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The Inducement Standard of Patentability

ABSTRACT. In *Graham v. John Deere Co.*, the Supreme Court explained that patent law's nonobviousness doctrine is meant to restrict the award of patents to only "those inventions which would not be disclosed or devised but for the inducement of a patent." This Article argues that this inducement standard, largely ignored in practice, should serve as the doctrinal polestar. Such an approach would provide a solid economic foundation for the patentability standard and would align patent law with the many other fields of regulatory law that currently apply economic analysis in determining the scope and content of regulation. The Article also offers several refinements to the inducement standard and explains how the Patent and Trademark Office and courts could implement the inducement standard in an administrable way.

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The inherent problem was to develop some means of weeding out those inventions which would not be disclosed or devised but for the inducement of a patent.

— A unanimous Supreme Court in *Graham v. John Deere Co.*¹

INTRODUCTION

The quotation above is one of the most memorable and insightful lines from arguably the most important patent law case of the twentieth century: the Supreme Court’s 1966 decision in *Graham v. John Deere Co.*² *Graham*’s preeminent place in the patent canon is well justified, for it is the Supreme Court’s seminal opinion on a patent law doctrine—the “nonobviousness” requirement—that is typically introduced as “the most important of the basic patent requirements,”³ “central to determining patentability,”⁴ “the key to defining what is a patentable invention,”⁵ or simply “the ultimate condition of patentability.”⁶ The basic rule of nonobviousness is easy enough to recite: under 35 U.S.C. § 103, a patent may not be granted on an invention that “would have been obvious at the time the invention was made to a person having ordinary skill in the art.”⁷ But the apparent simplicity of the requirement belies the complexities and difficulties that have historically bedeviled the doctrine.⁸ The inducement standard, as articulated in *Graham*,

1. 383 U.S. 1, 11 (1966).

2. 383 U.S. 1.

3. ROBERT PATRICK MERGES & JOHN FITZGERALD DUFFY, *PATENT LAW AND POLICY: CASES AND MATERIALS* 643 (3d ed. 2007).

4. Michael J. Meurer & Katherine J. Strandburg, *Patent Carrots and Sticks: A Model of Nonobviousness*, 12 LEWIS & CLARK L. REV. 547, 548 (2008).

5. Alan L. Durham, *Patent Symmetry*, 87 B.U. L. REV. 969, 970 (2007).

6. This phrase comes from the title of *NONOBVIOUSNESS: THE ULTIMATE CONDITION OF PATENTABILITY* (John F. Witherspoon ed., 1980), a prominent collection of articles celebrating the twenty-fifth anniversary of the codification of the obviousness doctrine in 35 U.S.C. § 103 (2006). Other authors have since used the same phrase to describe the doctrine. See, e.g., Daralyn J. Durie & Mark A. Lemley, *A Realistic Approach to the Obviousness of Inventions*, 50 WM. & MARY L. REV. 989, 990 (2008).

7. 35 U.S.C. § 103(a).

8. See, e.g., Durham, *supra* note 5, at 971 (“Obviousness is a difficult issue to resolve. It requires one to imagine how a claimed invention might have looked to a different person . . . at a different time . . . and without resorting to hindsight based on knowledge of the claimed invention”); Rebecca S. Eisenberg, *Obvious to Whom? Evaluating Inventions from the*

appears to be vitally important to understanding the statutory nonobviousness requirement, for it offers a simple explanation for why society should deny patents on some innovations: if the innovation would be created and disclosed even without patent protection, denying a patent on the innovation costs society nothing (because the innovation would be developed anyway) and saves society from needlessly suffering the well-known negative consequences of patents, including the restriction on output caused by a patentee's exclusive rights and the administrative and litigation costs associated with running a patent system.

Yet despite its apparent promise as the theoretical basis for the most important patentability doctrine, *Graham's* inducement standard has achieved only a modicum of influence.⁹ Though frequently cited, the inducement standard is often relegated to a passing mention or a footnote in introducing the patentability standard.¹⁰ Some articles have devoted more extended attention to the inducement standard, but these too have generally highlighted

Perspective of PHOSITA, 19 BERKELEY TECH. L.J. 885, 887 (2004) (stating that “the implementation of [the nonobviousness] standard poses certain administrative challenges”); Gregory Mandel, *The Non-Obvious Problem: How the Indeterminate Nonobviousness Standard Produces Excessive Patent Grants*, 42 U.C. DAVIS L. REV. 57, 59 (2008) (explaining that the indeterminacy of the nonobviousness standard results in too many patent grants even though “[t]he nonobvious standard is not simply too low, but both too high and too low. It is indeterminate.”); Joshua McGuire, *Nonobviousness: Limitations on Evidentiary Support*, 18 BERKELEY TECH. L.J. 175, 175 (2003) (“To obtain a patent, one must have patentable subject matter that is useful, novel, nonobvious, and adequately described; however, the standard for a nonobvious invention is often difficult to apply.” (footnote omitted)).

9. Some commentators, meanwhile, have criticized *Graham* for failing to articulate a clear test. T.J. Chiang, for example, notes: “The opinion gave all the appearance of expecting a solution to appear out of thin air once the formula was followed. The lack of an articulable rule meant that determinations of obviousness took the appearance—and arguably the reality—of resting on judicial whim” Tun-Jen Chiang, *A Cost-Benefit Approach to Patent Obviousness*, 82 ST. JOHN'S L. REV. 39, 49 (2008) (footnote omitted).
10. For example, Rebecca Eisenberg begins the analysis in a recent article by noting: “In theory, [the nonobviousness] standard prevents the issuance of patents on inventions that, although new, are so close to the prior art that they are likely to be forthcoming even without the incentive of a patent.” Rebecca S. Eisenberg, *Pharma's Nonobvious Problem*, 12 LEWIS & CLARK L. REV. 375, 381 (2008). The footnote to that sentence quotes *Graham's* articulation of the inducement standard, *id.* at 381 n.13, but inducement theory is never again mentioned in the remainder of the article. Similarly, Gregory Mandel quotes *Graham's* inducement standard in a footnote. See Mandel, *supra* note 8, at 85 n.121. Yet Mandel describes the sentence from *Graham* as “dicta” and concludes that the *Graham* Court did not hold “that this is what the statutory nonobviousness standard actually measures.” *Id.*

the difficulties in using the standard to decide cases or to shape legal doctrine.¹¹ For example, Ed Kitch's classic verdict on *Graham's* inducement standard emphasized that the nonobviousness requirement, as articulated by the courts, provides only an "awkward" tool "to sort out those innovations that would not be developed absent a patent system," with the "focus" of the legal doctrine always being on other issues.¹² Kitch's view has become the consensus. Thus, in a widely cited and influential 2003 report, the Federal Trade Commission summarized the testimony of numerous legal and economics scholars as demonstrating that, even though the inducement standard represents "the right way to assess whether to grant a patent" from a "theoretical perspective," the standard is not "administrable," so "the more manageable standards of the patent statute have evolved to serve as the means by which to measure when to grant a patent."¹³

In some ways, we agree with these prior assessments of the inducement standard. There is a certain awkwardness in the relationship between the inducement standard and the nonobviousness requirement, at least as that requirement has previously been articulated by the courts. Moreover, the Supreme Court in *Graham* did not provide a rigorous foundation for deriving the inducement standard from the statutory language. The absence of such a legal foundation may explain why courts and the Patent and Trademark Office (PTO) have typically avoided looking to the inducement standard for guidance in interpreting and applying the statutory nonobviousness requirement. The one exception, an insightful but ultimately flawed panel opinion by Judge Posner, relied on the inducement standard to invalidate a patent but nevertheless failed to identify any administrable test or metrics for applying the inducement standard to the specific facts of that case or other cases.¹⁴ Posner's

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11. Glynn Lunney considers the inducement standard in his treatment of obviousness doctrine, but in his view the lack of "empirical evidence [for] determining the point at which a patent becomes necessary to induce desirable invention" is a stumbling block to using the inducement standard more extensively in crafting patentability doctrine. Glynn S. Lunney, Jr., *E-Obviousness*, 7 MICH. TELECOMM. & TECH. L. REV. 363, 416 (2001). Similarly, Samuel Oddi has provided a treatment of inducement theory. A. Samuel Oddi, *Un-Unified Economic Theories of Patents: The Not-Quite-Holy Grail*, 71 NOTRE DAME L. REV. 267, 277-81 (1996). But he views the theory as merely one of several competing theories of the patent system, see *id.* at 268-71, and he does not attempt to refine the obviousness doctrine to conform to an inducement standard.
 12. Edmund W. Kitch, *Graham v. John Deere Co.: New Standards for Patents*, 1966 SUP. CT. REV. 293, 301.
 13. FED. TRADE COMM'N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY ch. 1, at 11 (2003).
 14. See *infra* notes 112-135 and accompanying text.

panel opinion was vacated en banc,¹⁵ and that history has perhaps cemented the notions that the inducement standard conflicts with the statutory obviousness standard, is antipatent, or is simply too difficult to apply in actual cases.

This Article aspires to show those notions to be wrong and to revitalize the inducement standard as the touchstone for understanding and refining the obviousness doctrine. The result should be more coherent, defensible, and predictable decisionmaking than is possible either under the current doctrine or under Judge Posner's treatment, which missed important implications of the inducement standard.

There are two motivations for undertaking this project. First, the time is right. In its 2007 decision *KSR International Co. v. Teleflex, Inc.*,¹⁶ the Supreme Court overturned a quarter-century-old test for nonobviousness that the nation's expert appellate court for patent law, the Court of Appeals for the Federal Circuit, had meticulously constructed. The *KSR* decision has precipitated a vibrant debate among scholars seeking to help the courts rebuild a pragmatic obviousness doctrine that yields predictable answers and is more theoretically sound than the Federal Circuit doctrine rejected in *KSR*.¹⁷ That reconstruction project can have little hope of enduring success without

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15. See *Roberts v. Sears, Roebuck & Co.*, 697 F.2d 796 (7th Cir.), *vacated en banc*, 723 F.2d 1324, 1329 (7th Cir. 1983).
 16. 550 U.S. 398 (2007). The Court rejected the Federal Circuit's test as excessively rigid and formalistic. *Id.* at 419. The Supreme Court explained that "familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle," precluding bright-line tests. *Id.* at 420.
 17. See, e.g., Durie & Lemley, *supra* note 6, at 998 (arguing for a more realistic inquiry into obviousness, and noting that "[i]n *KSR*, the Supreme Court ostensibly made the obviousness inquiry more 'flexible' and pragmatic"); Eisenberg, *supra* note 10 (analyzing the effect of *KSR* on the application of the nonobvious standard to pharmaceutical patents); Jeanne C. Fromer, *The Layers of Obviousness in Patent Law*, 22 HARV. J.L. & TECH. 75, 76 (2008) (discussing the proper object of the nonobviousness inquiry and stating that "[d]espite this overarching purpose [of encouraging innovation] highlighted in *KSR*, neither courts nor scholars have analyzed or settled on the obviousness inquiry's object, that is, the thing which must be nonobvious"); Meurer & Strandburg, *supra* note 4, at 548, 551 (measuring the effect of the nonobvious standard on the "choice of research projects" and stating that "[t]he *KSR* decision clears the way for new thinking about the obviousness issue, which, despite its importance, is surprisingly under-theorized"); Joseph Scott Miller, *Remixing Obviousness*, 16 TEX. INTELL. PROP. L.J. 237, 240 (2008) (discussing the impact of *KSR* on the concept of the person having ordinary skill in the art and advancing a "framework for determining whether a combination claim is nonobvious"); Joshua D. Sarnoff, Bilcare, *KSR*, *Presumptions of Validity, Preliminary Relief, and Obviousness in Patent Law*, 25 CARDOZO ARTS & ENT. L.J. 995, 1036 (2008) ("Whatever the legal or factual status of the obviousness inquiry, *KSR* has enormous importance as it has clearly raised the bar for determining when inventions are non-obvious and thus patentable.").

reexamining and reevaluating the ultimate goal of the nonobviousness requirement.

A second and more important motivation is the promise of the inducement standard in providing significant insights into some of the most difficult theoretical and practical problems in the field. Economic analysis of patent law frequently begins with the assertion that patents present a social tradeoff between providing incentives for innovation at the expense of accepting the deadweight loss associated with monopoly-like exclusive rights.¹⁸ And even beyond the law-and-economics literature, legal scholars often frame intellectual property law generally and patent law in particular as presenting a conflict between the public and private domains—a choice between openness and exclusivity.¹⁹ If, however, the law follows *Graham*'s inducement standard, such tradeoffs and conflicts do not necessarily exist.

