable would effectively exempt it from tax.[147] Lack of decision on whether Uber drivers are covered under the same regulation as taxi drivers[148] and whether Airbnb hosts are covered under hotel regulations would in effect exempt these companies from such norms until courts decide otherwise.[149] Second, regulation might be necessary for innovation to

142. For the most extreme view of the matter see MILTON FRIEDMAN, CAPITALISM AND FREEDOM 11 (1962) ("The great advances of civilization, whether in architecture or painting, in science or literature, in industry or agriculture, have never come from centralized government.").

143. *See, e.g.*, MARIANA MAZZUCATO, THE ENTREPRENEURIAL STATE: DEBUNKING PUBLIC VS. PRIVATE SECTOR MYTHS (2014); WILLIAM H. JANEWAY DOING CAPITALISM IN THE INNOVATION ECONOMY: MARKETS, SPECULATION AND THE STATE (2014).

144. *See supra* Part II.A.2.a. *See also* Cooter, *supra* note 65 (arguing that the lack of an effective legal framework can be the main obstacle to innovation and economic growth).

145. *See also* Gervais, *supra* note 6.

146. *See supra* note 41.

147. The IRS recently based a wholesale new guidance for taxing virtual currencies based on Bitcoin. *See* I.R.S. Notice 2014-21 (Mar. 25, 2014).

148. *About Uber*, UBER, http://perma.cc/R6M7-NEFN?type=image (last visited Feb. 22, 2015).

149. RACHEL BOTSMAN & ROO ROGERS, WHAT'S MINE IS YOURS: THE RISE OF COLLABORATIVE CONSUMPTION xiii (2010) ("Airbnb is an old idea, being replicated and made relevant again through peer-to-peer networks and new technologies.").

penetrate markets. Ignoring autonomous vehicles, for example, could have prevented even initial experiments with this technology because autonomous cars cannot comply with all the existing car regulations.[150] Similarly, one of the reasons cited for the slow entry of CCS into the market is the lack of default liability rules in case of leakage or migration of the stored CO_2.[151]

What is more, in the absence of regulation, uncertainty would be exacerbated. Market players may seek guidance in the judiciary system. In the words of Richard Epstein, compared to regulation, "[C]ase-by-case litigation can easily prove to be worse."[152] Sans regulation, industry players are also more likely to develop self-regulation and private arrangements, which, as discussed above, are likely to externalize costs on non-members of the arrangements.[153]

Indeed, the relevant question should be not *whether* or *how much* government intervention is desired, but rather *how* such intervention should be carried out. Under the present regime, regulation is conducted only reactively.[154] This kind of regulation surrenders any ability to influence the incentives of innovators ex ante. The current regulatory system simply does not make sure innovators bring the best products to the market. The Curated Innovation model, on the other hand, divides the power of state actors and private actors in order to better enhance societal welfare. Indeed, government actors are better positioned than private actors to identify social goals ex ante. Private actors, on the other hand, are better positioned to design products and solutions that would have demand in the marketplace and to actually build and deploy those products. Thus, the Curated Innovation model combines the broad picture regulators have with the optimizing tendencies of markets.[155]

150. Indeed, various states have recently designed law and regulation in order to permit the testing and use of autonomous vehicles in their jurisdiction, the first of which were Nevada, Florida, California, and Washington, D.C. Further legislation is pending in many other states. *See* Katyal, *supra* note 10, at 1688.

151. *See* Helman et al., *supra* note 103, at 13 ("Indeed, without a safe solution for storage that assures that CO_2 will be completely contained for the indefinite future, CCS emission reduction may be severely undermined by CO_2 leakage and migration."). Liability rules vary between jurisdictions. In two Australian jurisdictions, the storage site operator holds long term liability indefinitely. In the European Union liability is shouldered by the site operator, and states can assume liability after a period of time, under certain conditions. Other mechanisms have been raised, including imposing liability on the CO_2 producer, or implementing industry liability-pooling plans. *See id*.

152. Epstein, *supra* note 24, at 87. *See also* Edward L. Glaeser & Andrei Shleifer, *The Rise of the Regulatory State*, 41 J. ECON. LITERATURE 401, 402-03 (2003) (positing market regulation as response to dissatisfaction of litigation).

153. *See* Posner, *supra* note 64.

154. *See supra* Part I.A.

155. *See, e.g.*, *supra* note 138.

Finally, it should be noted that under the proposed Curated Innovation regime, innovators would still be able to pursue the market course without competing on a regulatory prize. Yet, even these innovators would be better off: these innovators would receive regulatory signals as to the desired state of affairs in the industry and would be able to internalize these considerations for the benefit of society.

