

# UC Davis

## UC Davis Previously Published Works

### Title

Weighing intellectual property: Can we balance the social costs and benefits of patenting?

### Permalink

<https://escholarship.org/uc/item/3f4089qh>

### Journal

History of Science, 57(1)

### ISSN

0073-2753

### Author

Biagioli, Mario

### Publication Date

2019-03-01

### DOI

10.1177/0073275318797787

Peer reviewed

# Weighing intellectual property: Can we balance the social costs and benefits of patenting?

History of Science

1–24

© The Author(s) 2018

Article reuse guidelines:

[sagepub.com/journals-permissions](http://sagepub.com/journals-permissions)

DOI: 10.1177/0073275318797787

[journals.sagepub.com/home/hos](http://journals.sagepub.com/home/hos)**Mario Biagioli**

School of Law and STS Program, UC Davis, USA

**Abstract**

The scale is the most famous emblem of the law, including intellectual property (IP). Because IP rights impose social costs on the public by limiting access to protected work, the law can be justified only to the extent that, on balance, it encourages enough creation and dissemination of new works to offset those costs. The scale is thus a potent rhetorical trope of fairness and objectivity, but also an instrument the law thinks with – one that is constantly invoked to justify or to question the extent of available IP protection. The balancing act that underlies the legitimacy of IP is, however, literally impossible to perform. Because we are unable to measure the benefits that IP has for inventors or the costs it has for the public, the scale has nothing to weigh. It conveys a clear sense that IP law can be balanced, but in fact propagates only a visible simulacrum of balance – one that is as empty as it is powerful.

**Keywords**

Balance, innovation, patent law, patent policy, social costs and benefits of intellectual property

Images of justice, with balance, sword, and blindfolds, adorn many courthouses, conveying the idea that justice and human-made law are one and the same or that, at the very least, the application of the law is impartial, objective, and swift.<sup>1</sup> The balance is the oldest

1. Judith Resnik and Dennis Curtis, *Representing Justice: Invention, Controversy, and Rights in City-States and Democratic Courtrooms* (New Haven: Yale University Press, 2011), pp.18–25.

**Corresponding author:**

Mario Biagioli, School of Law and STS Program, UC Davis, 400 Mrak Hall Dr, Davis, CA 95616, USA.

Email: [mbiagioli@ucdavis.edu](mailto:mbiagioli@ucdavis.edu)

and the most enduring of the iconographic features of justice, suggesting that it captures – if only as an image – something essential about the idea of justice. Occasionally, it did more than representing or emblemizing. The symmetric relationship between crime and punishment in the ancient *lex talionis* – an eye for an eye, a tooth for a tooth – suggests that, in certain contexts, the balance was an actual conceptual instrument or paradigmatic exemplar of justice.<sup>2</sup> The inexorable machinic logic of the balance – one that makes it a perfect candidate for what Daston and Galison have called “mechanical objectivity”<sup>3</sup> – continued to inform philosophies of justice at least until the Enlightenment. In the *Metaphysics of Morals* Kant argued,

[W]hat kind and what amount of punishment is it that public justice makes its principle and measure? None other than the principle of equality (in the position of the needle on the scale of justice), to incline no more to one side than to the other. [...] But only the *law of retribution* (*ius talionis*) [...] can specify definitely the quality and quantity of punishment; all other principles are fluctuating and unsuited for a sentence of pure and strict justice.<sup>4</sup>

However, if the balance has gone, since Kant, from being the paradigm of justice to becoming little more than its logo, a different picture emerges when we move down from lofty justice to specific branches of the law, like intellectual property.

While private property is treated as a personal right and has been recognized, in different forms, for millennia, intellectual property is a much more recent legal creation, whose existence is justified by a set of arguments that ultimately hinge on the balance. This is not the balance with empty pans held by Lady Justice, but a balance whose contents are dictated by the specific goals and justification of the law: balancing the interests of inventors with those of the public.<sup>5</sup> Far from being construed metaphorically, this is a balance that ought to weigh evidence to find a just equilibrium. Should we think of it as a kind of instrument? And, if so, can it perform the balancing act that the law expects and requires?

The works of authors and inventors are of an unusual nature. The economists call them “public goods,” goods that are expensive to make but easy to copy, making them unlikely to be produced under normal market conditions unless special measures are introduced to make their copying illegal. Intellectual property law provides that. At the same time, while inventions and works of authorship are easy to appropriate, their appropriation, unlike theft, does not produce a loss of the original.<sup>6</sup> Consequently, the law does

2. Willian Ian Miller, *Eye for an Eye* (Cambridge: Cambridge University Press, 2006).

3. Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007).

4. Immanuel Kant, “Metaphysics of Morals,” in Mary J. Gregor (trans. and ed.), *Practical Philosophy* (Cambridge: Cambridge University Press, 1996), p.401-588 (emphasis in original).

5. William M. Landes and Richard A. Posner, *The Economic Structure of Intellectual Property Law* (Cambridge, Mass.: Harvard University, 2003), pp.11–36.

6. Non-rivalrous refers to the fact that appropriating somebody’s patent is not like eating somebody’s apple. The patent is not ‘consumed’ as a result of being appropriated. Non-excludable refers to the fact that, unlike a piece of real estate that can be fenced off, it is typically impossible to prevent people from trespassing on intellectual property. IP remedies are post-facto – digital rights management (DRM) being the exception.

not give inventors the same rights in their innovations that landowners have in their estates. As indicated by the limited length of patent and copyright protection, authors and inventors “own” their work in a significantly qualified sense, and to an extent that is limited by the opposing rights of the public. In Thomas Jefferson’s words: “[I]nventions [...] cannot in nature be a subject of property. Society may give an exclusive right to the profits arising from them as an encouragement to men to pursue ideas which may produce utility. But this may, or may not be done, according to the will and convenience of the society, without claim or complaint from any body.”<sup>7</sup>

Jefferson’s views match the U.S. Constitution’s conceptualization of intellectual property (IP) as a tool to achieve a social good – what it refers to as the “Progress of Science and useful Arts” – innovation that would be unlikely to come into being unless authors and inventors could be granted temporary protection from copying.<sup>8</sup> Progress is ultimately accomplished when inventions and works of authorship are released into the public domain at the expiration of their term or protection, thus becoming free for everybody to use. As a result, granting intellectual property rights to authors and inventors is politically justifiable only by assuming that it is possible to balance the social benefits and costs of IP protection.<sup>9</sup> More than an emblem of the just application of the law by the courts, the balance thus provides the conditions of possibility of intellectual property. IP is not born just but becomes so when it achieves balance. Here is a textbook formulation:

[Because intellectual property rights impose social costs on the public], the intellectual property laws can be justified by the public goods argument only to the extent that they do on balance encourage enough creation and dissemination of new works to offset those costs[...] The key to economic efficiency lies in balancing the social benefits of providing economic incentives for creation and the social costs of limiting the diffusion of knowledge.<sup>10</sup>

That balance is also what construes intellectual property as a right rather than as a monopoly – a protection that benefits the inventor at the expense of the public. As the chairman of the U.S. Senate Subcommittee on Patents, Trademarks, and Copyrights

- 
7. “Thomas Jefferson to Isaac McPherson, 13 August 1813,” *Founders Online*, National Archives, last modified June 29, 2017, <http://founders.archives.gov/documents/Jefferson/03-06-02-0322> (last accessed May 15, 2018). Original source: J. Jefferson Looney (ed.), *The Papers of Thomas Jefferson*, Retirement Series, vol. 6, *11 March to 27 November 1813* (Princeton: Princeton University Press, 2009), pp.379–86.
  8. United States Constitution (Article I, Section 8, Clause 8): “The Congress shall have Power 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.”
  9. “The Congress in the exercise of the patent power may not overreach the restraints imposed by the stated constitutional purpose. Nor may it enlarge the patent monopoly without regard to the innovation, advancement or social benefit gained thereby” (*Graham v. John Deere Co.*, 383 U.S. 1, 5–6 (1966)).
  10. Robert Merges, Peter Menell, and Mark Lemley, *Intellectual Property in the New Technological Age*, 6th ed. (New York: Wolters Kluwer, 2012), p.14.

put it in 1958: “The patent system has, from its inception, involved a basic economic inconsistency. In a free-enterprise economy dedicated to competition, we have chosen, not only to tolerate, but to encourage individual limited islands of monopoly in the form of patents.”<sup>11</sup>

Being at the roots of intellectual property, that “economic inconsistency” is unavoidable, but it can be rationalized by claiming that balancing the conflicting interests of the inventors and the public would transform those “islands of monopoly” into more acceptable “islands of strategically limited rights.” IP’s necessary balancing act is then operationalized by adjusting key elements and requirements of the law. In the case of patents, this includes the requirements of novelty, utility, nonobviousness, and restrictions over acceptable patentable subject matter. For instance, in his 2006 dissenting opinion in *Labcorp v. Metabolite* (an intriguing case testing the demarcation between what kind of inventions are and are not patent eligible), Justice Breyer argued that to navigate the murky “product of nature” doctrine (which he invoked to argue that this specific patent concerned a “law of nature” and should thus be voided), one has to keep in mind the doctrine’s balance-keeping function.