Under a rigorously enforced inducement standard, patents would cover only those innovations that otherwise would not be created or disclosed—in

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18. See, e.g., WILLIAM D. NORDHAUS, *INVENTION, GROWTH, AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE* 76 (1969) (creating a model for calculating optimal patent term by balancing increased incentives for innovation against greater deadweight loss); Richard Gilbert & Carl Shapiro, *Optimal Patent Length and Breadth*, 21 RAND J. ECON. 106, 106 (1990) (referring to “the conventional analysis of optimal patent length, based on the tradeoff between the incentives for innovation and the extent of static monopoly deadweight loss”).
19. See, e.g., James Boyle, *The Second Enclosure Movement and the Construction of the Public Domain*, 66 LAW & CONTEMP. PROBS., Winter-Spring 2003, at 33, 38 (describing the “limits to intellectual property rights” as the “antierosion walls around the public domain” and more generally arguing that expansions of intellectual property rights erode the public domain); Niva Elkin-Koren, *What Contracts Cannot Do: The Limits of Private Ordering in Facilitating a Creative Commons*, 74 FORDHAM L. REV. 375, 375 (2005) (noting the effect of the expansion of intellectual property rights on the contraction of the public domain); Christine D. Galbraith, *A Panoptic Approach to Information Policy: Utilizing a More Balanced Theory of Property in Order To Ensure the Existence of a Prodigious Public Domain*, 15 J. INTELL. PROP. L. 1, 4 (2007) (advocating for a more accessible public domain because “[u]nfortunately, the public domain appears to be diminishing as the recent trend in formulating information policy is to utilize an organizing concept of private property ownership”); Pamela Samuelson, *Enriching Discourse on Public Domains*, 55 DUKE L.J. 783, 791 (2006) (acknowledging the tension between intellectual property rights and protecting the public domain and quoting *International News Service v. Associated Press*, 248 U.S. 215, 250 (1918) (Brandeis, J., dissenting) (“The general rule of law is, that the noblest of human productions—knowledge, truths ascertained, conceptions, and ideas—become, after voluntary communication to others, free as the air to common use.”)); John R. Therien, *Exorcising the Specter of a “Pay-Per-Use” Society: Toward Preserving Fair Use and the Public Domain in the Digital Age*, 16 BERKELEY TECH. L.J. 979, 1035 (2001) (arguing that “the judiciary must protect the public domain and fair use, whether impinged upon by technology-derived statutory rights or the technology itself”).

other words, patents would cover only innovations that, without the patent system, would not have been in the public domain. The patent system would then have only positive effects on the public domain: patents would cover only inventions that would otherwise not be in the public domain and, when the patents expire, the inventions would enter into and enrich the public domain. Similarly, the apparent deadweight losses created by patent rights would be an illusion because, if patent rights had not been available, the invention would not have been available from competing firms but instead would have been either unavailable or covered by trade secrecy. As we will show in this Article, the optimal implementation of the inducement standard may not achieve such a Panglossian resolution because, at least in some circumstances, patents should be allowed even if they merely induce earlier innovation. Thus, the analysis suggested by the inducement standard helps to identify more clearly the precise economic tradeoff at issue: patents produce earlier innovation but at the cost of higher prices and associated deadweight loss in a later period (when the invention would have existed even without the inducement of the patent). This point highlights another deep theoretical strength of the inducement standard, for it holds out the hope of grounding patentability decisions in a more rigorous economic framework and thereby bringing patent law closer to the vast body of modern regulatory law that commonly uses economic analysis in making specific decisions about the scope and extent of regulation.

The Article's rehabilitation of the inducement standard begins, in Part I, with an investigation of doctrinal difficulties associated with *Graham's* inducement standard. As Professor Kitch noted over forty years ago, the nonobviousness requirement seems at first to be an awkward way to implement an inducement standard. We agree that perhaps one natural interpretation of the statutory text points toward a cognitive definition of nonobviousness that focuses on whether individuals have epistemic awareness of technological solutions to problems. In embracing the inducement standard as the ultimate theory underlying nonobviousness, the *Graham* Court embraced an economic definition of nonobviousness and implicitly rejected a cognitive approach in interpreting the statute. The Court, however, failed to provide a sufficient legal justification for that interpretation, and that failure has almost certainly made courts and lawyers wary of placing too much reliance on the theoretical standard. Yet establishing a legal justification for the inducement standard is not so difficult. The statute itself sets the obviousness standard by reference to a highly fictional concept, the "person having ordinary skill in the art."²⁰ Defining that fictional person's abilities by reference to

20. 35 U.S.C. § 103(a) (2006).

economic incentives rather than technological cognition is no more radical than the now-familiar use of economics to define the behavior of the fictional reasonable person in tort law.²¹

The awkwardness of the inducement standard is, however, only partially remedied by the development of a more rigorous legal basis justifying the use of the standard in patentability determinations. Part II of the Article introduces ambiguities, puzzles, and other difficulties associated with the inducement standard. Because the inducement standard has not been taken seriously in the past, these ambiguities and difficulties have not been resolved. Our analysis leads to three necessary clarifications of *Graham's* inducement standard.

First, *Graham's* articulation of the inducement standard may be fairly criticized for treating a fundamentally dynamic issue—invention—as if it were static, with no time frame specified or implicit. *Graham's* inducement standard asks which inventions would be devised and disclosed even without the inducement of a patent, but it is silent on the crucial question: devised and disclosed by when? Even with no patent system, it is hard to imagine that many inventions would remain undevised and undisclosed forever. Thus, if the *Graham* inducement standard were interpreted as trying to identify “those inventions which would not [ever] be disclosed or devised but for the inducement of a patent,”²² then almost nothing would be patentable. On the other hand, if the inducement standard were interpreted as trying to identify “those inventions which would not [immediately] be disclosed or devised but for the inducement of a patent,”²³ almost everything would be patentable because patent law presumably provides at least marginal incentives for inventing earlier. Both extremes must be wrong. We show that *Graham's* inducement standard is best interpreted as requiring patents to cover only those inventions that, but for the inducement of a patent, would not have been disclosed or devised for a substantial period of time. Our reformulation produces a dynamic inducement standard, which is consistent with the growing body of literature that views the patent system as attempting not so much to increase but to accelerate invention.

A second insight relies upon an important feature of the patent system: competition. The modern patent system does not grant monopolies to industry participants that the sovereign happens to favor. Rather, patents are awarded competitively, and the competition to obtain patents has important implications for the practical enforcement of the patentability standard. Our

21. See, e.g., *United States v. Carroll Towing Co.*, 159 F.2d 169 (2d Cir. 1947).

22. *Graham v. John Deere Co.*, 383 U.S. 1, 11 (1966).

23. *Id.*

dynamic adjustment to the inducement standard introduces the concept of a “substantial period of time,” which naturally leads to the question of just how substantial a time period is necessary. Yet the competitive structure of the patent system makes the answer to that question less important than it first seems. The strong incentives of the patent system, coupled with the competition to obtain patents, should substantially accelerate the time of innovation, often by a period longer than the patent term itself, except in certain specific circumstances—the circumstances that make a patent-motivated innovator insignificantly better (that is, insignificantly earlier) than an innovator not motivated by the patent system. Those circumstances can serve as proxies for the inducement standard so that, by looking for such circumstances, government officials and judges can identify inventions not induced by the patent system without invoking any complex models of technological acceleration. These circumstances include a rapid decline in the cost of innovation, for example, because of the development of a technology that is an input into the new technology, or a positive demand shock shortly before invention, especially where multiple firms respond to the shock by developing the technology and even more so if some of those firms do not appear to be patent-motivated.

A third and final clarification to *Graham*'s inducement standard resolves the ambiguity in the concept of “invention.” Once it is recognized that the inducement standard must be interpreted dynamically—so that the inquiry is whether the inducement of the patent accelerated the arrival of the invention—then a crucial question becomes: what precisely must be accelerated, the conception of an invention or its practical, commercial implementation? Our conclusion is that *Graham*'s standard should be interpreted as requiring the inducement of an earlier arrival of the commercialized invention, not merely the “invention” in theory or on paper in a patent disclosure. A contrary approach would induce what we call “speculative patents”—patents that describe possible future applications of embryonic technologies. Such speculative patents, if they were to be allowed, might have a high option value—they would be valuable if technological development takes a particular course. But if the patents do little or nothing to advance the actual arrival of new technology in practical terms, then they would have little or no social value.

This third clarification to the inducement standard provides insight into what has so far been a muddled debate about the meaning and desirability of so-called patent trolls. The term “patent troll” has been generally, if somewhat loosely, defined in the literature as a “nonpracticing entity,” an entity that has

never commercialized or “practiced” its patented technology.²⁴ Such nonpracticing entities have generated enormous controversy in recent years and, as the label “troll” suggests, some patent practitioners have a visceral sense that, at least in some circumstances, such nonpracticing entities stand in the way of true innovators. But under orthodox patent doctrine and theory, it should not matter whether an entity practices a patent, because the quid pro quo of the patent is said to encompass merely the disclosure in the patent document. Our approach to the *Graham* inducement standard shows why it can matter whether an entity is practicing its invention: while a nonpracticing patentee might accelerate the actual practice of an invention, it is difficult to believe that has happened if other parties have independently invented and commercialized the technology without even planning to seek patent protection. Such circumstances would seem to be powerful evidence that the inducement of the patent was unnecessary to generate the invention and thus that the patent may be invalid under the inducement standard.

While Parts I and II are devoted to resolving the previously perceived legal and theoretical awkwardness of the inducement standard, Part III focuses on the other major criticism of the standard—that it is unadministrable. Many doctrines of patent law can be subjected to the simplistic objection that they lack mathematical precision, and prior approaches to the nonobviousness standard have been especially vulnerable to such attacks. A reinterpreted inducement standard need not demonstrate perfection. It can be an administrative success if it is even just a bit better than current doctrine as a helpful theoretical and pragmatic guide for applying the obviousness doctrine. We believe that the inducement standard easily satisfies that test. As a theoretical matter, the inducement standard provides a sound basis for interpreting “the person having ordinary skill in the art” not only as a person possessing technological knowledge but also as someone who is responsive to both economic incentives and economic limitations. Those economic incentives and limitations not only help to answer the previously intractable question of how obvious something must be to be obvious under the statute; they also help to unify patent law with bodies of regulatory law as diverse as common law torts, antitrust law, and modern federal administrative law. Beyond its

24. Peter Detkin, former assistant general counsel of Intel, claims to have created this term in 2001 while describing companies that do not create patents but rather buy them and then demand unusually high license fees by threatening costly litigation in the alternative. See Peter N. Detkin, *Leveling the Patent Playing Field*, 6 J. MARSHALL REV. INTELL. PROP. L. 636, 636 (2007). The broadest definition describes a patent troll as an entity that extracts profits by offering a target entity an option of purchasing a license or facing litigation. See Thomas S. Kim & Michael D. Stein, *Patent Value: Increased Interest Extends Beyond ‘Trolls,’* LEGAL INTELLIGENCER, May 23, 2005, at IP3.

theoretical successes, the inducement standard can also be a practical success. For example, it provides concrete guidance for how the nonobviousness standard should apply in fields like software, in which the costs of achieving any particular innovation may fall over time²⁵ and mechanisms other than patents (such as copyright protection) are likely to provide very significant inducements for innovation. The inducement standard suggests that patent examiners and judges should be especially vigilant in enforcing the nonobvious requirement in such fields because, even without the inducement of patents, many innovations would have been produced at only slightly later times.

Any disagreement about the specifics of our interpretation of the inducement standard should not obscure the overarching project. *Graham's* inducement standard provides an intuitively simple and powerful framework to justify granting patents for some innovations and denying patents for others. If *Graham's* articulation of the inducement standard is not perfect, it is nonetheless sufficiently meritorious and prominent to be worth saving. Our reinterpretation of the inducement standard merely ties it to three fundamental features of the patent system: it is dynamic, pragmatic, and competitive. The first two of those features are evident in the constitutional goal of the patent system: to "promote the Progress of . . . useful Arts."²⁶ "Progress" reminds us that invention is dynamic and that producing invention earlier in time is a central objective of the system. The constitutional reference to the "useful Arts" makes clear that the specific form of progress we should care about lies in the practical realm. Finally, although patents reduce short-term competition to lower prices, they foster long-term competition among innovators to find and develop tomorrow's technology.

25. One input for generating software innovation is almost certainly computing power, as experiments in software likely need to be repeatedly tested on fast computers. The cost of computing power has been dramatically falling ever since the "Moore's Law" prediction decades ago, when Moore noted that the number of transistors that can be placed on an integrated circuit had doubled every year from 1959 to 1965 and predicted that the trend would continue for at least ten years. Gordon E. Moore, *Cramming More Components onto Integrated Circuits*, *ELECTRONICS*, Apr. 19, 1965, at 114, 115-16. His prediction has proved so far to be accurate, so much so that the law is now used in the semiconductor industry to guide long-term planning and set targets for research and development. See Harro van Lent & Arie Rip, *Expectations in Technological Developments: An Example of Prospective Structures To Be Filled in by Agency*, in *GETTING NEW TECHNOLOGIES TOGETHER* 203, 206-07 (Cornelis Disco & Barend van der Meulen eds., 1998).