B. Practicality

Another critique that may arise against the Curated Innovation model relates to its practical aspects. Indeed, any regulatory decision-making process raises various practical problems, such as the endowment effect, problems of imperfect information, wealth effects, discounting, public choice, and expenses (decision costs). What is more, it is often believed that regulators are capable of contemplating risks and working to minimize them. Regulators are typically not entrusted with the task of defining "the upside," namely, to weigh the advantages of a forthcoming technology. This task is typically given to the market.

Allow me to tackle the second concern first. There is little justification for the different attitudes towards regulators' ability to assess risks and their ability to assess gains of a new innovation. Both risks and gains are speculative to a large extent. In fact, risks and benefits are often two sides of the same coin: it is not clear why a regulator is within its domain to decide whether a technology risks harms to the environment, but outside of its domain to decide whether its effect on the environment is positive. Indeed, if regulators can be trusted to assess the environmental effect of an innovation, there is little reason to limit this assessment to negative effects. What is more, regulators implicitly assess potential gains of technology anyway. No one seriously believes that regulators treat—or should treat—a technology whose potential value they view as enormous the same as a technology whose value they see as marginal. The Curated Innovation model renders this distinction explicit, as opposed to having such considerations implicitly embedded in the regulatory process.

It should also be noted that as discussed in Part II, markets are an imperfect proxy for the societal value of a new product. While nothing in this model takes away from markets' ability to make such a determination ex post, injecting public interest concerns into the decision-making process of innovators early in the process increases the chances that the innovation is going to be correlated to the actual public

value it generates and reduces the complexity of regulation later on.

As to the general concerns about the practicality of the regulatory process, I concede that the Curated Innovation model is not free from all the problems that are inherent to regulatory decision-making. Still, this model would not render any of these problems worse than it already is under the current regime, and in various important aspects this model will improve the current regime. Let us begin with the prevalent problem of imperfect information. Indeed, regulation of innovation-intensive industries needs to be conducted under conditions of "high uncertainty," namely, situations where the alternative state of the world cannot be calculated actuarially or formally.[156] The predictive powers of regulators are limited. There is no way for regulators to predict the full range of risks and benefits embedded in novel technologies, processes, or business models that have never been tried before.[157] Some of the effects of novel processes, technologies, and business models are also contingent upon future events that may or may not occur.[158]

Indeed, the Curated Innovation mechanism is not and does not claim to be a crystal ball.[159] It cannot produce certainty where uncertainty rules. Indeed, in the words of Friedrich Hayek, "Progress by its very nature cannot be planned."[160] Rather, policymakers are invited to begin a dynamic cycle of progress, which would gradually and constantly improve, together with the evolution of ideas and their

156. "Uncertainty" in Frank Knight's sense—contingency that cannot be known or calculated actuarially or with formal rigor but can only be estimated impressionistically. *See* FRANK H. KNIGHT, RISK, UNCERTAINTY AND PROFIT 19-20, 197-232 (1921). As Sidak and Teece argued in the context of antitrust law, "Because innovation produces new products and lowers the cost of existing products, policymakers must include such future products when defining the market, but doing so is quite difficult in many instances." *See* J. Gregory Sidak & David J. Teece, *Dynamic Competition in Antitrust Law*, 5 J. COMPETITION L. & ECON. 581, 614 (2009).

157. *See* Huber, *supra* note 18. A prominent example for that is the attempts to regulate the technology of file sharing in the early 2000s. The law has attempted to fight the file-sharing phenomenon in various ways, including via regulatory measures. The result of these efforts, however, have not only proved futile, but also have had the unintended consequence of change in design and in operation of the file-sharing market. Thus, the first file-sharing technologies were designed with a central server that indexed the content that was shared among peers. When the law cracked down on these technologies based on this central management, the next generation of file-sharing technologies was designed without central indexing at all and became ever more elusive and fragmented. Little of this was predictable at the time of regulatory decision-making.

158. There is an interesting debate on whether there needs to be a discount on next generation interest, for example.

159. *See* KNIGHT, *supra* note 156, at 197-232 (delineating economic risk and economic uncertainty). *See also* SANFORD IKEDA, DYNAMICS OF THE MIXED ECONOMY: TOWARD A THEORY OF INTERVENTIONISM 9 (1997) (noting "the centrality of unintended consequences in the development and implementation of public policy"). *See supra* Part I.B.