[S]ometimes too much patent protection can impede rather than “promote the Progress of Science and useful Arts,” the constitutional objective of patent and copyright protection. U. S. Const., Art. I, §8, cl. 8. [...] Patent law seeks to avoid the dangers of overprotection just as surely as it seeks to avoid the diminished incentive to invent that underprotection can threaten. One way in which patent law seeks to sail between these opposing and risky shoals is through rules that bring certain types of invention and discovery within the scope of patentability while excluding others.<sup>12</sup>

Similar balancing acts are invoked in discussions of the appropriate length of the term of protection – a discussion that, in copyright, goes from the landmark (and ill-fated) *Eldred v. Ashcroft* (2003) case, all the way back to the articulation of copyright law in the eighteenth century.<sup>13</sup> In the case of patents, the work of economist William Nordhaus exemplifies a theoretical approach to determining the proper term length to balance positive incentives for innovation and the social cost of the patent monopoly<sup>14</sup> – a balancing that also frames recent discussions about possible industry-specific length of protection

11. Joseph O’Mahoney, in Fritz Machlup, *An Economic Review of the Patent System – A Study of the Subcommittee on Patents, Trademarks, and Copyrights of the Committee on the Judiciary, U.S. Senate, 85th Congress, Second Session* (Washington, DC: United States Government Printing Office, 1958), p. III.

12. J. Breyer, 548 U. S. \_\_\_\_ (2006)

13. Marc Rose, *Authors and Owners: The Invention of Copyright* (Cambridge, Mass.: Harvard University Press, 1985); Ronan Deazley, *On the Origin of the Right to Copy* (London: Hart Publishing, 2004).

14. William Nordhaus, *Invention, Growth, and Welfare: A Theoretical Treatment of Technological Change* (Cambridge: MIT Press, 1969), pp.3–7. On the improbability of finding the right length of patent protection see Landes and Posner, *The Economic Structure of Intellectual Property Law* (note 5), p.300.

based on the different development costs and incentives in different fields of invention (software, pharmaceuticals, etc.).<sup>15</sup>

Far from being a metaphor, an emblem, or a rhetorical figure, the balance thus functions as a comprehensive framing device for the whole discourse of modern U.S. intellectual property, especially patent law. Not unlike the way nineteenth-century patent models became the templates through which the law conceptualized patentable invention, the balance functions as a *model* of how IP law *operates* and to what *end*.<sup>16</sup> While not a material instrument or model, the figure of the balance still retains a distinct machinic dimension in the sense that it instantiates an unnegotiable protocol – the balancing of social costs and benefits – that needs to take place and needs to be free from subjective judgment.<sup>17</sup>

Even critic David Lange, who strenuously defended the public domain and the commons from the ever-increasing expansion of intellectual property protections, framed his critique of IP as a call for a new and better-informed kind of balance.

The analogy that comes to mind is the environmental impact statement that must be prepared when, for example, government agencies propose to make some doubtful use of lands. The purpose of these statements is generally to require that, as against the uncontrolled ravages wrought in earlier times, would-be users today assure us that their proposals will not heedlessly affect the interests of individuals in generations to come. [...] If it is fair [...] to require the users of public lands to prepare impact statements as a condition of their use, then perhaps it is also fair to require similar assurances before we permit the outright appropriation of the territory of the creative subconscious.<sup>18</sup>

While Lange did not explicitly mention balance, he was clearly calling for a balanced and sustainable use of the public domain – one that would allow both the development of some of its parts through the granting of private intellectual property rights while leaving enough of it untouched for public use. That proposal was then articulated in James Boyle's manifesto of cultural environmentalism and the subsequent dramatic growth of the discourse of the commons, which is inherently rooted in the logic of balance in terms of the sustainable use and care of depletable resources.<sup>19</sup> The discourse of balance, therefore, is a common denominator shared by both supporters and critics of intellectual property. The former see balance as a way to justify IP protection and differentiate it from monopoly, and the latter see it as a door through which issues of social justice and public responsibility (especially responsibility toward future users and producers) can be brought into patent law.<sup>20</sup>

- 
15. Brian Kahin, *Patent Reform for a Digital Economy* (Washington, DC: Computer & Communications Industry Association, 2006).
  16. Alain Pottage, "Law Machines: Scale Models, Forensic Materiality and the Making of Modern Patent Law," *Social Studies of Science* 41 (2011): 621–43.
  17. Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007), pp.115–90.
  18. David Lange, "Recognizing the Public Domain," *Law and Contemporary Problems* 44 (1981): 147–178.
  19. James Boyle, "The Second Enclosure Movement and the Construction of the Public Domain," *Law and Contemporary Problems* 66 (2003): 33–74.
  20. Shobita Parthasarathy, *Patent Politics: Life Forms, Markets, and the Public Interest in the United States and Europe* (Chicago: University of Chicago Press, 2017).

## A just balance is an empty balance

A balance displays whether the objects placed on its two plates are of equal weight, and it does so without requiring special observational or interpretive skills. The instrument's ability to determine a balance stems from the fact that all the different objects that can be placed on its two plates, including apples and oranges, share one specific feature: mass. The common use of the balance, however, is profoundly different from the kind of balancing necessary to justify intellectual property or, more generally, the justness of justice. It is not clear that we share definitions of the costs and benefits of intellectual property to inventors and to society, that there is an agreement on how to measure them, or that such measurements could be done in commensurable units a balance could weigh.<sup>21</sup> Nor is it clear whether "costs" and "benefits" are stable objects one could place on a balance, or whether they constitute, instead, constantly moving targets.

It is also puzzling that while the balancing acts necessary for the justification of IP would effectively require *simulations* (estimations of the positive and negative *effects* of IP protection during and after the period of protection), we assume that such a task can be performed by an instrument that can only measure things that are right here, right now. The balance belongs to statics, a science that deals with the equilibrium of entities at rest in the absence of acceleration or movement, something that seems antithetical to innovation or to what the Constitution refers to as "the Progress of Science and the useful Arts." When we describe stable complex systems or ecologies, we use the term "equilibrium," not "balance."

Because of these empirical and conceptual problems (further discussed below), I believe that if the figure of the balance is invoked so widely and so often in legal and policy discourse, it is not because of its ability to actually balance what it is supposed to balance, but rather due to the fact that it conveys the *impression* that it is *possible* to perform the kind of accounting of social costs and benefits necessary to justify the existence of IP. The discourse of balance may succeed in making IP sound politically acceptable (in the same way that courtrooms' emblems of blindfolded Justice holding a set of scales project an image of law as just), but that does not mean that the balance can actually perform justice. It may not be accidental that depictions of justice across time and place invariably feature the goddess holding a balance with *empty* pans, always ready to weigh but never actually doing so.<sup>22</sup> Conversely, balances with loaded plates can be found in satirical representations of justice as corrupt like, for example, those featuring one pan full of (heavy) cash outweighing the other pan containing the (much lighter) gavel of the judge.

21. These issues of commensurability have been addressed in the work of constitutional law scholars such as Alexander Aleinikoff, "Constitutional Law in the Age of Balancing," *The Yale Law Journal* 96 (1987): 943–1005; and Jacco Bomhoff, *Balancing Constitutional Rights: The Origins and Meaning of Postwar Legal Discourse* (Cambridge: Cambridge University Press, 2013).

22. The theme of the balance's empty pans, and its inability to produce just judgments when loaded, is analyzed in Mario Biagioli, "Justice out of Balance," *Critical Inquiry* 44 (Issue no. 1, Winter) (2019).