26. U.S. CONST. art I, § 8, cl. 8.

I. REHABILITATING THE INDUCEMENT STANDARD: A DOCTRINAL FOUNDATION

It may seem exceptionally odd to begin with a doctrinal justification of a standard already supported by Supreme Court precedent. Yet any candid assessment must acknowledge that, despite its endorsement by the Supreme Court in 1966, the inducement standard has not shaped subsequent doctrinal development of the patentability standard. A reason for this startling absence of influence is that in neither *Graham* nor in subsequent cases has the Supreme Court attempted either to reconcile the inducement standard with the statutory text or to provide a general theoretical or doctrinal foundation for the inducement standard. Thus, the inducement standard has been viewed as a theoretical tangent in the *Graham* opinion, or perhaps even as an unhelpful distraction from the statutory inquiry.

The statutory text must be the starting point for any attempt to supply the inducement standard with a doctrinal foundation. As will be discussed in Section I.A, that text might seem at first glance to point toward a cognitive test of obviousness. Yet a cognitive approach to the statutory nonobviousness requirement raises numerous questions while offering little or no guidance for answering those questions. Section I.B then compares the inducement standard and the statutory text in more detail and finds that the most important features of the inducement standard are easily harmonized with the statutory text and structure. Section I.C examines the inducement standard in light of general regulatory theory and practice. Doctrine outside patent law justifies using an economic approach to interpret legal provisions, and the inducement standard can serve as the guide for an economic approach to obviousness. Finally, Section I.D analyzes three additional nuances of the inducement standard.

A. *The Difficulties with a Cognitive Approach*

Section 103(a) of the Patent Act provides the statutory foundation for the obviousness doctrine:

A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said

subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.²⁷

The word “obvious” is consistent with a cognitive approach, as a standard definition of the word is “[e]asily discovered, seen, or understood,”²⁸ and the last of these in particular focuses on the mental process of understanding or cognition.²⁹ Perhaps because the word “obvious” names the statutory doctrine, courts and commentators have tended to assume, implicitly or explicitly,³⁰ that the doctrine focuses on the degree of cognitive difficulty in conceiving the invention.

A purely cognitive approach to applying the statutory standard runs into immediate difficulty when the standard is read in its entirety, for obviousness is tested by reference to what would have been obvious not to any actual person, but to “a person having ordinary skill in the art”³¹—abbreviated typically, if inelegantly, as “PHOSITA.” As discussed below, the courts have constructed this person with attributes acknowledged to be highly fictional, and those fictional attributes make it difficult or impossible to gain any real intuition as to the cognitive processes of the mythical PHOSITA. That stumbling block is only the beginning of the problems for a cognitive approach.

27. 35 U.S.C. § 103(a) (2006).

28. WEBSTER'S NEW INTERNATIONAL DICTIONARY 1683 (2d ed. 1957). The word derives from the Latin prefix *ob-* (meaning “in the way of” or “on”) and the Latin word *via* (“street”). The word “ob-via” could be accurately translated as “lying in the street.”

29. The words “easily discovered,” meanwhile, are consistent with an economic approach. See *infra* text following note 76.

30. See, e.g., *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (focusing on “the understandings and knowledge of persons having ordinary skill in the art”); Colleen M. Seifert, *Now Why Didn't I Think of That? The Cognitive Processes That Create the Obvious*, 12 LEWIS & CLARK L. REV. 489 (2008) (offering a psychological critique of the courts' approaches to nonobviousness but on the assumption that nonobviousness is an epistemic phenomenon); Dorothy Whelan, Note, *A Critique of the Use of Secondary Considerations in Applying the Section 103 Nonobviousness Test for Patentability*, 28 B.C. L. REV. 357, 381 (1987) (suggesting that the purpose of secondary considerations “is to ascertain the state of mind of a hypothetical worker having ordinary skill”).

31. 35 U.S.C. § 103(a).

1. *The Imaginary Person of Extraordinary Knowledge and Ordinary Creativity*

The courts have rejected the proposition that the construct of a “person having ordinary skill in the art” should be defined by reference to the actual or average abilities of real individuals. In *Kimberly-Clark Corp. v. Johnson & Johnson*³²—a decision that the Federal Circuit handed down only two years after its creation—Judge Rich emphasized that this person was a “hypothetical person” and “an imaginary being” and forthrightly acknowledged that “the courts have always applied a standard based on an imaginary worker of their own devising.”³³ The Federal Circuit has since held that whatever an actual expert “did or did not *personally* realize at the time based on his actual knowledge is irrelevant” to applying the statutory nonobviousness standard because the “relevant inquiry” is always directed toward “what a hypothetical ordinarily skilled artisan would have gleaned from [the prior art].”³⁴ Furthermore, the court has repeatedly recognized that this “legal construct” of the “hypothetical person”³⁵—this “ghost”³⁶—“is akin to the ‘reasonable person’ used as a reference in negligence determinations.”³⁷

The reference to the “reasonable person” of tort law is an important signal. At least one school of thought during the last century—one might even say the dominant school—has viewed the “reasonable” person as different from the “average” person.³⁸ The reasonable person in tort is instead an “ideal creature” whose behavior is controlled “not [by] what *is*, but [by] *what ought to be*.”³⁹ Lon Fuller and William Perdue long ago recognized that reasonable person tests have “an element of circularity” and are “subject to manipulation by the

32. 745 F.2d 1437 (Fed. Cir. 1984).

33. *Id.* at 1454.

34. *Amazon.com, Inc. v. Barnesandnoble.com, Inc.*, 239 F.3d 1343, 1364 (Fed. Cir. 2001).

35. *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998).

36. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1566 (Fed. Cir. 1987).

37. *Rouffet*, 149 F.3d at 1357; *see also Panduit*, 810 F.2d at 1566 (noting that, in applying the obviousness test, “the decisionmaker confronts a ghost, i.e., ‘a person having ordinary skill in the art,’ not unlike the ‘reasonable man’ and other ghosts in the law”).

38. Francis H. Bohlen, *Mixed Questions of Law and Fact*, 72 U. PA. L. REV. 111, 114 (1924) (“[T]he ‘reasonable man’ is not the average man.”).

39. *Id.* at 113-14; *see also* W. PAGE KEETON ET AL., PROSSER AND KEETON ON TORTS 173-75 (5th ed. 1984) (emphasizing that the reasonable person is described by the courts as a “community ideal of reasonable behavior” and not as any actual person who might very well do unreasonable things from time to time).

simple device of defining the characteristics of the hypothetical man.”⁴⁰ This circularity can be eliminated only with an appropriate normative foundation, such as economics.⁴¹

Without such a framework, the concept of a “person having ordinary skill” is similarly question-begging. The cognitive approach does not provide a normative foundation, let alone a clear doctrinal test, for determining what constitutes the level of “ordinary skill.” It would be circular to define “ordinary skill” by reference to inventors, because the statute defines invention by reference to ordinary skill.⁴² The Federal Circuit has held that “[i]nventors, as a class, according to the concepts underlying the Constitution and the statutes that have created the patent system, possess something—call it what you will—which sets them apart from the workers of *ordinary skill*.”⁴³ This follows as a matter of definition, but if we cannot get a handle on or even a name for this “something,” the law will inevitably reflect a series of ad hoc and ungrounded policy judgments.

In the absence of a compelling normative framework, the courts have defined the person of *ordinary skill* to be a rather *extraordinary* creature, an idiot savant with extraordinary knowledge and virtually no creativity. The mind of this hypothetical person comes equipped with a complete and thorough knowledge of all legally pertinent prior art, far more knowledge than could be possessed by any average or actual researcher.⁴⁴ Thus, the hypothetical person, as constructed by the courts, is deemed to know about pieces of prior art that are not only extremely difficult to find—for example, a single copy of a doctoral

40. L.L. Fuller & William R. Perdue, Jr., *The Reliance Interest in Contract Damages* (pt. 1), 46 YALE L.J. 52, 85 (1936). For recognition of similar circularity problems in other areas, see Orin S. Kerr, *Four Models of Fourth Amendment Protection*, 60 STAN. L. REV. 503, 511 n.34 (2007), which identifies circularity in the Fourth Amendment’s “reasonable” expectation of privacy; and James Weinstein, *The Federal Common Law Origins of Judicial Jurisdiction: Implications for Modern Doctrine*, 90 VA. L. REV. 169, 273 (2004), noting circularity in the test of *World-Wide Volkswagen Corp. v. Woodson*, 444 U.S. 286, 297 (1980), which makes a court’s jurisdiction turn on whether defendants could “reasonably anticipate being haled into court there.”

41. That foundation in turn allows for critique of the test announced. See, e.g., Allan M. Feldman & Jeonghyun Kim, *The Hand Rule and United States v. Carroll Towing Co. Reconsidered*, 7 AM. L. & ECON. REV. 523 (2005) (identifying inefficiencies in Hand’s formulation).

42. 35 U.S.C. § 103 (2006) (referring to “a person having ordinary skill in the art”).

43. *Standard Oil Co. v. Am. Cyanamid Co.*, 774 F.2d 448, 454 (Fed. Cir. 1985).

44. See, e.g., MERGES & DUFFY, *supra* note 3, at 762-63 (recognizing that, in degree of knowledge, the person having ordinary skill is a “superperson” in the art).

dissertation in a library of a foreign country,⁴⁵ an entry in a commercial catalogue circulated overseas,⁴⁶ or a few uses of an unpublished process somewhere inside the United States⁴⁷—but even impossible to find—for example, patent specifications still being held in secret by the Patent Office,⁴⁸ and inventions still held in secret by other inventors.⁴⁹ Meanwhile, the Federal Circuit at one time described the person of ordinary skill as someone “who thinks along the line of conventional wisdom in the art and is not one who undertakes to innovate.”⁵⁰

Constructing the person of ordinary skill in this way may have seemed the most straightforward path to making the cognitive test administrable. A court could perhaps imagine the logical processes of a well-read robot and hold innovations obvious only where the prior art “connect[ed] the dots . . . very, very clearly.”⁵¹ That case law, however, did not survive the Supreme Court’s decision in *KSR International Co. v. Teleflex, Inc.*, which stated that “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.”⁵² Whatever administrability benefit the courts once derived from their textually implausible construction of “ordinary” is thus lost today. The cognitive approach provides no guide for determining what constitutes “ordinary creativity.” Even if creativity could be measured by something like IQ, the cognitive approach provides no basis for determining, even at a conceptual level, what an appropriate cutoff would be.

It might seem that the cognitive approach might be salvageable if the courts used real people as a reference point.⁵³ But this would introduce new

45. See *In re Hall*, 781 F.2d 897, 898 (Fed. Cir. 1986).

46. See 35 U.S.C. § 102(a).

47. See *id.*

48. See *Hazeltine Research, Inc. v. Brenner*, 382 U.S. 252, 255-56 (1965) (holding that § 102(e) patent applications are a source of prior art for purposes of § 103).

49. See *In re Bass*, 474 F.2d 1276, 1283 (C.C.P.A. 1973) (counting as within the prior art an earlier invention as long as that invention was not abandoned, suppressed, or concealed, even if the invention was not available to the public at the relevant time).

50. *Standard Oil Co. v. Am. Cyanamid Co.*, 774 F.2d 448, 454 (Fed. Cir. 1985).

51. FED. TRADE COMM’N, *supra* note 13, ch. 4, at 11 (recounting the 2002 testimony of Stephen Kunin, Deputy Commissioner for Patent Examination Policy, U.S. Patent and Trademark Office, and describing his understanding of the Federal Circuit’s case law on obviousness).

52. 550 U.S. 398, 421 (2007).

53. Courts sometimes use real people to help define the level of ordinary skill but often in passing. See *infra* note 237 and accompanying text. Perhaps this is because of the courts’ insistence that the construct is hypothetical or perhaps because the cognitive approach offers no good way of answering the question.

potential for arbitrariness. Skill exists on a continuum, ranging from the student just learning a subject to the world's foremost expert. Ordinary skill is somewhere in the middle. We cannot define ordinary skill as the level of those who are awarded patents because this too would be circular. Perhaps we might then define the level as that needed to earn a livelihood in a field without earning patents. This is close to the solution that we will reach under the inducement standard,⁵⁴ but the cognitive approach does not provide an explanation for why this is the level that should matter. Moreover, the level of ordinary skill would then be higher for fields in which a group of people needs knowledge of the field to perform their work, even if those individuals are performing a type of work that does not involve innovation. But why should this happenstance of job specialization matter? The people who ought to matter, we will argue, are those who would be inventing without patents. This observation flows not from a cognitive approach but from the inducement standard.