160. FRIEDRICH A. HAYEK, THE CONSTITUTION OF LIBERTY 41 (1960).

formation into products and commodities that enter the market.

Other problems that pertain to regulators under any model are capture and public choice.[161] The vast scope of evidence suggests that agencies systematically make decisions that prioritize interests of contemporary regulated entities over the interests of the public.[162] As George J. Stigler famously put it, "[A]s a rule, regulation is acquired by the industry and is designed and operated primarily for its benefits."[163] Indeed, regulators are likely to attribute excessive weight to the interests of incumbents over that of newcomers and of the public at large, and may result in a diminished social welfare.[164]

Indeed, deciding whether future occurrences are good or bad and weighing the interests against each other are matters of personal preference and political inclination. As such, these issues are also susceptible to capture and public choice. These problems are much more

161. A voluminous literature sets out the concerns associated with government bodies systematically making decisions that favor special interests over those of the general public. For a small sample of such literature, see ROGER G. KNOLL, REFORMING REGULATION: AN EVALUATION OF THE ASH COUNCIL PROPOSALS 99-100 (1971); PAUL J. QUIRK, INDUSTRY INFLUENCE IN FEDERAL REGULATORY AGENCIES 4 (1981); B. DAN WOOD & RICHARD W. WATERMAN, BUREAUCRATIC DYNAMICS: THE ROLE OF BUREAUCRACY IN A DEMOCRACY 18-19 (1994); Steven P. Croley, *Theories of Regulation: Incorporating the Administrative Process*, 98 COLUM. L. REV. 1, 5 (1998); Michael E. Levine & Jennifer L. Forrence, *Regulatory Capture, Public Interest, and the Public Agenda: Toward a Synthesis*, 6 J.L. ECON. & ORG. 167, 167-68 (1990); George J. Stigler, *The Theory of Economic Regulation*, 2 BELL J. ECON. & MGMT. SCI. 3, 3 (1971).

162. *See, e.g.*, Wasserman, *supra*, note 81, at 629. ("A voluminous literature sets out the concerns associated with government bodies systematically making decisions that favor special interests over those of the general public."); Stigler, *supra* note 161.

163. *See* Stigler, *supra* note 161; Anthony Downs, *An Economic Theory of Political Action in a Democracy*, 65 J. POL. ECON. 135 (1957). *See also* William A. Jordan, *Producer Protection, Prior Market Structure and the Effects of Government Regulation*, 15 J.L. & ECON. 151 (1972); Mark Green & Ralph Nader, *Economic Regulation vs. Competition: Uncle Sam the Monopoly Man*, 82 YALE L.J. 871 (1973); Barry R. Weingast, *Regulation, Reregulation and Deregulation: The Foundation of Agency-Clientele Relationships*, 44 LAW & CONTEMP. PROBS. 147 (1981); Bruce Yandle, *Bootleggers and Baptists: The Education of a Regulatory Economist*, 7 AEI J. GOV'T & Soc'y 12 (1983); William W. Bratton & Joseph A. McCahery, *Regulatory Competition, Regulatory Capture, and Corporate Self-regulation*, 73 N.C. L. REV. 1861 (1995); Fred S. McChesney, *Rent Extraction and Rent Creation in the Economic Theory of Regulation*, 16 J. LEGAL STUD. 101 (1987); Jean-Jacques Laffont & Jean Tirole, *The Politics of Government Decision-Making: A Theory of Regulatory Capture*, 106 Q.J. ECON. 1089.

164. *See, e.g.*, TIM WU, THE MASTER SWITCH: THE RISE AND FALL OF INFORMATION EMPIRES 307-08 (2010) (discussing the "[g]overnment's tendency to protect large market players" and how "[t]ime and again [the government] has stood beside concentrated power against the underdog at the expense of economic dynamism"). *See generally* 2 ALFRED E. KAHN, THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS 12 (1998) ("Responsible for the continued provision and improvement of service, [the regulatory commission] comes increasingly and understandably to identify the interest of the public with that of the existing companies on whom it must rely to deliver these goods."). *See also* Cooter, *supra* note 65 ("Industrial policy is rife with political favoritism, chicanery, cronyism, and corruption.").

manageable under the Curated Innovation model than they are on the current regime. An ex post regulatory regime, by its nature, intervenes sporadically and unexpectedly, often times as a reaction to a bad case that may or may not represent broader trends in the industry.[165] It may thus produce an inadequate or skewed regulation. What is more, an ex post regime invites capture.[166] The proposed regime, however, has future outlook and thus mitigates the influence of incumbents. The Curated Innovation model provides a framework for regulators to consider structurally and systematically the various ways innovation under their domain can affect welfare. The Curated Innovation framework would thus be more difficult to manipulate by bureaucrats and interest groups than ex post, formal, or informal processes where new entrants may not even be included.[167]

As to decision costs, a systematic framework with incremental changes would likely be less costly than ongoing ad-hoc decision-making processes. The costs can also be better planned for by governmental agencies, as the process steps are predefined.