While my argument is essentially critical, it is not inherently negative. Acknowledging that we have little to gain from a balance that works only when unemployed does not create a new problem we did not have before. We have, instead, a chance to reframe discussions social justice and public responsibility in patent law outside and beyond the conceptual template of the balance, which is not only conceptually unfit but also inherently conservative, its political pedigree rooted in the mercantilistic zero-sum-game political economy of ancien régime physiocrats.<sup>23</sup>

## On one pan

What is the evidence of the social benefits of patenting that we can put on the balance? There have been lively debates on the pros and cons of patents since at least the mid nineteenth century.<sup>24</sup> Here, however, I focus on the much narrower genre of *empirical* studies of the correlation between patenting and inventive activity – studies that seek to map, through different data and methodologies, whether the availability of patents creates an incentive to produce inventions that, instead, would not have been pursued in the absence of the patent system.<sup>25</sup> This is the evidence we need to put on the first pan of the balance.

Produced for the U.S. Senate in 1958, the first of such studies (rather synthetic and historical in nature) was Fritz Machlup's *An Economic Review of the Patent System*. It concluded on a strikingly ambivalent note: "If we did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one. But since we have had a patent system for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it."<sup>26</sup>

Subsequent studies have adopted increasingly sophisticated methodologies and better data but have not produced more conclusive results. In 1986, Edwin Mansfield reported that "Despite the fact that the patent system generally is defended at least partly on the grounds that it increases the rate of innovation, the present study indicates that its effects in this regard are very small in most of the industry we studied."<sup>27</sup>

This is how Roberto Mazzoleni and Richard Nelson summarized the state of the evidence about ten years later, in 1998,

---

23. Michel Foucault, *Security, Territory, Population: Lectures at the College de France 1977–1978*, Michel Senellart and Arnold Davidson (eds.) (Basingstoke: Palgrave Macmillan, 2009), pp.285–311.

24. Christine MacLeod, "Concepts of Invention and the Patent Controversy in Victorian Britain," in Robert Fox (ed.), *Technological Change: Methods and Themes in the History of Technology* (London: Routledge, 1998), pp.137–53; Fritz Machlup and Edith Penrose, "The Patent Controversy in the Nineteenth Century," *The Journal of Economic History* 10 (1950): 1–29.

25. A good overall recent assessment of the state of the debate, inclusive of but not limited to the examples discussed below, is François Lévêque and Yann Ménière, "Patents and Innovation: Friends or Foes?" *UC Berkley Recent Work*, March 2007, <http://escholarship.org/uc/item/2w8605xg>.

26. Fritz Machlup, *An Economic Review of the Patent System* (note 11), p.80.

27. Edwin Mansfield, "Patents and Innovation: An Empirical Study," *Management Science* 32 (1986): 173–81.



In the 1950s, Scherer et al. studied firms in the United States. In the 1970s, Taylor and Silberston studied firms in the UK. Both studies reached the then surprising conclusion that, aside from pharmaceuticals, firms in most industries reported that patents were neither particularly effective, nor necessary, for enabling them to appropriate returns from their R & D. In the 1980s, Mansfield and Levin et al. undertook similar studies. The conclusions were similar. The very recent studies of Cohen et al. for the United States, Goto and Nagata for Japan, and Arundel and van de Paal for Europe, suggest that the situation in the 1990s is not very different.<sup>28</sup>

Shortly after, focusing on post-1980 U.S. data, Adam Jaffe offered a comparably ambivalent assessment, acknowledging that his findings went against his own assumptions about the relationship between patents (and the strengthening of patent protection) and inventive activity:

I have taken the view that it would be surprising if major changes in the patent system did not affect the innovation process. [...] Unfortunately, it is not possible to make very many robust statements about the effects of these changes on the innovation process. [...] The results we have generally suggested that the innovation process was not affected. This limited success is due partially to the difficulty of measuring the parameters of patent policy, and partly due to the difficulty of discerning statistically significant effects when many things have been changing at the same time. [...] An alternative view is that these negative results confirm what we thought we already knew, which is that patents are not central to appropriating the returns to R&D in most industries.<sup>29</sup>

A subsequent broadly comparative and sophisticated study by Josh Lerner released in 2002 found that “An examination of 177 policy changes [across sixty countries over a 150-year period] reveals that strengthening patent protection appears to have few positive effects on patent applications by entities in the country undertaking the policy change.”<sup>30</sup>

While most of these studies focused on somewhat large companies in traditional industries, the 2008 Berkeley Patent Survey looked at 1,332 early-stage high-tech companies founded since 1998. They reported that,

[R]espondents told us that on average patents offer just above a “slight incentive” to engage in invention, R&D, and commercialization, and between “slight” and “no incentive at all” to create internal tools and processes. While venture-backed startup executives rate the inventive value more

- 
28. Roberto Mazzoleni and Richard R. Nelson, “The Benefits and Costs of Strong Patent Protection: A Contribution to the Current Debate,” *Research Policy* 27 (1998): 273–84, at 275–6. See also their “Economic Theories about the Benefits and Costs of Patents,” *Journal of Economic Issues* 32 (1998): 1031–2, at 1037–8: “These include a study by E. Mansfield [1986], what has come to be called the Yale survey [Levin et al. 1987], and what we will call the Carnegie Mellon study [Cohen, Nelson, and Walsh 1996]. All of these studies come to basically the same conclusion, which is partially about the efficacy of patents and partly about the effectiveness of other means to enable firms to profit from their innovations [...]. In a nutshell, patents are an important inducement to invention in only a few industries.”
29. Adam Jaffe, “The U.S. Patent System in Transition: Policy Innovation and the Innovation Process,” *Research Policy* 29 (2000): 531–57, at 554.
30. Josh Lerner, “Patent Protection and Innovation Over 150 Years,” NBER Working Paper 8977, June 2002, [www.nber.org/papers/w8977](http://www.nber.org/papers/w8977).

highly than do those at [other] companies, in no category are patents reported to provide even a “moderate” incentive for any of the four entrepreneurial activities about which we queried.<sup>31</sup>

There is, however, an exception to this litany of inconclusive or negative findings.<sup>32</sup> In 2000, Wesley Cohen, Richard Nelson, and John Walsh published the results of a large, detailed survey of 1,478 R&D laboratories in the United States – the so-called Carnegie Mellon Survey – which confirmed that “patents tend to be the least emphasized” among the tools that firms used to “protect the profits due to invention.”<sup>33</sup> A more focused follow-up study of the same database, however, found something different. Focusing on the patent premium (the increase in the value of the innovation that is realized by patenting it), the authors found that while in the majority of cases there is no patent premium (that is, the cost of patenting exceeds the value of the invention), things look different if one considers the value of some of those inventions that the firms *did choose* to patent. In these cases, “firms earn on average a 50% premium over the no patenting case, ranging from 60% in the health related industries to about 40% in electronics.”<sup>34</sup> More importantly, simulations based on a model they had developed indicated that higher patent premiums would provide substantial stimuli for additional R&D, that is, further investments in the production of innovation (as distinct from just more patenting).<sup>35</sup>

Although their study stands out in finding a positive relationship between patenting and innovation incentives (however limited to certain industries, of a certain size, in a certain period and country, etc.), Arora and his colleagues closed the analysis of their findings with a clear cautionary note:

With its focus on private returns, our analysis does not, however, imply that patents necessarily yield a net social welfare benefit in any specific industry, nor overall. [That is because] the net social return to patenting may well be negative in industries subject to cumulative innovation where the assertion of patent rights restrict the use of discoveries in follow-on research to the point where the private returns to the initial patent-protected innovation are more than offset.<sup>36</sup>

By “cumulative innovation” they refer to technological environments where there are few or no options to pursue R&D in a direction parallel to a pre-existent patent, or to

- 
31. Stuart Graham, Robert Merges, Pam Samuelson, and Ted Sichelman, “High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey,” *Berkeley Technology Law Journal* 24(2010): 1255–1328.
  32. Additional reviews of the literature include Nancy Gallini, “The Economics of Patents: Lessons from Recent U.S. Patent Reform,” *Journal of Economic Perspectives* 16 (2002): 131–54; and Michele Boldrin and David Levine, *Against Intellectual Monopoly* (Cambridge: Cambridge University Press, 2008), Chapter 8, pp.216–25.
  33. Wesley Cohen, Richard Nelson, and John Walsh, “Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not),” NBER Working Paper No. 7552, February 2000, p.1.
  34. Ashish Arora, Marco Ceccagnoli, and Wesley M. Cohen, “R&D and the Patent Premium,” *International Journal of Industrial Organization* 26 (2008): 1153–79.
  35. Arora et al., “R&D and the Patent Premium,” p.1173 (note 34).
  36. Arora et al., “R&D and the Patent Premium,” p.1173 (note 34).

invent around it. In such environments, those who manage to patent first reap unusually high rewards by being able to block subsequent innovation by other inventors.<sup>37</sup> The high patent premiums discussed by Arora et al. may thus incentivize additional R&D, but a kind of R&D that would increase the incumbent's monopoly position and revenue rather than provide benefits for the public.