2. *The Degree of Obviousness and the Commingling of Economic Factors*

In addition to the theoretical difficulties in defining the person having ordinary skill, courts applying the statutory obviousness standard must also confront the ultimate question of how obvious something must be in order for it to be viewed as "obvious," and therefore unpatentable, as a matter of law. Even if the courts were to follow a cognitive approach to obviousness, they would still confront this "how obvious" question, and the cognitive approach provides no guidance except for the insight that, cognitively, problems can present a full spectrum of difficulty—from the extremely obvious to the extremely hard.⁵⁵ The cognitive approach is especially ill equipped to resolve the "how obvious" question, in part because cognition is an epistemic phenomenon that takes place at a particular moment in time while invention occurs across time. Once the hypothetical person of ordinary skill becomes the focus of the obviousness inquiry, the natural question would be how much effort it would take this person to arrive at the solution; a cognitive approach, rigorously followed, instead seems to ask about the chance that the person of ordinary skill would see the solution at the outset.

54. See *infra* Subsection I.B.2.

55. The case law rarely recognizes even this, instead dichotomizing "'ordinary innovation' or 'ordinary creativity' on one hand and 'real innovation' on the other," despite psychological evidence that "creativity is believed to vary along a continuum." Mandel, *supra* note 8, at 120-21.

It should not be surprising then that the doctrine of nonobviousness in fact does not adhere to a rigorous cognitive definition of nonobviousness. The category of what is “obvious” as a matter of patent law clearly extends to more than just situations where the person of ordinary skill could consider the problem in an instant and immediately intuit the solution. In *KSR*, the Supreme Court made clear that the obviousness standard can be met in some situations where several potential solutions to a problem are “obvious to try.”⁵⁶ The Court wrote:

When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.⁵⁷

Thus, a solution can be deemed legally obvious even though the person having ordinary skill would have had to “pursue” “a finite number” of potential solutions until an “anticipated success” is realized.

The “obvious to try” doctrine presents judges following a purely cognitive approach with a set of unappealing choices. Consider, for example, two potential research projects, both of which are obvious to try. Each research project requires researchers to explore a fairly large number of potential alternatives to find a solution. The testing of each alternative is routine, demanding nothing more than time and competent labor. In each case, the researcher can be fairly confident that a solution will be found, but prior to undertaking experiments the exact solution cannot be predicted. Finally, assume that, for one research project, the testing of all possible solutions can be concluded at low cost within a few hours while, for the other, testing will take years and hundreds of millions of dollars.

The inducement standard provides a clear intuition about whether the fruits of each research project should be patentable: the patent probably should be granted for the years-long project, but not for the hours-long project. Yet if judges follow a purely cognitive approach, without peeking at the utterly different economics of the two scenarios, they will find the two scenarios difficult or impossible to distinguish. The judges might feel compelled to find neither patentable, following literally the Supreme Court’s reference to “a finite number of identified, predictable solutions.” Or judges attracted to the cognitive approach might be tempted to hold the results of both research

56. 550 U.S. at 421.

57. *Id.*

projects to be patentable, for in both the end solution cannot be recognized at the outset.

This problem is not hypothetical. In *In re Deuel*,⁵⁸ the Federal Circuit considered whether it was obvious to isolate the DNA sequence coding for a particular human protein given that (1) the protein had previously been discovered, and (2) there were available techniques by which a researcher could isolate the DNA sequence coding for any protein once the protein was known. The PTO adopted an appropriate methodological approach, looking to the practicalities—that is, the economics—of the problem. The agency concluded that the DNA sequence was obvious because the agency found that, once a protein's amino acid sequence is known (indeed, even if it is only partially known), well-known screening techniques could find the corresponding DNA sequence for the protein by “effectively sampl[ing] all the DNA of the mammalian cell” in a process that would take “at worst, only a few weeks.”⁵⁹

While holding the isolated DNA sequence obvious made good policy sense, the Federal Circuit nonetheless reversed the agency. The court's decision serves as a paradigm of the pure cognitive approach. The court reasoned that knowledge of the amino acid sequence of a protein does not necessarily render obvious the corresponding DNA sequence because there were “an enormous number of DNA sequences” that could potentially code for the protein.⁶⁰ In its prior decision *In re Bell*,⁶¹ which was repeatedly cited in *Deuel*,⁶² the Federal Circuit had determined that “more than 10^{36} different nucleotide sequences” could encode the particular protein at issue there.⁶³ Numbers like 10^{36} —one undecillion, or a trillion trillion trillion—are certainly enormous. No one could guess it until the screening procedures were complete. To the PTO, the cognitive difficulty posed by that multitude of possibilities did not matter as long as known screening procedures could be used to isolate the correct DNA

58. 51 F.3d 1552 (Fed. Cir. 1995).

59. *Ex parte Deuel*, No. 92-3627, 33 U.S.P.Q.2d (BNA) 1445, 1447 (B.P.A.I. Nov. 30, 1993) (quoting JAMES D. WATSON ET AL., RECOMBINANT DNA: A SHORT COURSE 78 (1983), which was then a standard reference in the field). We would not automatically assume that any process that would be expected to take only a few weeks could not be patented. The question is whether inventors could be expected to take the time in the absence of patent protection, and this might depend in turn on the potential benefits from completing the invention. *See infra* Subsection III.B.1.

60. *In re Deuel*, 51 F.3d at 1558.

61. 991 F.2d 781 (Fed. Cir. 1993).

62. *See, e.g., In re Deuel*, 51 F.3d at 1559, 1560.

63. *In re Bell*, 991 F.2d at 784.

sequence without any difficulty or any undue experimentation.⁶⁴ To the Federal Circuit, however, “the existence of a general method of isolating . . . DNA molecules is essentially irrelevant to the question whether the specific molecules themselves would have been obvious.”⁶⁵ This logic suggests that the court would have reached the same outcome even if the screening could be completed in a matter of minutes on inexpensive equipment.

Deuel makes perfect sense from a cognitive perspective, but it was terrible policy and a poor interpretation of the statutory patentability standard. The decision was widely criticized by academics and, toward the end of its life, began to draw criticism even within the Federal Circuit, with Judge Rader offering very pointed criticism of the decision.⁶⁶ Soon after the Supreme Court decided *KSR International Co. v. Teleflex, Inc.*,⁶⁷ the PTO took the opportunity to assert that the analysis in *Deuel* had to be disavowed in light of the new Supreme Court teachings.⁶⁸ In *In re Kubin*,⁶⁹ Judge Rader was able to garner the votes to sustain the agency’s pragmatic approach. The Federal Circuit overruled *Deuel* and specifically embraced the argument that, in determining the obviousness of DNA sequences coding for a particular protein, the courts must take into account “the ease and predictability” of techniques for isolating those DNA sequences.⁷⁰

“Ease” is, of course, a relative term, and that is its strength. The term invites judgment about the economic factors that make the process of developing something new more or less difficult. Finding the right DNA sequence out of a trillion trillion trillion possibilities should be considered easy if standard, low-cost techniques can resolve the problem in a short time and there would be ample incentive to undertake the effort even without patents. Finding the right answer among a mere ten or twenty possibilities may be considered difficult if testing each possibility requires enormous expense, time, and effort. As in *Deuel*, the purely cognitive approach to obviousness has no

64. In *In re Bell*, the PTO had reasoned that standard techniques could be “easily” applied to isolate the DNA coding for a particular known protein. *Id.* at 785 (quoting the reasoning of the PTO Board). The Federal Circuit rejected that reasoning, *see id.*, so in *In re Deuel* the agency tried to use synonyms for “easily,” 51 F.3d at 1556.

65. *In re Deuel*, 51 F.3d at 1559.

66. *See, e.g., In re Fisher*, 421 F.3d 1365, 1382 (Fed. Cir. 2005) (Rader, J., dissenting) (arguing that *In re Deuel* should be overruled).

67. 550 U.S. 398 (2007).

68. *Ex parte Kubin*, No. 2007-0819, 2007 Pat. App. LEXIS 13, at *11, *17 (B.P.A.I. May 31, 2007) (reasoning that *KSR* “cast doubt on the viability of *Deuel*”).

69. 561 F.3d 1351 (Fed. Cir. 2009).

70. *Id.* at 1360; *see also id.* at 1358 (holding that *KSR* discredited the holding of *Deuel*).

place for considering those factors. *Deuel's* demise shows that the courts have not been able to maintain a purely cognitive approach. Mixing economic considerations into the analysis—or better still, making economic factors the centerpiece of analysis rather than merely relevant factors—is desirable not only because it generates better patent policy but also because it represents the better interpretation of the statute and reconciles patent law with other areas of regulatory theory. To those matters we now turn.

B. The Inducement Standard and the Statutory Text

The intellectual weaknesses of the cognitive approach and the courts' decisions that stray from this approach in service of the patent system's policy goals do not themselves establish a legal justification for embracing an economic interpretation of the statutory nonobviousness requirement. The statutory text, it might be argued, still does not point toward an economic approach to defining patentability such as the inducement standard, and thus the courts should muddle along with a cognitive approach, despite its glaring flaws, with arbitrary exceptions where necessary. Yet careful analysis of the statute proves that the inducement standard provides a stronger framework for interpreting the statutory text than the cognitive approach.

Our analysis focuses on a straightforward interpretation of three critical words in § 103: "A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains."⁷¹ We interpret "obvious" to mean its dictionary definition of "easily discovered,"⁷² "ordinary" to mean "not patent-induced," and "person" to mean "human or entity." We freely admit that there are alternative possible interpretations of each of these words standing alone, but each of these interpretations is readily defensible under ordinary principles of statutory interpretation, and reading these three words in this way makes them cohere with one another, with *Graham*, and, as we will show below,⁷³ with regulatory law more generally. One could reject some aspect of this interpretation and still allow some role for the inducement standard, but the combination of all three of these points shows that the inducement standard in *Graham* is not an

71. 35 U.S.C. § 103 (2006).

72. See *supra* note 28.

73. See *infra* Section I.C.

extratextual gloss on or unjustified theory of the statute but a reasonable reading of it.⁷⁴

1. “Obvious” and Ease of Discovery

The word “obvious” can mean not merely “easily understood” but also “easily discovered.”⁷⁵ As the *Deuel* example shows, a standard based on the ease of discovery is not difficult to reconcile with an economic test, for such a standard recognizes both that something may be obvious even if it takes some searching and that the concept of obviousness is, like the concept of “easily,” a matter of degree and context. Even under a dictionary definition of “obvious,” courts need to evaluate how difficult a discovery must be before it can no longer be considered easy. There are three plausible approaches. First, the courts could try to articulate an absolute standard—a degree of anticipated time, difficulty, and expense beyond which a discovery will be considered not obvious. While that approach is linguistically plausible, it is also indeterminate. The statute provides no guidance for the courts to decide the level at which to fix this absolute standard. Perhaps the courts could do so—holding, for example, that an anticipated expense of one million dollars will be the threshold for nonobviousness—but this would be arbitrary.⁷⁶

74. We also note that nothing in the legislative history of § 103 is inconsistent with interpreting the statute to impose an inducement standard of patentability. The legislative history confirms that the statute was intended to codify a requirement of patentability that had previously been imposed by “decisions of the courts,” and that Congress drew language from those decisions in writing the statute. *See, e.g.*, H.R. REP. NO. 82-1923, at 7 (1952); S. REP. NO. 82-1979, at 6 (1952). Indeed, both the House and Senate Reports stated that the new statutory formulation was intended “to serve as a basis for the addition at a later time of some criteria which may be worked out.” H.R. REP. NO. 82-1923, at 18; S. REP. NO. 82-1979, at 18. The legislative reports use the passive voice, leaving open whether the additional criteria would be “worked out” through the legislative process or through the judicial process in subsequent decisions. Given that the nonobviousness requirement was originally judge-made and Congress was approving that judicial development, it is a fair inference that Congress did not want to foreclose the judiciary from engaging in further common law development of the nonobviousness standard as future decisions “worked out” more specific criteria to measure and define the standard.

75. *See supra* text accompanying note 28.

76. Of course, the courts do sometimes announce holdings that include bright-line numeric thresholds. *See, e.g.*, *Maryland v. Shatzer*, 130 S. Ct. 1213 (2010) (establishing fourteen days as a bright line for determining whether a break in custody means that a criminal procedure protection no longer applies). Doing so in this context would be undesirable because the appropriate threshold likely varies considerably from one context to another. When the benefits of an invention are relatively small, an amount considerably less than one million dollars should perhaps be sufficient for patenting. *See infra* text following note 251.

The second approach is the inducement standard: innovations should be considered “easily discovered” if they would otherwise be devised and disclosed without the strong incentives of the patent system. This approach provides a guide for setting the level. It is sensitive to the context, and it recognizes that the word “obvious” in the statute encompasses achievements generated by ordinary economic forces where these achievements are “easily discovered.” A third approach is to determine ease in reference to the person of ordinary skill. This approach does not so much solve the problem of defining a standard as it does merely push the problem down the line. The approach becomes congruent with the second approach if the inducement standard is used to define the skills possessed by the person of ordinary skill.