I do, however, submit that there are some situations where the Curated Innovation system should not be applied. This system would be ideal in cases where the interests at stake are relatively clear and can be analyzed. In most cases, even when the industry is nascent, the interests that are furthered and threatened by it are relatively clear and identifiable. In cases of extreme lack of information, however, where regulators simply have no more than guesses about the interests that may be at play, the Curated Innovation system—and perhaps regulation as a whole—should be suspended.

165. *See supra* Part I.A .

166. Capture would also have adverse competitive effects. See Harold Demsetz's conclusion that "in utility industries, regulation has often been sought because of the inconvenience of competition." Harold Demsetz, *Why Regulate Utilities?*, 11 J.L. ECON. 55, 61 (1968). Gervais brings as an example the telecommunications industry where deregulation was seen as a necessary step to promote innovation and competition. *See* Gervais, *supra* note 6, at n. 3. *See also* Justus Haucap, et al., *Credible Threats as an Instrument of Regulation for Network Industries*, *in* DIGITAL ECONOMIC DYNAMICS: INNOVATIONS, NETWORKS AND REGULATIONS 171, 183-89 (2007).

167. *See* Mark Seidenfeld, *Bending the Rules: Flexible Regulation and Constraints on Agency Discretion*, 51 ADMIN. L. REV. 429, 464 (1999) (indicating that special interest groups have access to additional information due to their specialization, and this access to information benefits them when communicating with agencies); Wendy E. Wagner, *Administrative Law, Filter Failure, and Information Capture*, 59 DUKE L.J. 1321, 1378-79 (2010) (arguing that greater access to information by special interests groups creates oversight problems).

C. Change Aversion

A third criticism raises an interesting potential challenge for the Curated Innovation model. This challenge is rooted in the fact that societal values change constantly. Family values, attitudes towards equality, privacy, and many other views have gone through some dramatic transformation throughout the years, and at the exponential rate of change of the past few decades, it is hard to predict what interests will remain relevant. But these factors and interests change much faster than regulators perceive. Thus, the argument goes, under the Curated Innovation proposal, regulators may still require innovators to aim at yesterday's values and goals, and become a stagnation force instead of a promoter of positive change. This is an important and serious point, and regulators need to be aware of this concern especially during the first and the last stage of the model. There, regulators need to make sure winds of change will come into expression. Public participation, rigorous consultations, and inclusive procedures must be employed to assess the innovation and bring in new approaches and new ways of thinking.

It should also be noted that under the present regime, this point is all the more problematic, because of the heightened risk of capture that is embedded in it and due to the risk-averse nature of many regulatory frameworks. The inclusive and dynamic nature of the Curated Innovation model is likely to reflect more change in societal values than is likely to be reflected today.

V. CONCLUSION

The world in the 21st century cherishes innovation and sees it as a solution to many global challenges. The purpose of this Article is to show how policymakers can join forces with private actors in order to ensure that innovation that brings the most utility to society finds its way to the marketplace.

The preceding discussion demonstrates the misalignment of interests between the innovation society wishes to encourage and the innovation entrepreneurs are encouraged to pursue under the current regime. The current regime trusts markets, grants, prizes, tax credits, and "corrections" by regulation post-facto to align those interests. Yet, as I demonstrated, markets may be a good tool to align the incentives of the entrepreneur with the interests of potential buyers of the innovation but are an imperfect proxy for societal welfare. Grants, prizes, and other incentives are a limited, sporadic cure, and can be used only to

encourage desired innovation in its narrow sense, but not to discourage undesired innovation. On the other hand, ex post regulation is an inefficient tool to contend with the potential negative consequences of some innovative products. A new framework is needed to create regulation that promotes innovation and ensures that it promotes societal interests and welfare.

The Curated Innovation model is not a silver bullet. Even after regulators implement the model, conflicts could arise between stable order and innovative ideas that threaten the known and the status quo. Important questions will be raised on the role of patents and their desired scope. However, the Curated Innovation model marks a promising way forward and a general analytic framework to address the issue of regulation of innovation-intensive industries.