One can always call for further research based on bigger surveys and better data sets, and no doubt scholars will write grant proposals precisely to do that. But it will take some dramatically different results to reverse the overall pattern of agnostic findings that have been consistently produced over the last fifty years by several studies that have analyzed different periods, countries, and industries with different methodologies and data sets of different kinds and sizes. With the partial exception of the pharmaceutical industry, we just do not have clear evidence to support the assumption that patents provide significant incentives to inventive activity.

The problem is not just an empirical one but extends to defining what *kind* of evidence one should put in the balance's pan. While the U.S. Constitution unequivocally states that intellectual property law should be a tool 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," it is difficult to tease out exactly what it meant by "progress" and by "useful" (and to whom).<sup>38</sup> In other words, how can we translate the constitutional goals into a balance between the social costs of IP rights and the benefits of the innovation they would make possible?<sup>39</sup> It does not seem, however, that we even have a clear definition of what cost and benefit mean.

The studies discussed above and the literature that has drawn on them recognize the need not to confuse social benefits with the number of patents issued. (Without that distinction, it would be a self-fulfilling prophecy to say that patents foster innovation.) Still, while it is clear that one needs to identify benefits only with the production of innovation that would not have been developed in the absence of patent protection, that analytical focus proves difficult to maintain.<sup>40</sup> That is partly a consequence of the view that the job

---

37. Robert Merges and Richard Nelson, "On the Complex Economics of Patent Scope," *Columbia Law Review*, 90 (1990): 839–916; Suzanne Scotchmer, "Standing on the Shoulders of Giants: Cumulative Research and the Patent Law," *Journal of Economic Perspectives*, 5 (1991): 29–41.

38. There is an intriguing analogy between the difficulty of defining the social benefit of patents and of the patent system more generally with the debate over the definition of utility (or, rather, its growing indeterminacy) in patent law. In both cases, there is a struggle to both define who the beneficiaries should be, and the timeframe of those benefits or utility. See for instance *Juicy Whip, Inc. v. Orange Bang, Inc.*, 185 F3rd 1364 (Fed. Cir. 1999).

39. Edward C. Walterscheid, "Within the Limits of the Constitutional Grant: Constitutional Limitations on the Patent Power," *Journal of Intellectual Property Law* 9 (2002): 291–360.

40. On the importance of not confusing patents with innovation, or assuming a causal relationship between patenting and innovating, see Landes and Posner, *The Economic Structure of Intellectual Property Law*, p.327 (note 5); and Walter G. Park and Juan Carlos Ginarte, "Intellectual Property Rights and Economic Growth," *Contemporary Economic Policy* 15 (1997): 51–61. In another study: "The relationship between innovation and patent use is found to be much stronger going from innovation to patent use than from patent use to innovation. Firms that innovate take out patents; but firms and industries that make more

of the inventor/entrepreneur is not just to invent, but to build or run a business involving those inventions. Under that view, patents come to be seen as incentives to whatever they can be incentives to – their use expanding well beyond their original function of promoting inventive activity to include any post-inventive strategic use that entrepreneurs and firms can find for them.

There is a tension, therefore, between what the law means by “incentive to innovation” and what an entrepreneur may mean by that same term.<sup>41</sup> Obviously, if one elides the line between inventive and post-inventive activity, then patents would become more business tools for the private benefit of the entrepreneur rather than tools for the production of public benefits. (Conversely, that elision would be virtually invisible if one holds a capacious notion of “innovation” that is co-terminus with “innovative business.”) And while the line between inventive and post-inventive uses of patents is never openly disregarded in the studies mentioned above, there is a tendency to slip toward the point of view of the entrepreneurs, especially in those studies based on interviews and surveys of inventors and patentees. Analogously, the value of a patent is typically identified with its evaluation as an asset of and by the patentee rather than as an innovation that will benefit “Science and the useful Arts.”<sup>42</sup> This may be less the result of neoliberal ideological bias on the part of the scholars who conduct these studies than of the challenges they face when trying to quantify progress. Counting patents and looking at their short-term uses by (and value for) their holders is significantly easier than trying to assess their possible downstream long-term beneficial effects for the public. Still, be that as it may, the constraints on quantification skew the definition of “benefit” toward a patentee-centered and short-term direction.

---

intensive use of patents do not tend to produce more innovations” (Baldwin, John R., Hanel, Petr and Sabourin, David, “Determinants of Innovative Activity in Canadian Manufacturing Firms: The Role of Intellectual Property Rights” (March 7, 2000), *Statistics Canada Working Paper* No. 122, at SSRN: <https://ssrn.com/abstract=229792> or <http://dx.doi.org/10.2139/ssrn.229792>) (last accessed May 15, 2018).

41. Graham et al., “High Technology Entrepreneurs and the Patent System,” 1284–5 (note 31). The authors argue that, most likely, their respondents understand the term “incentive” with the meaning given to it by economic theory, but then qualify: “Of course, while the respondents may have understood our questions [about incentives], they may not fully comprehend the role patenting actually plays in their innovation process, which is often subtle. So while we are reasonably confident that our response capture at least a proximate window into the incentive role that patents play for technology entrepreneurs, we nevertheless recognize that further investigation of our findings is warranted.”
42. An example is the popular approach of assessing the value of a patent by looking at the patentee’s decision to renew the patent protection at various times during the duration of the grant. These renewals involve substantial fees, and the patentee’s decision to renew is thus seen as an index of the patent’s value, except that it reflects only the value of the patent in the eyes of the patentee. On this approach, see Mark Schankerman, “How Valuable is Patent Protection?” *RAND Economics Journal* 29 (1998): 77–107, esp. 87. Landes and Posner provides a critique of the economic significance of the value computed by these methods: *The Economic Structure of Intellectual Property Law*, pp. 311–12 (note 5). Cecil D. Quillen, Jr., “Commentary on Bessen and Meurer’s Patent Failure: An Industry Perspective,” *Journal of Intellectual Property Law* 16 (2008): 57–81, provides an equally skeptical view from the patenting trenches.

## And on the other pan

If the plate of the scale weighing the social benefits of patenting remains virtually empty (or is at best loaded with inconclusive data), what empirical evidence can we put on the other?<sup>43</sup> The answer requires some prefacing. First, while intellectual and political critiques of intellectual property have been frequent and forceful, we have only a few empirical studies of the actual social costs of patents, and virtually none of those of copyright protection.<sup>44</sup> Furthermore, the few available studies are rather recent, mostly emerging after a 1998 *Science* article by Michael Heller and Rebecca Eisenberg, which triggered a lively debate on the so-called “tragedy of the anticommons.”<sup>45</sup> As a result, they have been mostly focused on proving or disproving their thesis, which is:

The recent proliferation of intellectual property rights in biomedical research suggests [...] an “anticommons” in which people underuse scarce resources because too many owners can block each other. Privatization of biomedical research must be more carefully deployed to sustain both upstream research and downstream product development. Otherwise, more intellectual property rights may lead paradoxically to fewer useful products for improving human health.<sup>46</sup>