2. “Ordinary” Skill

Graham’s inducement standard does provide a way to interpret the level of “ordinary skill.” It should be interpreted to be the level that would exist without the inducement of patents. That insight provides courts with a coherent and theoretically rigorous way to define the capabilities of the hypothetical person of ordinary skill while avoiding the difficulties we found with either endowing the person with omniscient knowledge and minimal creativity or with seeking to identify the relevant level of ordinary skill on the basis of a cognitive approach to nonobviousness.⁷⁷ Defining the level of ordinary skill does not do all of the work of the inducement standard; we will still need to consider the motivations of people with this level of skill in the absence of patents to determine what would have happened absent patent protection. But it moves us much closer to an administrable doctrine with a normatively defensible foundation.

The inducement standard thus offers an escape from the otherwise unanchored and potentially circular “reasonable person” test of the Patent Act, in much the same way that economic analysis provided content to the reasonable person test of tort law. The standard establishes a baseline that is independent of the patent system because it looks to the economic forces that would exist without patents. The person of “ordinary” skill is the person who would be in the industry even if the patent system did not exist, and an innovation should be considered “obvious” or “easily” discoverable if nonpatent incentives would be sufficient.

The practical importance of this resolution can be understood by considering the application of the test in two fields: software and

77. See *supra* Subsection I.A.1.

pharmaceutical research. In both fields, the vast majority of actual practitioners are expected to be very creative. Under the inducement standard, however, ordinary skill is defined not by the average researcher whose position may depend on the incentives of patents but by the hypothetical practitioner who would exist in the field even without the inducement of patents. In many branches of the software industry, that hypothetical practitioner would still be very highly skilled and creative because the intellectual property protection of copyright would still provide firms with significant incentives to hire very smart software researchers and writers. The pharmaceutical industry provides a stark contrast because it is known to depend heavily on patent incentives to fund its research. Without the inducement of patents, pharmaceutical firms would perhaps hire some chemists to keep their production lines running, but they would not have the incentives to hire cutting-edge researchers. In short, all firms would look like current “generic” pharmaceutical firms, which generally do not conduct research into new pharmaceuticals. The level of “ordinary” skill in the pharmaceutical industry would thus be lower than the average skill of patent-seeking researchers currently in the field, but this result makes perfect sense under the inducement standard. Existing research pharmaceutical firms presumably try to hire only those researchers creative enough to secure patents. Patent law ought not look to the average skill level of these researchers and label them all ordinary because that approach would tend to undermine the very patents necessary to hire these researchers.

3. *The “Person” Who Possesses the Skill*

Further conceptual improvement can be made by understanding that a “person” can be conceived of not merely as an individual but also as a corporation or some other entity. An entity, of course, naturally includes different people offering different types of contributions, and in most cases it makes more economic sense to ask about the economic incentives that an entity would face absent patent inducement than to ask about the economic incentives of hypothetical individuals. With this clarification, the inducement standard asks not only what some individual blessed with economic common sense and a lab in the garage would do in a world without patent incentives, but also what entities would do. Inventions are often developed by teams of inventors, and thus it makes economic sense for the inducement standard to apply at more than the individual level. If, for example, no individual would pursue a project, but a group of individuals certainly would, even without patent incentives, then we should characterize the invention as patent-induced. This step furthers the project of making the person of ordinary skill less hypothetical; it is still hypothetical in the sense that it is “ordinary” and thus

operating without patent incentives, but no longer do we need to imagine a person with extraordinary capabilities. We need only consider what an entity would easily discover, using typical research protocols, given a particular incentive structure.

It might appear that this change would require rewriting the statute. But the very first section of the *United States Code*, the Dictionary Act, provides: “In determining the meaning of any Act of Congress, unless the context indicates otherwise . . . the words ‘person’ and ‘whoever’ include corporations, companies, associations, firms, partnerships, societies, and joint stock companies, as well as individuals.”⁷⁸ The failure of others to suggest that the Dictionary Act should be applied to the patent statute is likely a consequence, not a cause, of the existing judicial conception of the “person of ordinary skill” in cognitive rather than economic terms. Courts have not always followed the Dictionary Act;⁷⁹ yet even commentators who are skeptical that the Dictionary Act should always be followed seem troubled only where applying the statute would conflict with other principles of interpretation.⁸⁰ There may well be statutes—say, a typical murder statute—in which the Dictionary Act would not apply to the word “person.” But, as we have seen, there is already a longstanding tradition in patent law of treating the “person of ordinary skill” as a hypothetical rather than a real person, and the Dictionary Act provides a means of honoring the sense behind this tradition that a real person cannot be intended without doing violence to the statutory text. That an entity is a legal “person” is a commonplace,⁸¹ and it may be a particularly appropriate fiction once the obviousness doctrine is conceived in economic terms. Nothing in § 103 suggests that “person” should exclude entities.

C. Reconciling the Patentability Standard with General Regulatory Theory

Embracing an economic approach such as the inducement standard while rejecting a purely cognitive approach to obviousness provides one final important benefit: it generates theoretical consistency between patent law and

78. 1 U.S.C. § 1 (2006).

79. See Nicholas Quinn Rosenkranz, *Federal Rules of Statutory Interpretation*, 115 HARV. L. REV. 2085, 2121-24 (2002) (discussing judicial interpretation of the Dictionary Act).

80. See, e.g., 1 LAURENCE H. TRIBE, *AMERICAN CONSTITUTIONAL LAW* § 2-3, at 124 n.1 (3d ed. 2000) (cited and discussed in Rosenkranz, *supra* note 79, at 2117).

81. See generally Susanna K. Ripken, *Corporations Are People Too: A Multi-Dimensional Approach to the Corporate Personhood Puzzle*, 15 FORDHAM J. CORP. & FIN. L. 97 (2009) (examining the history and underpinnings of the law’s treatment of corporations as people).

a much broader range of federal regulatory law in which economic approaches are ubiquitous.

A starting place is the federal common law of torts, where negligence has long been defined as conduct falling below the standard of care that would be followed by a reasonable person.⁸² Tort law is an especially good field for comparison to patent law in this context because tort law's "reasonable person" has frequently been cited as a hypothetical construct that is analogous to the statutory "person having ordinary skill in the art" used in defining nonobviousness. One could imagine a cognitive approach to defining the care that would be employed by a reasonable person—for example, an approach asking how much care actual, average, or perhaps even hypothetical individuals would think of taking in particular circumstances. Yet courts have not taken such an approach for more than half a century. The set of decisions made by actual individuals—in other words, the customary level of care—is not the ultimate touchstone of negligence. Rather, the courts have overtly tied the standard of reasonable care to an economic calculus, most famously outlined in Learned Hand's opinion in *United States v. Carroll Towing Co.*⁸³

The obviousness doctrine of patent law could be distinguished from the negligence standard of federal tort law on the grounds that patent law is a statutory field, not an area of common law. In a common law field, judges have inherent law-making powers, while in statutory fields, judges are supposed to follow the policy dictates of statutory law as encoded by the legislature. Judicial importation of economic analysis into a common law field is thus less troubling than a similar step would be in a statutory field. Yet while the distinction between statutory and common law fields is significant in many contexts, it is not so here for two reasons.

First, the nonobviousness requirement evolved first as a common law doctrine developed by the courts themselves.⁸⁴ Congress's codification of the requirement in 1952 is widely understood to be a legislative validation of the

82. See, e.g., *Davidson Steamship Co. v. United States*, 205 U.S. 187, 193 (1907) ("[T]here is an obligation on all persons to take the care which under the ordinary circumstances of the case a reasonable and prudent man would take, and the omission of that care constitutes negligence.").

83. 159 F.2d 169, 173 (2d Cir. 1947). See generally Chiang, *supra* note 9, at 43-46 (recounting the development of the common law of obviousness before codification); John F. Duffy, *Inventing Invention: A Case Study of Legal Innovation*, 86 TEX. L. REV. 1 (2007) (providing a history of the development of the obviousness doctrine).

84. A critical turning point in doctrinal development was the Supreme Court's decision in *Hotchkiss v. Greenwood*, 52 U.S. 248 (1850).

general thrust of the doctrine as it had been evolving in the courts.⁸⁵ Indeed, the Supreme Court in *Graham* expressly held that the statutory nonobviousness requirement “was intended to codify judicial precedents.”⁸⁶ Where Congress endorses the general thrust of judicially created common law through codification, the resulting statute might well be interpreted as maintaining a significant role for further judicial development and refinement of the law. The obvious analogy comes from the other branch of federal monopoly law, antitrust law. The Supreme Court has expressly interpreted the Sherman Act as “drawing on common-law tradition”⁸⁷ and has repeatedly held that, in interpreting that statute, the courts maintain a greater degree of policymaking power than they do with respect to other statutory enactments.⁸⁸

Second, even in the statutory arena, the federal courts have not balked at importing economic analysis into vaguely worded regulatory statutes. The antitrust laws again provide an obvious example. Section 1 of the Sherman Act prohibits “[e]very contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade,”⁸⁹ and yet the Supreme Court soon imposed on the statute a reasonable gloss that was defined in economic terms.⁹⁰ Like the Sherman Act, the Patent Act concerns the permissible (indeed, desirable) extent of monopolies in our economic system, and like the Sherman Act, the Patent Act is based on economic goals.⁹¹ While the Patent Act is more detailed

85. See Giles S. Rich, *The Vague Concept of “Invention” as Replaced by Section 103 of the 1952 Patent Act*, in NONOBVIOUSNESS: THE ULTIMATE CONDITION OF PATENTABILITY, *supra* note 6, at 1-400, 1-409; see also *supra* note 74 (discussing the legislative history of the 1952 codification of § 103).

86. *Graham v. John Deere Co.*, 383 U.S. 1, 3 (1966).

87. *Nat’l Soc’y of Prof’l Eng’rs v. United States*, 435 U.S. 679, 688 (1978); see also *Leegin Creative Leather Prods., Inc. v. PSKS, Inc.*, 551 U.S. 877, 899 (2007) (“From the beginning the Court has treated the Sherman Act as a common-law statute.”).

88. See, e.g., *Leegin*, 551 U.S. at 899 (“Just as the common law adapts to modern understanding and greater experience, so too does the Sherman Act’s prohibition on ‘restraint[s] of trade’ evolve to meet the dynamics of present economic conditions.”).

89. 15 U.S.C. § 1 (2006).

90. See *Standard Oil Co. v. United States*, 221 U.S. 1, 60, 62 (1911) (announcing that a “standard of reason” or “rule of reason” was to be applied in enforcing the Sherman Act); see also *id.* at 55, 58 (recognizing that the conceptions of unreasonable restraints on trade depend on “economic conceptions”). The *Standard Oil* Court’s imposition of an economic reasonableness test onto the Sherman Act was controversial. In dissent, Justice Harlan accused the Court majority of “judicial legislation” because it had decided “to insert the word ‘unreasonable’ in the act.” *Id.* at 90 (Harlan, J., concurring in part and dissenting in part).

91. See, e.g., *Mazer v. Stein*, 347 U.S. 201, 219 (1954) (noting that the constitutional “clause empowering Congress to grant patents and copyrights” is based on an “economic

and specific than the Sherman Act and should not be interpreted to be merely an authorization for federal courts to create their own common law of patents (as the Sherman Act is in the field of antitrust), the greater specificity of the Patent Act should not prevent courts from interpreting the Act's individual provisions in a manner consistent with larger regulatory theory. The Supreme Court has already imported economic analysis in interpreting the Copyright Act—in determining, for example, the extent of “fair use” that may be made of copyrighted works.⁹² More generally, modern regulatory statutes are typically interpreted to include economic analysis. While in many regulatory areas that interpretive gloss is supplied by the executive branch,⁹³ the source of the interpretive gloss merely reflects Congress's decision to allocate substantive lawmaking powers to administrative agencies in the modern regulatory state. Where Congress has not granted administrative agencies substantive lawmaking powers (as in the patent field), the courts need not eschew economic analysis. Rather, courts may properly recognize that, in numerous areas—ranging from pure common law (tort law), to areas of mixed statutory and common law (antitrust), to modern statutory administrative areas (environmental law⁹⁴)—economic analysis is a broadly accepted interpretive gloss.

Viewed in this larger context, *Graham's* inducement standard, with its economic gloss on the statutory nonobviousness standard, is not in the least anomalous. The anomaly is the paucity of economic analysis in lower court

philosophy . . . that encouragement of individual effort by personal gain is the best way to advance public welfare through the talents of authors and inventors in ‘Science and useful Arts’”).

92. See, e.g., *Harper & Row, Publishers v. Nation Enters.*, 471 U.S. 539, 559, 566 n.9 (1985) (relying on economic theory in interpreting the permissible scope of fair use). While the statutory language of the current fair use statute, 17 U.S.C. § 107 (2006), includes at least one factor that points toward economic analysis (factor four, “the effect of the use upon the potential market for or value of the copyrighted work,” *id.* § 107(4)), the statute itself is a codification of a judicial gloss imposed on the Copyright Act prior to any legislative recognition of fair use. See *Campbell v. Acuff-Rose Music, Inc.*, 510 U.S. 569, 577 (1994) (recognizing the statutory provision as a restatement of judicially created doctrine).
93. See, e.g., Exec. Order No. 12,866, 58 Fed. Reg. 51,736, § 1(b)(6) (1993) (requiring that, to the extent permitted by law, executive branch agencies should engage in cost-benefit analysis and should regulate only if the benefits of regulation exceed the costs); see also *Entergy Corp. v. Riverkeeper, Inc.*, 129 S. Ct. 1498 (2009) (sustaining the EPA's decision to require economic cost-benefit analysis in administering a statute that did not clearly forbid such analysis).
94. Barton H. Thompson, Jr., *What Good Is Economics?*, 37 U.C. DAVIS L. REV. 175, 176 (2003) (“One cannot study environmental law today without encountering economic analyses. Economics is everywhere—in legislative hearings and debates, regulatory documents, judicial opinions, legal casebooks, and academic articles.”).

applications of the nonobviousness standard. An electronic search of all Federal Circuit decisions since 1982 found fewer than two dozen cases in which economic factors are even mentioned as part of a nonobviousness analysis.⁹⁵ Moreover, in the majority of those cases, the courts were distinguishing economic from technological factors and were holding that the economic factors were not relevant in determining nonobviousness. At most, the survey was able to identify only six cases in a quarter-century that had overtly applied economic analysis in deciding patent obviousness issues, and none of those cases had been decided in the last decade. This vacuum of economic analysis need not exist. Incorporating basic economic wisdom into patentability decisions would help harmonize patent law with the overarching thrust of regulatory law in many other fields. *Graham's* inducement standard points the way toward that end.

D. Implications of the Inducement Standard

Our textual analysis above justifies the use of an economic rather than cognitive approach to the nonobviousness standard. This still leaves several questions about what the inducement standard would require, and we address three important questions here.

1. Objectivity

One question is whether the courts should ask whether the particular inventor would have invented without patent incentives or whether any

95. In the Lexis file of all Federal Circuit decisions, the following search was executed on February 14, 2010: "patent and econom! w/200 (obviou! or nonobviou!) and (overview(patent or patent!) or core-terms (patent or patent!))." (The restrictions "(overview(patent or patent!) or core-terms (patent or patent!))" were designed to exclude any nonpatent cases.) The search yielded 68 cases. Those cases were independently coded by two coders into three categories: (1) false positives (that is, cases that did not involve any use of economic principles in obviousness analysis); (2) cases in which the courts distinguished economic factors from technological factors and held that economic factors were not relevant to obviousness analysis; and (3) cases in which courts were using economic factors as proxies or considerations for either obviousness or nonobviousness. Of the 68 cases, 52 cases were coded by at least one coder as false positives, and in 50 of those cases both coders agreed on the classification (intercoder agreement = 0.96). Sixteen of the cases were coded by at least one coder as falling within category (2), with agreement on coding in 12 of those cases (intercoder agreement = 0.75). Only 6 cases were classified by at least one coder as falling into category (3), and in only 2 cases did the coders agree on the classification (intercoder agreement = 0.33). None of the cases classified in category (3) by either coder was decided in the last decade.

inventor would have. Because *Graham's* articulation of the inducement standard employs the passive voice (referring to the inventions that “would not be disclosed or devised”),⁹⁶ the inducement standard could be read as subjective: would this inventor have devised and disclosed without the patent inducement? But the more natural reading of the passage, and the reading more justifiable on policy grounds,⁹⁷ is an objective one. The passive voice employed in the sentence highlights the invention, not the inventor. The *Graham* Court appeared to favor the latter approach, an objective patentability standard,⁹⁸ and an objective patentability standard is almost certainly compelled by the second sentence of § 103, which forbids reliance on the inventor’s actual inventive process as a ground for rejecting a patent.⁹⁹ Properly construed, the inducement standard looks objectively to determine whether any person would likely have devised and disclosed the invention without a patent inducement.

96. *Graham v. John Deere Co.*, 383 U.S. 1, 11 (1966).

97. A subjective inducement standard might be easier to administer because the PTO and the courts could look merely to historical facts about how a particular inventor derived the invention. Moreover, where an innovation is discovered merely by chance, without actually being motivated by the promise of a patent, it is unclear why society is better off rewarding the discovery with a patent. *But see* Sean B. Seymore, *Serendipity*, 88 N.C. L. REV. 185 (2009) (defending patentability of serendipitous inventions, while arguing that conception occurs after initial accident).

Yet a subjective standard would have significant drawbacks. Courts and patent examiners would have to determine the mental state of individual inventors—a difficult task compounded by the inventor’s superior technical knowledge. Legally knowledgeable inventors could often feign additional efforts if they believed that their actual efforts in making the discovery might demonstrate that the invention was too subjectively obvious. Indeed, even in the case of a chance discovery, the patent applicant could delay seeking a patent while pretending to do additional experiments that are in fact unnecessary. An objective standard does not exclude the possibility that how hard the inventor worked may be indirectly relevant as evidence of how hard a problem was expected to be. *See infra* Subsection III.B.2.

Finally, the choice in favor of an objective standard aligns patentability decisions with other areas of law that are designed to regulate economic behavior. Tort law, for example, applies an objective standard of reasonableness and generally affords the clumsy or inattentive no adjustment. *See* Susan Randall, *Corrective Justice and the Torts Process*, 27 IND. L. REV. 1, 19 (1993) (“[I]ndividuals who cannot conform to the standard of the reasonable person, as an unfortunate consequence of subnormal intellectual capacity or some other shortcoming, may be held liable for conduct which represents their best efforts.”). So, too, is the rule of reason in antitrust law based on an objective analysis of economic behavior. *See* *United States v. Brown Univ.*, 5 F.3d 658, 671 (3d Cir. 1993).

98. 383 U.S. at 15 n.7.

99. 35 U.S.C. § 103(a) (2006) (“Patentability shall not be negated by the manner in which the invention was made.”).

2. *Trade Secrecy and Disclosure*

Under the Court's articulation of the inducement standard, an invention is patentable if it would not be devised or disclosed but for the inducement of a patent. For inventions that would not be created at all without the promise of a patent, it is easy to understand the social benefits of granting the patent. For inventions that would be created but held as trade secrets in the absence of the patent system, the social calculus is more complex. The position taken under the *Graham* standard—which permits patents on such inventions—might be open to question as a matter of policy, but it does make *Graham's* inducement standard easier to reconcile with the statutory text.

Consider, for example, an alternative inducement standard that allowed patenting only if the invention would not have been devised but for the inducement of the patent system, whether or not the invention was disclosed. If that standard were followed, whenever trade secrecy would provide adequate incentive by itself to make inventions, the inventions would be considered obvious and thus patent protection would be unavailable. The problem for this hypothetical alternative inducement standard is that, in certain circumstances, the incentives associated with trade secrecy protection are strong.¹⁰⁰ Indeed, trade secrecy protection can theoretically provide even more powerful incentives than patents because trade secrecy rights are potentially infinite in duration. Because of those incentives, some innovations induced by trade secrecy may have been difficult to discover, and thus courts are likely to view them to be not obvious according to some basic, commonsense interpretation of the statutory language.¹⁰¹

The actual inducement standard endorsed by the *Graham* Court does not, however, suffer from this problem. *Graham's* inducement standard requires innovations to be viewed as unpatentable only if they would be created and shared without any patent inducement. Such innovations are likely to be relatively easy—meaning inexpensive—to create because such an inventor must

100. See, e.g., David S. Levine, *Secrecy and Unaccountability: Trade Secrets in Our Public Infrastructure*, 59 FLA. L. REV. 135, 157 (2007) (“Because a trade secret lasts, at least in theory, as long as a trade secret holder maintains its secrecy, the possibility that the information will never enter the public domain is very real.”).

101. The alternative inducement standard would also seemingly require decisionmakers to investigate the extent to which inventions could be kept secret, with patents denied to inventions that were capable of being held in secret. In a sense, the alternative inducement standard would make secrecy the preferred policy, with patenting allowed only if the incentives associated with trade secrecy are inadequate. That approach would seem to be contrary to longstanding patent precedent and present another hurdle for reconciling the statutory text with the alternative inducement standard.

find the means of recouping the investment made in an innovation that anyone can freely copy. Thus, the position on trade secrecy taken by the *Graham* inducement standard narrows any potential gap between the inducement standard and the statutory text: if an innovation is sufficiently difficult that no one would engage in the creative activity absent the possibility of either trade secret or patent protection, then the invention should not be viewed as easily discovered or “obvious.” The end result is also sensible: where an invention is sufficiently difficult that the incentives of either trade secrecy or the patent system are needed to induce its creation, the law will permit protection of the invention under either regime.

A more challenging policy critique of the *Graham* standard would suggest that it might sometimes make it too easy to patent. Consider a situation in which technological information is easily developed and known by multiple firms in an industry, but in which each firm would protect the information as a trade secret because there is no benefit from public disclosure. Granting patents on such technological information is consistent with the “exchange for secrets” theory, a venerable (if historically controversial) rationale for patents.¹⁰² But this theory is a better justification for permitting patents to cover information that would otherwise be held in secret by a single firm. Allowing patents on widely held secrets imposes more social costs (because it halts preexisting competitive use of the information) and fewer benefits (because placing information in the public domain is likely to provide little social benefit where most or all parties who could make use of the information previously had access to it). But this problem in any event is not severe. Typically, easily developed information is likely to spill out of trade secrecy and enter the public domain long before a twenty-year patent would place the technology in the public domain. So it would only be a small group of inventions—for which there is some reason to believe that no such spillover would occur—for which the inducement standard would give excessive protection.

3. *Nonpatent Inducements for Innovation*

Graham’s inducement might, in contrast, also be viewed as establishing too stringent of an obviousness standard where the nonpatent inducements for innovation are especially powerful. Consider, for example, a situation where

102. David G. Luetgen, *Functional Usefulness vs. Communicative Usefulness: Thin Copyright Protection for the Nonliteral Elements of Computer Programs*, 4 TEX. INTELL. PROP. L.J. 233, 261-62 (1996) (explaining the rationale of this theory and its tension with justifications for patent law).

the government, a foundation, or a wealthy philanthropist offers a prize (or a subsidy or grant) for creating and disclosing a particular type of advance—for example, for a better treatment for a particular disease.¹⁰³ Assume that the prize is sufficiently large that it spurs teams of top researchers to seek the innovation. After years of hard work, one team succeeds, claims the prize, and seeks a patent. Such an innovation would seem difficult or impossible to label “obvious” in any linguistic sense. Yet an argument might be made that the patent should be denied under the inducement standard because the powerful incentives created by the prize would have led to the innovation being devised and disclosed even without the possibility of a patent.

Much turns, however, on the conditions under which the prize or subsidy is granted. Federal research subsidies are now typically granted under the rule, codified in legislation, that grant recipients will be able to seek patents on the fruits of their federally funded research.¹⁰⁴ The possibility of a patent likely will affect the amount and intensity of the grantee’s research and thus can be viewed as a proximate cause of the innovation. The inducement standard would then not be a significant barrier to patenting. Indeed, since the inducement of a possible patent existed prior to any offer for a prize, the hypothetical suggests that the invention was so difficult to achieve that it could not be devised or disclosed but for the inducement of a patent plus other incentives. Even if it could be shown in a particular case that a particular federally funded invention would have been invented at about the same time without the patent incentive, there is a strong argument for reading the Bayh-Dole Act in conjunction with the patent statute to allow patentability if the combination of the patent incentive and federal funding sufficiently accelerated the invention.

If the government, foundation, or philanthropist wants to preclude patenting, then the award of a grant or prize could be conditioned on the grantee or winner dedicating the patent rights to the public domain.¹⁰⁵ This arrangement, however, poses no special problem for the inducement standard.

103. See, e.g., *Prize for the Development of New Treatments for Chagas Disease*, KNOWLEDGE ECOLOGY INT’L, http://www.keionline.org/misc-docs/b_b_igwg/prop2_chagas_prize.pdf (last visited June 9, 2010) (proposing a prize for new treatments of a particular disease).

104. See Bayh-Dole Act, 35 U.S.C. § 202(a) (allowing nonprofit and small business entities to retain title to any “subject invention,” which is defined in § 201(e) to encompass any invention created “in the performance of work under a [federal] funding agreement”).