- 
43. The critical literature includes, but is not limited to: Adam Jaffe and Josh Lerner, *Innovation and its Discontents* (Princeton: Princeton University Press, 2007); Michele Boldrin and David Levine, *Against Intellectual Monopoly* (Cambridge: Cambridge University Press, 2008); James Bessen and Michael Meurer, *Patent Failure: How Judges, Bureaucrats, and Lawyers Put Innovators at Risk* (Princeton: Princeton University Press, 2009).
44. The fact that we have few studies of the costs of patenting, and that they have emerged almost fifty years after the first study of the benefits of patenting, seems to be a small puzzle in and of itself, perhaps suggesting that balance may really be just a form of speech if policy makers and the politicians who have been voting on the strengthening of patent law since the 1980s do not seem to be too interested in trying to gather or look at evidence on the balance, or absence thereof.
45. The studies include John Walsh, Ashish Arora, and Wesley Cohen, “Effects of Research Tool Patents and Licensing on Biomedical Innovation,” in Wesley Cohen and Stephen Merrill (eds), *Patents in the Knowledge-Based Economy* (Washington, DC: National Academies Press, 2003), pp.285–340; John Walsh, Charlene Cho, and Wesley Cohen, “The View From the Bench: Patents, Material Transfers and Biomedical Research,” *Science* 309 (2005): 2002–3; Dianne Nicol and Jane Nielsen, “Patents and Medical Biotechnology: An Empirical Analysis of Issues Facing the Australian Industry,” University of Tasmania Center for Law and Genetics, Occasional Paper no. 6, 2003; Joseph Straus, Joseph Holzapfel, and M. Lindenmeir, *Genetic Inventions and Patent Law: An Empirical Survey of Selected German R&D Institutions* (Munich: Max Planck Institute for Intellectual Property, Competition, and Tax Law, 2002); Heidi Williams, “Intellectual Property Rights and Innovation: Evidence from the Human Genome,” *Journal of Political Economy* 121 (2013): 1–27; Fiona Murray and Scott Stern, “Do Formal Intellectual Property Rights Hinder the Free Flow of Scientific Knowledge? An Empirical Test of the Anti-Commons Hypothesis,” NBER. Working Paper no. 11465, June 2005. A few additional works are reviewed in Rebecca Eisenberg, “Noncompliance, Nonenforcement, Nonproblem? Rethinking the Anticommons in Biomedical Research,” *Houston Law Review* 45 (2008): 1059–99.
46. Michael A. Heller and Rebecca S. Eisenberg, “Can Patents Deter Innovation? The Anticommons in Biomedical Research,” *Science* 280 (1998): 698–701, at 698.

Second, they tend to define “cost” quite narrowly, typically as the innovation opportunities that society might never benefit from due to the obstacles created by pre-existing patents. An example would be studies that seek to evaluate whether IP protection of certain research tools or genetic materials caused the delay or cancellation of research programs.<sup>47</sup> That is, social cost tends to be identified with missed scientific and technological opportunities rather than with the higher financial costs to patients or loss of health (or life) that may have resulted from, say, the high price that, thanks to its patents, Myriad Genetics was able to place on its breast and ovarian cancer tests, or that pharmaceutical companies can put on their patented drugs. To be fair, the social welfare costs produced by the delay or cancellation of R&D projects are occasionally mentioned,<sup>48</sup> but they are never quantified, suggesting that the issue is not neoliberal callousness to human suffering but the difficulty of finding weighable evidence for it – evidence one could place on the social costs pan. (The problems surrounding the definition of “cost” are thus symmetric to those concerning the definition of “benefit.”)

The distinctly short-term scope of these studies contrasts with the long-term intergenerational timeframe of the “environmental impact statements” called for by David Lange. This may reflect the genealogy of these studies. Because they were sparked by the anti-commons debate, they tend to look at a rather narrow interval within the R&D spectrum (typically very upstream), trying to quantify how many papers or patents were foreclosed by the inability to access some key patented resource – a transgenic laboratory animal, an instrument, and so forth. In most cases, what is estimated is not the ecological impact of innovations that might (but did not) make it to the market (in the long term), but rather the non-happening of scientific papers or patents related to upstream inventions. This is shown by how these studies identify the parties likely to be harmed by the effects of patenting. Rather than the general public or future generations of innovation users and producers, the potentially aggrieved parties are identified as those scientists whose research programs may have been slowed down or even cancelled as a result of the costs or the impossibility of securing licenses for the patented inventions that they needed to pursue their research. The potential victims are the very respondents to the data-collection surveys conducted by these studies (in the same way that the beneficiaries of the patent system tend to be identified with those inventors and entrepreneurs who were interviewed or surveyed by the studies on the benefits of patents).<sup>49</sup> Even those studies

---

47. See for example Walsh, Cho, and Cohen, “The View from the Bench,” 2002–3 (note 45).

48. Williams, “Intellectual Property Rights and Innovation,” 14 (note 45).

49. See for example Mansfield, “Patents and Innovation,” 174 (note 27): “From each firm we obtained an estimate of the proportion of its inventions developed in 1981–3 that would not have been developed if it could not have obtained patent protection.” The Yale Survey and the Carnegie Mellon Survey adopted comparable methodologies based on industry informants. Symmetrically, the anti-commons studies are typically survey-based, posing questions that yield results like these: “Over a 1-year period, an average of one in six respondents reported that delays in receiving materials from other academics caused at least one project they were working on to suffer a greater than 1-month delay, a substantial delay in a fast-moving research field. Noncompliance by other academics with research input requests resulted in about 1 in 14 scientists abandoning at least one of their projects each year” (Walsh, Cho, and Cohen, “The View from the Bench,” note 45). Murray and Stern, “Do Formal Intellectual



that do not rely on questionnaires but use impersonal indicators (such as numbers of patents and papers on a given discovery or invention, and their citations) have time horizons that are just a few years long.

Returning to the key question of what these studies tell us, the short answer is: not much. Their results have been as inconclusive as those of the studies of the social benefits of patents, despite a few outliers.<sup>50</sup> In a 2010 study of the Human Genome Initiative, Heidi Williams looked at the effects of the IP arrangements developed by Celera (a private company engaged in sequencing the genome in competition with a government-supported public program). She found that, by controlling access for two years to the genes it had sequenced,<sup>51</sup> Celera's strategy "led to reductions in subsequent scientific research and product development on the order of 20 to 30 percent."<sup>52</sup> Fiona Murray and Scott Stern have found similar, if smaller, effects in their study of 340 original research articles published in *Nature Biotechnology* from 1997 to 1999.<sup>53</sup>

While this is not a systematic review of all available studies, it suffices to capture the key empirical findings, showing that the second plate of the scale is collecting as much dust as the first one, and that the few exceptions we have for both the costs and benefits of patenting do not change that overall pattern. As Landes and Posner put it in their classical study of the economics of intellectual property: "[W]hether the benefits exceed the costs is impossible to answer with confidence on the basis of present knowledge."<sup>54</sup> Ironically, the trust we seem to have in the discourse of balancing seems to be supported (rather than undermined) by the fact that we do not have any conclusive evidence to put on either plate. The balance of justice works well only when empty, and we are not in the position of doing anything else except keeping it empty, thus shielding its performance from falsification. That does not seem to be a problem for policy makers. While entrusted

---

Property Rights Hinder the Free Flow of Scientific Knowledge?" (note 45) is a partial exception. While looking at the possible short-term anti-commons effects experienced by scientists and inventors, they do not use surveys but rely on scientometric evidence and patent data.

50. There have been some critiques of these studies' methodology, like their focus on the constraints posed by patenting on upstream scientific research rather than on downstream innovation, where anticommons effects could be more pronounced (Eisenberg, "Noncompliance, Nonenforcement, Nonproblem?" note 45). It is also the case that these studies have not mapped the broad field of innovation but have focused almost exclusively on biomedicine. Still, the fact remains that no consistent evidence of significant anti-commons effects has been demonstrated.
51. Technically, this was done not by patenting these sequences but by keeping the information secret and making it available only through a subscription-based contract. The effects, however, were, for all intents and purposes comparable to the licensing of a patented invention.
52. Williams, "Intellectual Property Rights and Innovation," 1 (note 45).
53. Murray and Stern, "Do Formal Intellectual Property Rights Hinder the Free Flow of Scientific Knowledge?" p.1 (note 45): "Relative to the expected citation pattern for publications with a given quality level, anticommons theory predicts that the citation rate to a scientific publication should fall after formal IP rights associated with that publication are granted. [...] We find evidence for a modest anti-commons effect (the citation rate after the patent grant declines by between 9 and 17%)."
54. Landes and Posner, *The Economic Structure of Intellectual Property Law*, p.310 (note 5).

with keeping the balance straight, they do not seem to bother to check it. Commenting on the trend toward expanding patent protection (genetically modified organisms, software, etc.), the authors of the Carnegie Mellon Survey remarked that “curiously enough, these changes in policy and managerial practice and perception have proceeded despite a limited understanding of the effect of patents – no less stronger patents – on R&D and, in turn, on technical advance.<sup>55</sup> Evidence free policy-making has only become starker in subsequent years.<sup>56</sup>

## Time, change, and the cracks in the balance

The paucity and ambiguity of the evidence for the costs and benefits of patenting is confining the balance to being a reassuring but empty form of speech. Furthermore, both as a figure and an instrument, the balance is inherently unsuited to assessing entities that change in time. It could perhaps work in the context of a judgment of fixed entities, but certainly not in one involving simulations and the assessment of future scenarios. It is not accidental that the first known association of the balance with justice in the Egyptian *Book of the Dead* deals with the judgment of a soul to determine whether it should be allowed to transition to the afterlife. This is, literally, a post-facto scenario where all change is frozen – forever. The actions of the deceased – the object of the judgment – cannot change anymore, nor will his future afterlife. But if time is irrelevant (or antithetical) to the idea of justice, it is central to the political economy of modern patent law and to the “Progress of Science and the useful Arts” that frames its legitimacy. The balancing that patents need to achieve involves future scenarios, not present or past ones.