105. Alternatively, the prize sponsor could allow patenting but require that any resulting product be sold at a low price. See, e.g., AIDAN HOLLIS & THOMAS POGGE, INCENTIVES FOR GLOBAL HEALTH, THE HEALTH IMPACT FUND: MAKING NEW MEDICINES ACCESSIBLE FOR ALL 3 (2008) (describing rules of the Health Impact Fund that would require specified prices for prize recipients), available at http://www.yale.edu/macmillan/igh/hif_book.pdf.

The conditioned grant or prize looks largely identical to standard employment contracts in for-profit firms, which award workers with money (in the form of a salary and other benefits) in exchange for, inter alia, an assignment of patent rights in any inventions created at work.¹⁰⁶ Because the patentability standard is objective, it cannot matter whether the individual actually seeking the patent intends to assign the rights (in exchange for a salary) to a firm for commercial exploitation or to assign the rights (in exchange for a grant or prize) to the public domain.

Nonetheless, while grants and prizes do not usually present a situation in which the inducement standard produces results divergent from an intuitive sense of “obviousness,” we do not discount the possibility that the inducement standard could produce such results in some circumstances. Sometimes even nonpatent incentives such as tenure hopes might clearly have been sufficient for some inventions. Indeed, the existence of such incentives might be particularly likely to render patent protection unnecessary to induce invention after a supply shock makes invention much easier or a demand shock makes invention much more useful.¹⁰⁷ The inducement standard is most congruent with an intuitive sense of “obviousness” where the nonpatent inducements are relatively weak in comparison to the patent inducement. If the nonpatent inducements are powerful, then those inducements may spur the creation of relatively difficult inventions. At least for the general run of cases, the PTO and courts should focus on and apply the inducement standard because it is supported by Supreme Court precedent, it provides a compelling economic justification for granting patents in some circumstances and denying them in others, and it gives specific intuitions for how to administer the obviousness doctrine, as we will show in Part III.

II. REFINING THE INDUCEMENT STANDARD

Graham's inducement standard lends itself to economic analysis because it focuses on the incentives provided by patents. The question of whether the invention would not have been “disclosed or devised but for the inducement of a patent” demands an inquiry into (1) the economic incentives or inducements that would exist without the patent and (2) the expected economic costs of generating the invention. Where there would be sufficient inducements to

¹⁰⁶. The Netflix Prize similarly required that the winner provide Netflix a royalty-free license. See *The Netflix Prize Rules*, NETFLIX, <http://www.netflixprize.com/rules> (last visited June 7, 2010).

¹⁰⁷. See *infra* Section II.B.

cover the costs of generating invention even absent patent protection, a patent would entail costs and no benefit. Yet while the inducement standard provides that basic economic intuition, the standard needs to be refined or clarified in at least three important respects. Not surprisingly, these three refinements concern fundamental issues in patent policy: time, competition, and the meaning of “invention.”

A. Time

Time is one of the most important features in the patent system. Patents are relatively short property rights, and parties often engage in intense competition known as patent racing to be the first in time to obtain a patent.¹⁰⁸ Whether “first in time” is defined by reference to the date of invention or the date of application filing matters not for these purposes.¹⁰⁹ More generally, the patent system is frequently modeled as a system designed to produce not more innovation but earlier innovation.¹¹⁰

Yet despite the importance of time to the patent system, *Graham* articulates an atemporal inducement standard. Plainly, the standard has to be modified to take time into account. The basic insights here are straightforward. If the prospect of a patent induces invention to occur twenty years or more before it otherwise would have occurred, then the issuance of the patent is unambiguously desirable (assuming, of course, that the invention is socially valuable¹¹¹). With the inducement of the patent, society has the technology at an earlier time (albeit under exclusive rights). After the expiration of the patent (which we will assume to last for twenty years), the technology enters the

108. See generally JEAN TIROLE, *THE THEORY OF INDUSTRIAL ORGANIZATION* 399-400 (1988) (discussing potential costs and benefits of patent races); Christopher A. Cotropia, *The Folly of Early Filing in Patent Law*, 61 *HASTINGS L.J.* 65, 85-86 (2009) (assessing the efficiency of racing); Glenn C. Loury, *Market Structure and Innovation*, 93 *Q.J. ECON.* 395 (1979) (offering a model of the dynamics of patent races); Suzanne Scotchmer, *Incentives To Innovate*, in *THE NEW PALGRAVE DICTIONARY OF ECONOMICS AND THE LAW* 273, 275 (Peter Newman ed., 1998) (summarizing competing conclusions in the literature).

109. See generally Toshiko Takenaka, *Rethinking the United States First-To-Invent Principle from a Comparative Law Perspective: A Proposal To Restructure § 102 Novelty and Priority Provisions*, 39 *HOUS. L. REV.* 621 (2002) (critiquing the United States's acceptance of the first-to-invent principle and arguing for specific changes).

110. See, e.g., John F. Duffy, *Rethinking the Prospect Theory of Patents*, 71 *U. CHI. L. REV.* 439, 444 (2004) (noting that one advantage of earlier invention is that inventions fall into the public domain sooner).

111. The patent system generally does not consider the social desirability of an invention. See *Juicy Whip, Inc. v. Orange Bang, Inc.*, 185 F.3d 1364, 1367-68 (Fed. Cir. 1999).

public domain at the same time as or earlier than it otherwise would have if there had been no patent inducement. At the other extreme, a patent is almost certainly undesirable where it induces invention to be devised and disclosed only a day or two earlier than would otherwise have occurred without the patent inducement. Society is then burdened with having the technology exist under exclusive rights for a long period of time, although society would have obtained the technology free of exclusive rights very soon even without the patent inducement. Between those two extremes, there can be reasonable debate about the precise amount of temporal acceleration needed to justify a patent.

For our immediate purposes, we may leave that temporal period vaguely defined by requiring the inducement of a patent to accelerate invention by a substantial period of time, where substantiality is some period of years. Extreme patent skeptics might put that period close to twenty years. Patent enthusiasts could reasonably argue that, if the inducement of a patent advances the arrival of technology by only a few years, society is better off having the earlier arrival of the technology even though the deadweight losses associated with the patent will continue for many more years. In principle, “substantial” should be defined as the amount of time for which the social benefits of the invention’s existing for that time period are equal to the social costs of patent protection for the patent term minus that period. As we will soon see, a precise numeric definition of that period of time is less necessary than it may first seem.

An excellent case to illustrate this temporal refinement of the inducement standard is the brilliant – yet, in our view, ultimately wrong – opinion by Judge Posner in the panel decision from *Roberts v. Sears, Roebuck & Co.*¹¹² Posner’s panel opinion is the only reported court of appeals case that has ever attempted to apply *Graham*’s inducement standard. Posner recognized that the standard needed temporal adjustment. He reasoned: “The framers of the Constitution and the Patent Code would not have wanted patents to be granted where the invention would have been made anyway, and about as soon, without any hope of patent protection.”¹¹³ Where the invention would be made “about as soon” without a patent inducement, Posner understood that the patent “would confer no benefits that might offset the costs of monopoly.”¹¹⁴ He identified the obviousness doctrine as the correct doctrinal vehicle to deny patents in such circumstances, and for good measure, he cited *Graham* as well as Kitch’s article

^{112.} 697 F.2d 796 (7th Cir.), *vacated en banc*, 723 F.2d 1324 (7th Cir. 1983).

^{113.} *Id.* at 797.

^{114.} *Id.*

on obviousness—the leading judicial and academic authorities to endorse the inducement standard.¹¹⁵ So far, Posner’s reasoning mirrors our own approach.

Then Posner turned to applying the inducement standard. The invention before the court was famous.¹¹⁶ It was a “quick-release” socket wrench—a wrench that allowed the user to push a button to release the socket attached to the wrench.¹¹⁷ Socket wrenches were very old in the art. Also very old was the idea that a socket head could be attached to the wrench by a spring-loaded ball bearing and that the wrench could encompass some releasing mechanism.¹¹⁸ Peter Roberts, the inventor, set out to fix what he saw as a problem with the existing designs: releasing the socket from the wrench was “difficult . . . particularly when the sockets are small and the user’s hands are greasy.”¹¹⁹ Roberts’s novel quick-release mechanism provided a button, typically on the top of the wrench (see Figure 1), that would quickly and easily release the ball bearing “so that it no longer holds the socket, which then can be easily withdrawn from the [wrench] or in fact can actually fall off . . . due to gravity.”¹²⁰ The release button was positioned so that it could be easily pushed by the same hand used to hold the wrench.

115. See Kitch, *supra* note 12; *supra* text accompanying note 12.

116. For mainstream media coverage of the David-versus-Goliath case that grew out of the invention, see *Sears Loses Patent Suit*, N.Y. TIMES, Apr. 3, 1982, at 32; *Wrenching Sears*, TIME, Oct. 23, 1978, at 46, available at <http://www.time.com/time/magazine/article/0,9171,946093,00.html>.

117. Quick Release for Socket Wrenches, U.S. Patent No. 3,208,318 (filed Apr. 24, 1964) (issued Sept. 28, 1965).

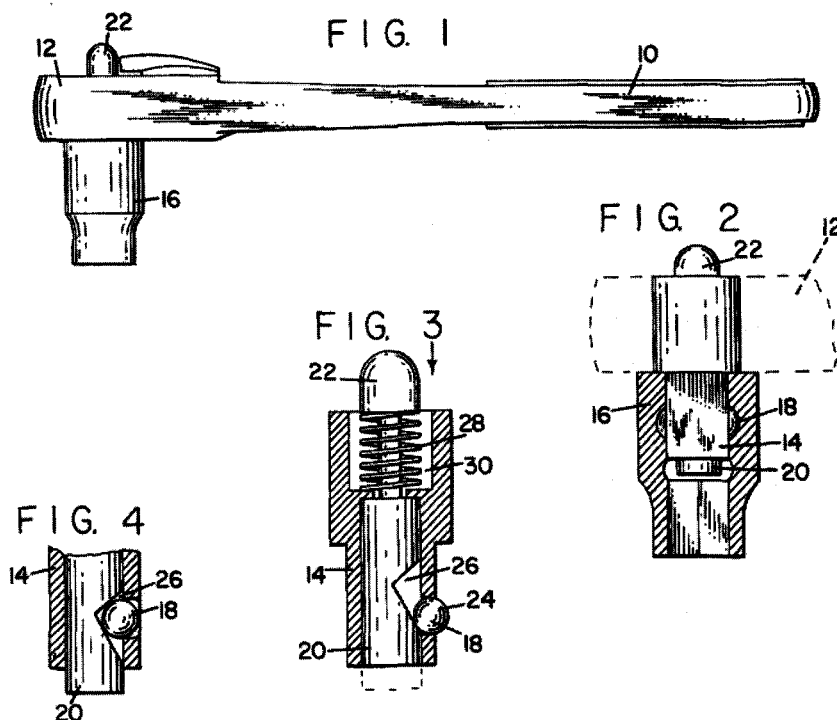
118. See, e.g., U.S. Patent No. 1,660,989 (filed Jan. 27, 1927) (issued Feb. 28, 1928) (disclosing both the use of a ball bearing to secure the socket head and a mechanism, albeit an awkward one, for releasing the socket).

119. ' 318 Patent, at col.1 ll.14-16.

120. *Id.* at col.1 ll.21-24.

Figure 1.

ROBERTS'S QUICK-RELEASE SOCKET WRENCH



The ball bearing (18) is used to lock the socket head in place, as was typical in preexisting socket wrenches. In Roberts's wrench, pushing the button (22) allows the ball bearing to move into the notch (26) and thereby to release the socket head.

Posner acknowledged that Roberts had made a "genuine" contribution in designing "a device in which [the preexisting] ideas worked smoothly to enable sockets to be changed easily with one hand."¹²¹ But that contribution "was entitled to patent protection only if it was the kind of contribution unlikely to be induced except by the promise of a monopoly, and we do not think it was that kind of invention, because we think it would have been made anyway, and soon."¹²² Once again, Posner appropriately adjusted the inducement standard

121. *Roberts v. Sears, Roebuck & Co.*, 697 F.2d 796, 798 (7th Cir.), *vacated en banc*, 723 F.2d 1324 (7th Cir. 1983).

122. *Id.* at 798.

to account for time: the invention should be viewed as obvious only if it would have been made “soon” without the inducement of a patent.