First of all, starting with the patent itself, there is a well-known tension between the fact that the patent appears to be a fixed technical and legal object while in fact that image is only a snapshot of the baby patent at birth. In the twenty years of its life the patent will develop different embodiments (enabled by the doctrine of equivalents) and perhaps even different uses. As a result, both the costs and benefits of a patent are bound to change in ways that, I believe, escape the possibility of modeling them. But what also changes in time on a larger and longer-term scale is the very use of patents and, with that, the social costs and benefits of the patent system as a whole. Modern patents were introduced to ensure that inventors could have sufficient incentives to counter the “public goods” problem posed by intangible property. But it has been clear for some time that patents have developed many additional uses (sometime called strategic) that differ from their invention-incentivizing purposes. In 2000, the Carnegie Mellon Survey found that “firms patent for reasons that often extend beyond directly profiting from a patented innovation through either its commercialization or licensing”<sup>57</sup> – a pattern that, while

---

55. Cohen et al., “Protecting Their Intellectual Assets,” p.2 (note 33).

56. “Governmental emphasis on patent systems increased in the wake of impressive new findings from economic studies showing that patents played a surprisingly minor role in well-established corporations’ decisions to invest in research, development, and technological innovation,” Frederic Scherer, “The Political Economy of Patent Policy Reform in the United States,” *Journal of Telecommunication & High Technology Law* 7 (2009): 167–216, at 167–8.

57. Cohen et al., “Protecting Their Intellectual Assets,” p.14 (note 33).



traceable all the way back to the late nineteenth century, has become more conspicuous in recent years. According to the 2008 “Berkeley Patent Survey,”

Our results show that entrepreneurs have varied and subtle reasons for using the patent system, many of which diverge from the traditional theory that patents provide an “incentive to invent.” Somewhat surprisingly, startup executives report that patents generally provide weak incentives to conduct inventive activities. But while a substantial share of early-stage companies hold no patents, we also find that holding patents is more widespread than previously reported, with patenting patterns and motives being highly industry, technology, and context specific.<sup>58</sup>

For instance, some firms use patents as a signaling device, claiming them less to secure protection for innovation than to signal to potential skilled employees or investors that they are a competitive firm: “a patent can be [...] a badge, a branding, of a successful innovative high-tech company.”<sup>59</sup> Second, the 1980 Bayh–Dole Act that mandated universities receiving federal funding to patent their inventions was not justified by the argument that patents were needed to incentivize invention. Because universities routinely produce inventions (even in the absence of patent incentives) and usually give them to the public through publications, the Bayh–Dole Act construed patenting as a means to facilitate the commercialization of university-generated inventions (which is something rather different from inventive activity). Patents are also used both defensively and proactively in the so-called “patent portfolio races” to create leverage against competitors or with potential partners. (In that context, patents are not tools for *invention* but for *post-inventive* wars or collaborations *made possible and necessary by the widespread use of patents*). Another example is that of biotech companies and startups in other high-tech fields that routinely use patents not so much as an incentive for invention, but to create assets they can put on the table when negotiating venture capital funding, or as tools to enhance their valorization and thus gain better terms under which to be acquired by larger firms. The list could be easily extended, starting with the use of patents as infringement traps by non-practicing entities or “trolls” – uses that are utterly unrelated to incentives to invention.<sup>60</sup>

These uses of patents are doubly *post-inventive*. They are post-inventive in the literal sense that a firm deploys them not to secure incentives to invent, but to seek other business advantages after the invention has already taken place. More importantly, however, they are post-inventive in the sense that they exemplify the long-term emergence of new business ecologies built on – rather than simply incentivized by – the routine wide-scale deployment of patents by many inventors and firms. (We are seeing similar patent-informed changes in the ecology of academic technoscience as well.)<sup>61</sup> It might be worth thinking of the patent system as a Rheinberghian experimental system that, as it goes through its iterations within

58. Graham et al., “High Technology Entrepreneurs and the Patent System,” 1255 (note 31).

59. *Ibid.*, 1296.

60. Markus Reitzig, Joachim Henkel, and Christopher Heath, “On Sharks, Trolls, and their Patent Prey—Unrealistic Damage Awards and Firms’ Strategies of ‘Being Infringed,’” *Research Policy* 36 (2007): 134–54.

61. Nicolas Rasmussen, *Gene Jockeys: Life Science and the Rise of the Biotech Enterprise* (Baltimore: The Johns Hopkins University Press, 2014); Myles Jackson, *The Genealogy of a Gene* (Cambridge, Mass.: MIT Press, 2016).

a business environment, generates different new patent uses.<sup>62</sup> (Distinctly post-inventive uses of patents like the so-called “patent portfolio races” are obviously part of business strategies that would have been unthinkable prior to the routine and large-scale reliance on the patent system for incentivizing inventive activities.) Rather than critiquing these new uses as merely strategic, or as perversions of the original intent of the patent system, we should recognize that they are both *new effects and new uses of the operations of that very system* and that, in all likelihood, they will continue to proliferate. It is the use of patents that generates other kinds of uses of patents.

The generative character of this process is best seen in those cases – the Bayh–Dole Act being one of them – where policy justifications are offered for the new uses of patents. The university has always been producing inventions, which it occasionally patented but most often placed into the public domain through publications, thus turning them into unprotectable prior art for everybody to use and produce more innovation with.<sup>63</sup> This exemplifies a situation where the public goods problem has already been fully solved: inventions are produced and delivered to the public without needing the incentive provided by patents. But instead of seeing this as a success, the Bayh–Dole Act reconceptualized it as a problem. That the university patented few of its inventions was construed as a problem because, it was claimed, unless a firm can receive a temporary monopoly on the invention (an invention it could have found for *free* in scientific publications), it would not be willing to invest enough to turn it into a marketable product.<sup>64</sup> Patents thus came to be seen not as incentives to invention – the invention had already happened without them – but as an incentive to development and commercialization of an invention that would have become known and public anyway.

Setting aside the strangeness of public research funds metamorphosing into patents held by private entities, the justification of the use of patents to incentivize innovation is just a replay, with considerable displacement, of the original justification of patents as

---

62. Hans-Joerg Rheinberger, “Experimental Systems: Historiality, Narration, and Deconstruction,” in Mario Biagioli (ed.), *The Science Studies Reader* (New York: Routledge, 1999), pp. 141–429.

63. In the United States, university patenting goes back at least to the 1920s. Until well after WWII, it was typically managed not by the universities but by foundations connected to but legally separate from the university (as in the case of the Wisconsin Alumni Research Foundation), or by clearinghouse-style companies (like the Research Corporation). It was only in the 1970s that universities overcame their reluctance to become proactively engaged in patenting. The Bayh–Dole Act recognized and strengthened a trend already in place. On the history of university patenting in the United States see Sally Hughes, “Making Dollars out of DNA: The First Major Patent in Biotechnology and the Commercialization of Molecular Biology, 1974–1980,” *Isis* 92 (2001): 541–75; Rima Apple, “Patenting University Research: Harry Steenbock and the Wisconsin Alumni Research Foundation,” *Isis* 80 (1989): 375–94; Charles Weiner, “Patenting and Academic Research: Historical Case Studies,” *Science, Technology, & Human Values* 12 (1987): 50–62.

64. This argument surfaced much earlier than its eventual incorporation into the rationale of the Bayh–Dole Act. Mowery and Sampat have traced the various arguments for and against university patenting since the 1920s, showing that this specific argument was already deployed in an AAAS 1934 report. Davis Mowery and Bhaven N. Sampat, “University Patents and Patent Policy Debates in the USA, 1925–1980,” *Industrial & Corporate Change* 10 (2001): 781–814, at 783–5.

incentives for invention. In time, the patent has thus become disconnected from its initial goal, becoming a form of incentive that can be translated to other situations (e.g., from invention to commercialization) provided that the new scenarios can be represented as problems comparable to those that called for the introduction of the patent system. It is often said that an invention solves a problem we did not realize we had. The Bayh–Dole Act shows us that something similar can be said of patents: using patents makes us perceive problems we did not think we had – problems that may then be solved through new and different uses of patents.

This recursive expansion of the uses of patents through the redefinition of solutions as problems entails a parallel redefinition of social costs and benefits, which confirms yet again the exceptional difficulty of determining what should go on which plate of the balance. One would have said that the university's production and publication of inventions was precisely the kind of social benefit the framers envisaged the patent system to provide. That, however, was subsequently reconfigured as a social cost: taxpayers fund scientific research that ends up wastefully stagnating in publications rather than generating innovation, jobs, and wealth. The public becomes short-changed by receiving inventions they can freely use. Luckily, patents can turn it back into a benefit.

These new uses of patents are alien to the framers' conceptualization of the patent system and have no direct bearing on solving the fundamental public goods problem. The issue, however, is not whether this proliferation of new uses is good or bad, but that, together with the changes in the business ecology of which it is part, this proliferation undermines the possibility of assessing the balance that should be achieved to legitimize the very existence of the patent system. We are observing a redefinition of the problems and goals that patents are supposed to pursue, with what costs and benefits, and for whom. Modeling such a complex and changing system with a balance looks like trying to forecast the weather with an abacus.

## Ecological metrics, or the impossibility thereof

The short-term nature of the studies of the pros and cons of patenting are symptoms of their inability to tackle the long-term evolving scenarios that should be brought into balance, but they also reflect more mundane problems of quantification in general. As we have seen, the methodology of all the available studies involves counting the number of patents granted over a certain period as a key measure of innovation, or the number of citations they receive as an index of their value. Symmetrically, studies of the social costs of patenting have looked at differentials in article citation counts, or at the quantifiable output of questionnaires from both scientists and corporate informants. The significance of this kind of counting has been questioned on a variety of grounds, but it remains the standard approach given that there does not seem to be much else to count.<sup>65</sup>

65. On both the value and problems of patent data see Zvi Griliches, "Patent Statistics as Economic Indicators: A Survey, Part I," NBER Working Paper no. 3301, March 1990, at [www.nber.org/papers/w3301.pdf](http://www.nber.org/papers/w3301.pdf). Landes and Posner, *The Economic Structure of Intellectual Property Law*, pp.310–11 (note 5): "[C]itations to patents do not reveal whether an invention would have been made without the prospect of its being patented. Even assessments of the relative value of patents on the basis of citations are of limited reliability, especially if social rather than private

The inherent problems of quantification and evidence-gathering about the balance that patent law is deemed to achieve may be highlighted by going back to Lange's call for "environmental impact statements" and ask how such statements would look like in the case of patents or IP more generally. The first thing that stands out in Lange's environmental examples (about prairies, bison population, wetlands, etc.) is that one can actually measure things like heads of bison, hectares of prairie, acres of destroyed wetlands, and so on. The same applies to the commons, and to the sustainability model that Lange tries to import from them. One can measure the amount of water pumped out of the communal aquifer as well as the rate of its natural replenishment. Similarly, in principle one can track how many firs are cut or how many lobsters are caught in a certain area, and how long it will take to grow them back. Even when you move to a much larger scale, like the one involved in global warming, you can not only estimate the amount of CO<sub>2</sub> we are globally releasing in the atmosphere, but you can also estimate the temperature rise caused by that. Back on earth, when you build a water dam you can assess how the downstream water flow is going to be affected, what area is going to be submerged, and what are the species likely to be affected by that, whether they can migrate elsewhere or not, and so forth.

While such environmental accounting is bound to be both difficult and imprecise as each change is going to affect the ecology and thus trigger further changes and feedbacks, one can at least attempt some modeling because we are able to estimate what we are taking out or putting in, as well as what the basic processes are that may reconstitute the resources (firs re-growing, water percolating back into the aquifer, etc.), or harm them (as in the relation between CO<sub>2</sub> release and temperature increase). But we do not have the ability to do anything like that for intellectual property. We have found no way, so far, to develop the equivalent of a carbon footprint for patents. The cultural environmentalists have given us an analogy between the environment and the public domain that has been remarkably effective to reconceptualize it as a positive entity rather than the cemetery where intellectual property goes to die. Still, despite its remarkable political effectiveness, the analogy between the public domain and the environment has not enabled us to take the next step and turn that analogy into a workable model to assess the costs and benefits of IP to the public and the public domain. In sum, like the proponents of the patent system, the cultural environmentalists have invoked the balance but have not shown us how it works or whether it could ever work.

Part of the problem is that Lange and his followers have focused on the environmental harm caused by extractive, depletive activities (trapping lobster, killing bison, pumping water, drying wetlands, etc.). However, the costs that patenting causes to the public are only partially comparable to extractive activities, or to other kinds of physical interventions on the environment.<sup>66</sup> That is not only because of the so-called intangible nature of

---

value is the concern." For a more recent, and more hopeful, assessment, see Adam Jaffe and Gaetan de Rassenfossé, "Patent Citation Data in Social Science Research: Overview and Best Practice," *Journal of the Association for Information Science and Technology* 68 (2107), at: <http://onlinelibrary.wiley.com/doi/10.1002/asi.23731/pdf>.

66. I therefore find myself in disagreement with the assumptions behind Kitch's "prospect theory" of patents (Edmund Kitch, "The Nature and Function of the Patent System," *Journal of Law and Economics* 20 (1977): 265–90).

the resources involved. For instance, the way a patent prevents an invention from being publicly usable is qualitatively different from the extraction of natural resources from the public domain. In the case of patents, the ‘extraction’ is not as nearly as complete or permanent as that of, say, catching fish from the ocean. The patent does give the inventor exclusive rights to the use and sale of the invention, but the knowledge of the invention is immediately made public through the specification (the fish is both caught and still partially swimming, so to speak.) Then, when the patent expires twenty years later, the invention goes back into the public domain.<sup>67</sup> The fish, however, is caught once and for all and, sadly, does not go back into the ocean. Similarly, once you have developed a piece of land, it is difficult and very costly to bring it back to its original pre-developed state. However, as soon as you make patents or copyrighted works publicly available at the end of their term of protection, the damage is instantly undone. (More precisely, the damage is undone in the sense that the work as a whole becomes publicly available in its original form, though of course that does not undo the possible damage that its unavailability for 20 years or more had on the public cultural sphere.)

Second, water is water and lobster are lobster, one gallon or pound of them is like any other gallon or pound of them. Patents, instead, are not measured by the pound or by the number but by their specific features. Patents may be thought of as stock in the aggregate (as in a firm’s patent portfolio), but the value of each individual patent is rooted in the specificity of its claims and utility. Furthermore, the value of that patent (if indeed it will gain any) will become evident only over the length of its protection, in relation or competition with other patents. In sum, social costs and benefits depend on the specific life trajectories of those patents, whether they become important or remain marginal, whether they affect many people or few, whether they die without progeny or whether, instead, they spawn new fields of technology and business. The broad environmental analogy proposed by Lange and Boyle does not give us any obvious tool to model those dynamics and scenarios.

Third, the environmental analogy puts emphasis on damages in the form of pollution, not just extraction and depletion. Pollution, however, is hardly a problem with regard to intellectual property. IP does not literally pollute the public domain. Furthermore, in the case of IP, the harm to the public domain is time-related. That is, the harm stems less from how much text or music you copyright or how many inventions you patent than from how long you keep those texts and inventions unusable by other people, preventing them from developing further innovations. The social harm caused by IP protection is not comparable to spoiling a certain acreage of the cultural environment, but from limiting access to it for a certain number of years. Unfortunately, the fact that environmental notions of harm and remedies are not properly transferable to the cultural environment means that we do not know how to model and measure the impact of IP on ecologies of knowledge production.

## **A good balance is a tautological balance**

Surprisingly, there is a crucial balance at the roots of intellectual property law that does not suffer from the theoretical and empirical ailments I have discussed here. It is an

---

67. This is not completely accurate, though, because in a sense the patent does not go *back* into the public domain because it was never, strictly speaking, in it. The making of that invention depended on resources found in the public domain, but was not fully reducible to them.

exception, but one that confirms the pattern. It concerns a balance that works well because, while appearing to balance two different things, it does not in fact do so. This is the so-called “patent bargain,” the foundational contract between the inventor and the public, which legitimizes modern patents by distinguishing them from early modern privileges or monopolies.

A patent is a contract between the inventor and the public, by which the inventor, in consideration that the exclusive use of his invention is secured to him for a limited period of time, confers upon the public the knowledge of the invention during that period and an unrestricted right to use it after that period has expired [...]. The specification is the instrument in which the terms of these mutual considerations and promises are declared, and on its completeness and accuracy depends the validity and the value of the contract itself.<sup>68</sup>

The inventor gives the public the description of the invention in the patent application, and in return the government (on behalf of the public) grants the inventor a temporary monopoly on that same invention.

Theoretically, this is a self-calibrating balance: the more the inventor discloses to the public, the more the government commits to protect the inventor’s patent. Unlike all the balances we have seen so far, this one seems unable to go off kilter: the more you put on one plate, the more will automatically appear on the other. Even more remarkable is the fact that time and changing business ecologies will leave its performance unscathed. No matter how much the values or weights in the two pans will change during the life of the patent and beyond, the balance will keep them aligned. It is irrelevant whether the patent will end up transforming a whole industry or simply collect dust in a drawer. Also irrelevant is whether it will create hundreds of thousands of jobs and save countless lives or, instead, choke the further development of a technological field and harm the public by allowing the patentee to extract high prices for the products or services based on the monopoly created by that patent. The balance is not affected because the patent bargain is not about the social benefits and costs of the patent but about the contractual arrangement between the public and the inventor that defines what a patent is. Whatever happens after the grant of the patent does not affect the contractual balance.

This particular kind of balance does not weigh two different bodies but the same entity under two different names and semblances. What sits on each of the two plates is the invention itself. On one side is the invention that the inventor gives to the public, and on the other is the same invention that the public accepts to protect. Another way to put it is that invention, in the balance of the patent bargain, functions like mass in a normal balance. There are two different-looking things on the two plates, like apples and oranges, but the balance feels only their mass, which it can balance. Symmetrically, the balance of the patent bargain displays two different halves of the contract between the public and the inventor, but those two halves are just two different sets of actions about the same thing – the invention. On one plate there is the invention disclosed and on the other the invention protected. In sum, this is a coin with two faces camouflaged as a balance with

---

68. William Robinson, *The Law of Patents for Useful Inventions* (Boston: Little, Brown, and Co., 1890), Vol.II, p.70.



two pans. It works only because it is not a balance – like the balance of justice that balances only when it is empty.

## Conclusion: judgment out of balance

The discourse of balance is a comforting one for both the supporters and the critics of IP. They may not agree on what they take to be the appropriate balance between the costs and benefits of IP, but they believe that there is one. This “harmony of illusions” (to cite Ludwik Fleck)<sup>69</sup> is enough to make it look as if patent law stands on legitimate grounds (that is, that it is not a monopoly), while also providing the critics with a vocabulary in which to frame their activism – one that is aimed at establishing a socially just balance between the rights of the inventor and of the public. But, as we have seen, we do not have much to put on its plates, do not seem to agree about what should be put on them, and in any case the balance would not function even if we could load it up. This skepticism can be read back into Machlup’s summation that “If we did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one. But since we have had a patent system for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it.”<sup>70</sup>

What Machlup is describing here is an ecological dilemma: decisions about the public costs and benefits of the patents system have become internal to today’s patent-based business ecologies. If we had to decide now to install such ecology, the evidence would advise against it. But now that we have it already in place, abolishing the patent system would not simply remove a tool from the inventors’ and entrepreneurs’ kit but probably collapse the whole ecology that had developed from and with it. While it would not be irrational to call for the abolition of the patent system, we would be unable to gauge the consequences. For better or for worse, the patent system falls in the “too big to fail” category.

Still, it would be irresponsible to pretend that we know for sure that the patent system is worth having, and that it is justifiable (and just) based on its proven performance as an incentive to inventive activity. We know that, at best, we do not know that. And if we cannot trust the patent system as a whole (that is, if we cannot assume that it generally achieves the balance it is supposed to achieve), then a reasonable alternative would be to ask questions about the pros and cons of patents on an individual basis, with each application that is filed. This arrangement is what the first U.S. Patent Act envisaged in 1790 when it required a close examination of each application by a three-person committee (referred to as the “Commissioners for the Promotion of Useful Arts,” of which Jefferson was the leading member) with the authority to judge whether the invention was “sufficiently useful and important” to be granted a patent, or not. That practice was a development of the procedures typical of early modern patent examination, which could include the assessment, on an individual basis, of the pros and cons of the patent in the specific local jurisdiction in which it was applied for.<sup>71</sup>

69. Ludwik Fleck, *Genesis and Development of a Scientific Fact* (Chicago: University of Chicago Press, 1981), pp.27–8; 87–93.

70. Fritz Machlup, *An Economic Review of the Patent System* (note 11), p.80.

71. O’Mahoney, in Machlup, *An Economic Review of the Patent System*, p.IV (note 11).

The 1790 Patent Act lasted only a few years, largely because of the commissioners' inability to process the applications expeditiously, which created an unsustainable backlog. Instead of scaling up the system already in place, the reaction was to jettison technical review altogether and move to a virtually registration-only system. When examination was eventually reintroduced, it was kept limited to the formal features of the invention (patentable subject matter, novelty, nonobviousness, etc.) without considerations of technological quality or impact.

While it may seem strange to propose resurrecting that early experiment, there are explicit indications that a more "local" approach is far from inconceivable today. We now agree that the one-size-fits-all model of patent law has become obsolete, and that we need to adapt both law and policy to industry specificities. The considerations that may apply to the pharmaceutical industry do not apply to the software industry, and so on.<sup>72</sup> These well-known industry specificities reflect the different business ecologies that have evolved from a combination of technological and legal transformations – the patent system being a key one. It is the complexity and changing nature of these ecologies (changes that include the emergence of industry specificities) that, as I have argued, undermine the possibility of a balanced patent system as it was originally conceived. To acknowledge the need for a more industry-specific approach means acknowledging that no general balance can be achieved (or perhaps not even be conceptualized), and that therefore we need to move toward a more local and individualized approach to the assessment of the pros and cons of patents.<sup>73</sup>

There is no reason to present this as the same old balancing act now translated to a more specific or local industry level. We can admit that we are unable to predict the long-term effects of patents, but without that admission being seen to undermine the possibility of an informed discussion of the impact of specific patents. We can acknowledge the conflicts between inventors and public, and even admit that they might be incommensurable, or that the public is not one but many, and that they may change in the near future. We could turn each patent examination into a case study of social justice, on its specific merits. We can hold on to the idea that we need checks, but that they don't need to be associated with balances.

## Acknowledgements

An early version of this essay was written for the 2017 "Patents, Social Justice, and Public Responsibility" conference at the University of Michigan. I want to thank Shobita Parthasarathy

---

72. Dan Burk and Mark Lemley, *The Patent Crisis and How the Courts Can Solve It* (Chicago: University of Chicago Press, 2009).

73. In the early modern period, before the advent of liberal economies, the political authorities decided on a case-by-case basis whether a patent was potentially useful or deleterious to the local economy (Mario Biagioli, "Patent Republic," *Social Research* 73 (2006): 1129–1172). Following the collapse of controlled local economies and political absolutism, the decision about the benefits and costs of the patent (which had, until then, been both assessed by the sovereign and his/her officials as part of the application review process) went in two separate ways. The decision about the value of the patent was handed over to the free market, while that concerning its costs was nominally folded into the concept of balance. Both the cost and value of a patent, therefore, became forward-looking concepts.



for nudging me toward the topic, the conference participants for asking all sorts of good questions, and the two referees for helping me write something reasonable about it. Grazie mille a Francesco Lissoni.

**Funding**

The author(s) received no financial support for the research, authorship, and/or publication of this article.

**Conflict of interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Author biography**

Mario Biagioli is Distinguished Professor of Law, STS, and History at the University of California at Davis. He is interested in the intersection between intellectual property and the technosciences.