But how did Judge Posner know that Roberts’s invention would have been made “soon”? The invention was “simplicity itself,” and “its essential elements were well known when it was invented.”¹²³ Posner noted that “Gonzalez and Carpenter separately had patented socket wrenches that had the essential elements of the Roberts patent; true, the emphasis was on the locking rather than the release function, but these are reciprocals.”¹²⁴ Thus, in Posner’s view, all that needed to be done was for a person skilled in the art to recognize that a “reciprocal” of existing elements was needed. Posner concluded that such a recognition was likely to happen quickly:

Everyone knew there was a market for a quick-release wrench; everyone knew the elements of such a wrench It was just a question of coming up with a workable embodiment of these ideas, a task for which no special training, expensive equipment, or prolonged testing and refining were necessary.¹²⁵

Yet there is one glaring oddity about Posner’s reasoning: though he correctly modified the inducement standard to account for time, he otherwise did not mention time at all in his opinion. All of the prior art patents were cited by the inventor’s name only, without reference to either the patent issuance number or date.¹²⁶ If dates are added to the prior patents, we discover that the Carpenter patent—the patent that Posner heralded as having all the essential elements needed to make Roberts’s invention—was issued in 1928, three and a half decades prior to the time of Roberts’s invention.¹²⁷ In expressing confidence that, even without the inducement of a patent, the elements of the 1928 Carpenter patent could be modified “soon” to produce a quick-release wrench, Judge Posner offered nothing more than *ipse dixit* contradicted by history: no one in the art had been able to make the necessary changes for an extremely long time, and the one person who was able to do it—Roberts—seems to have been induced by a possibility of a patent.¹²⁸ While other pieces of

123. *Id.* at 797.

124. *Id.* at 797-98.

125. *Id.* at 798.

126. See, e.g., *id.* at 797-98 (referring to the “Roberts patent” and comparing it to “DePew,” “Gonzalez,” “Carpenter,” and “Wilson”).

127. See U.S. Patent No. 1,660,989 (filed Jan. 27, 1927) (issued Feb. 28, 1928).

128. In 1963, Roberts spent about six months designing his improved wrench and developing a prototype. See *Roberts*, 697 F.2d at 797. He submitted his prototype to Sears in May of 1964,

prior art cited in Posner's opinion were closer in time to Roberts's invention, the opinion did not maintain that any of those pieces of art contained additional elements or ideas that were not already in the 1928 Carpenter patent.¹²⁹

The Seventh Circuit, sitting en banc, held that Posner's panel opinion was wrong to rule Roberts's wrench invalid as a matter of law.¹³⁰ Overturning the panel's flawed reasoning was amply justified, but the en banc court also went out of its way to disavow Posner's modified inducement standard.¹³¹ The en banc court's rejection of his analysis led Judge Posner to write a dissenting opinion that, in addition to repeating his earlier analysis, also chastised the majority for refusing to apply economic analysis to the problem. "[L]awyers and judges," Posner wrote, may seem to find "the language of economics repulsive. Yet the policies that have given shape to the patent statute are quintessentially economic, and the language of economics is therefore the natural language in which to articulate the test for obviousness."¹³² Once again, we agree entirely with Posner's general approach, and we also agree that the en banc majority did not "succeed[] very well in articulating an alternative test."¹³³ But Judge Posner's poor application of the economic test, resulting in the invalidation of a patent on an invention that intuitively seems extraordinarily clever, may have alienated the en banc court and, in the process, given the inducement approach a bad name. In our view, the en banc court should have rejected only Posner's application of the inducement standard, not the

one month after filing his patent application. *Roberts v. Sears, Roebuck & Co.*, 573 F.2d 976, 978 (7th Cir. 1978). The sequence of events strongly suggests that Roberts spent time creating the invention in the hope of obtaining a patent and then marketing the patent to Sears.

129. In reverse chronological order, the other pieces of prior art considered by Posner were: (1) the Gonzales patent, U.S. Patent No. 3,172,675 (filed Feb. 19, 1963) (issued Mar. 9, 1965), which, like the Carpenter patent, provided a mechanism for holding and locking in sockets; (2) the De Pew patent, U.S. Patent No. 3,069,191 (filed Apr. 13, 1961) (issued Dec. 18, 1962), which did not discuss wrenches at all but instead was a device for holding loads being lifted by "winch or other power means"; and (3) the Wendling patent, U.S. Patent No. 2,987,334 (filed June 22, 1959) (issued June 6, 1961), which was a tool holder with an "interlock mechanism which positively prevents accidental disengagement thereof." None of these pieces of prior art even attempted to address the problem of building a "quick release" mechanism.
130. The en banc court remanded the case for a new trial because the district court had submitted the case to the jury in a procedurally flawed manner. *See Roberts v. Sears, Roebuck & Co.*, 723 F.2d 1324, 1343 (7th Cir. 1983) (en banc).
131. *Id.* at 1329 n.5.
132. *Id.* at 1347.
133. *Id.*

inducement standard itself or an economically based test. Given the failure of the literature and case law to point out the relevance of the timing of prior art,¹³⁴ however, the en banc court's approach was at least understandable. The en banc court's approach reflected a common, though mistaken, intuition that the inducement standard cannot be applied in a principled or consistent way.¹³⁵

B. Competition

Patent rights are distributed through a competition to be first in time, and that competition has implications for the inducement standard. Competition is most likely to speed invention when both the costs of innovation and the value of patent rights are relatively stable. Where this is so, competition to obtain the patent should advance the time of innovation by long periods, provided that the patent confers significantly greater market protection than can be obtained otherwise. To demonstrate this point, we here construct a model of invention that relies on a few straightforward assumptions about invention and competition. Though simple, the model illustrates the circumstances under which the time of innovation will depend little on whether there is a patent system. Our model will support several conclusions: (1) where the cost of innovation is falling rapidly, patents ordinarily should not issue, as inventors would likely have strong incentives to invent within a short period of time; (2) where the cost of innovation is constant or falling slowly, patents are more likely to be justified because the patent incentive will generally lead to invention long before it would have occurred with nonpatent first mover advantages; (3) where nonpatent incentives to invent are much greater, patent inducement is less likely and thus patents are less likely to be justified; (4) where market demand unexpectedly increases greatly shortly before invention, patents are less likely to be justified; and (5) where an invention will not be useful for some time, perhaps because supporting technologies are not yet sufficiently advanced, patents probably will not be justified because earlier innovation is not socially beneficial. The most difficult cases are those in which the patent incentive accelerates invention for a substantial period that is nonetheless substantially shorter than the patent term.

Four assumptions are necessary to create the model. First, the process of innovation has a cost, which may decrease with time. The assumption that

134. See John F. Duffy, *A Timing Approach to Patentability*, 12 LEWIS & CLARK L. REV. 343, 357-61 (2008) (identifying other cases that failed to take proper account of the timing of inventions).

135. See *supra* notes 12-13 and accompanying text; *infra* Part III.

innovation has some cost should not be difficult to defend. If innovations were costless, then the patent system would be difficult to justify because innovation would simply happen, like manna descending from the heavens.¹³⁶ The decreasing cost of invention also accords with basic notions of progress. Past advances in technology provide necessary predicates, insights, and tools that make subsequent advances easier.

Second, innovations have some positive value that may increase with time. This potential growth in the value of an innovation can be justified by the increasing size of markets and the gradual accumulation of wealth. Alternatively, an innovation could increase in value because complementary technologies or markets arise. For example, a method of speeding check-out procedures for online transactions might become considerably more valuable after cheaper bandwidth leads to an explosion in the number of Internet users.

Third, part of an innovation's social value can be captured by the innovator through either patents or nonpatent, non-trade-secret mechanisms, such as first-mover advantages, copyrights, or trademarks. We exclude trade secrecy from the alternative mechanisms for capturing part of an invention's value because, as previously explained, *Graham's* inducement standard looks to whether the innovation would be devised and disclosed without patent incentives.¹³⁷ We also assume that a patent allows an innovator to capture a larger fraction of an innovation's value than would the nonpatent, non-trade-secret mechanisms alone. Obviously, if patents and nonpatent incentives are similar in size, innovation will not be retarded by denying patent protection.

Fourth and most importantly, we assume that competition for innovations—either patent racing or competition to be the first in the market—will allow innovation to occur when the portion of the innovation's value that can be privately appropriated just equals and begins to exceed the cost of developing the innovation.¹³⁸ This is a standard assumption in industrial

136. See Yoram Barzel, *Optimal Timing of Innovations*, 50 REV. ECON. & STAT. 348, 354 (1968) (noting that technical change “does not descend on us like manna” and that for any regulatory system, encouraging technical change must take into account the resources needed to generate such change).

137. See *supra* Subsection I.D.3.

138. A more elaborate assumption would recognize that success might occur only with some probability. In that case, an attempt at innovation will occur only when the expected costs are equal to the expected benefits, discounting for the possibility of failure. See Duffy, *supra* note 110, at 480-82 (offering a model in which attempts to invent have only probabilistic success); see also Mark T.L. Sargent, *Economics Upside-Down: Low-Price Guarantees as Mechanisms for Facilitating Tacit Collusion*, 141 U. PA. L. REV. 2055, 2076 n.102 (1993) (noting that “the assumption of zero economic profits for the industry does not imply that each firm is earning zero economic profits”).

organization models¹³⁹ and follows from the more general assumption that firms maximize wealth. Competition is therefore essential to determining the timing of innovation.

Figure 2 justifies our conclusion that patents ordinarily should not issue when the cost of the innovation is declining dramatically. The cost—represented by the solid, nearly vertical line dropping toward zero—is assumed to decline at a rate of ninety-five percent per year near a particular point in time (represented arbitrarily as the year 2020). The dot-solid, dot-dashed, and dotted lines are, respectively, the private value of the innovation if it is (1) protected by a patent (which is assumed to allow the capture of twenty years of rents on the innovation), (2) protected by a two-year first-mover advantage, and (3) protected by a one-year first-mover advantage (which is equivalent to the rents per year from the innovation).

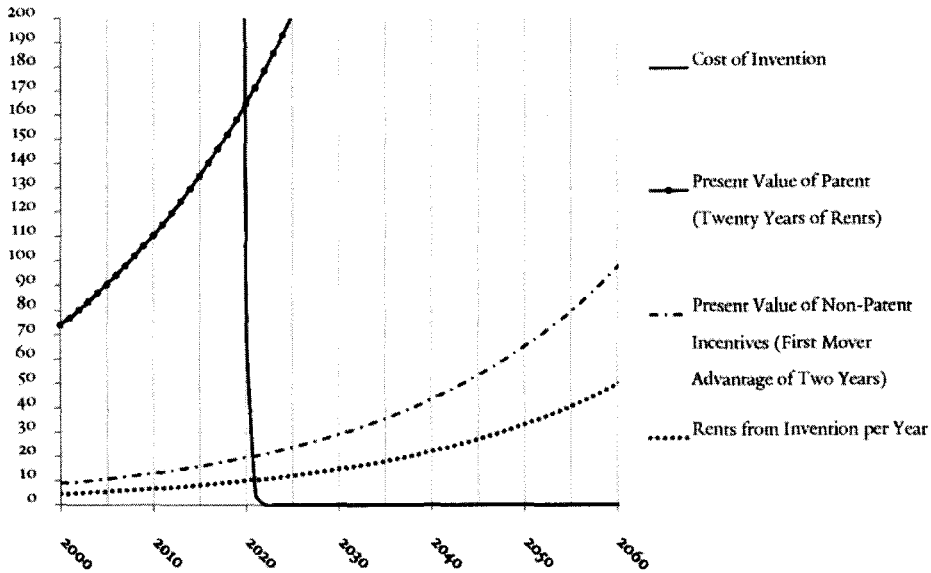
The situation portrayed in Figure 2 is a stark case where the issuance of a patent should not be viewed as meeting *Graham's* inducement standard. Without the inducement of a patent, the innovation would be devised and disclosed just a few months into the year 2020, where the cost line is intersected by the dot-dash line (if nonpatent incentives equal two years of rents), or by the dotted line (if nonpatent incentives equal a single year of rents). With the inducement of a patent, the innovation would be devised and disclosed just shortly before 2020 (where the dot-solid line intersects the cost line). If such an innovation were protected by a patent, society would bear the costs of twenty years of patent protection for almost no gain. Worse still, from the standpoint of social welfare, the promise of patent protection may induce an intense race to be first so that many times the social resources needed to achieve the innovation would be expended in order to obtain the innovation just a few months earlier. These conclusions are relatively insensitive to changes in other assumptions.¹⁴⁰

139. See, e.g., Susan Rose-Ackerman, *Unfair Competition and Corporate Income Taxation*, 34 STAN. L. REV. 1017, 1025 n.28 (1982) (“In equilibrium in a competitive industry marginal firms earn zero ‘economic’ profits and positive accounting profits. Their accounting profits include both a return to the equity capital invested in the firm, reflecting the opportunity cost of that capital, and the value of the entrepreneurs’ time.”).

140. In the graph depicted, the discount rate (interest rate) is assumed to be 6% and the market growth rate is assumed to be 4%. A patent would induce innovation only a few months earlier if the discount and growth rates fall anywhere within a range of 0% to 20%.

Figure 2.

INNOVATION COST SHOCK



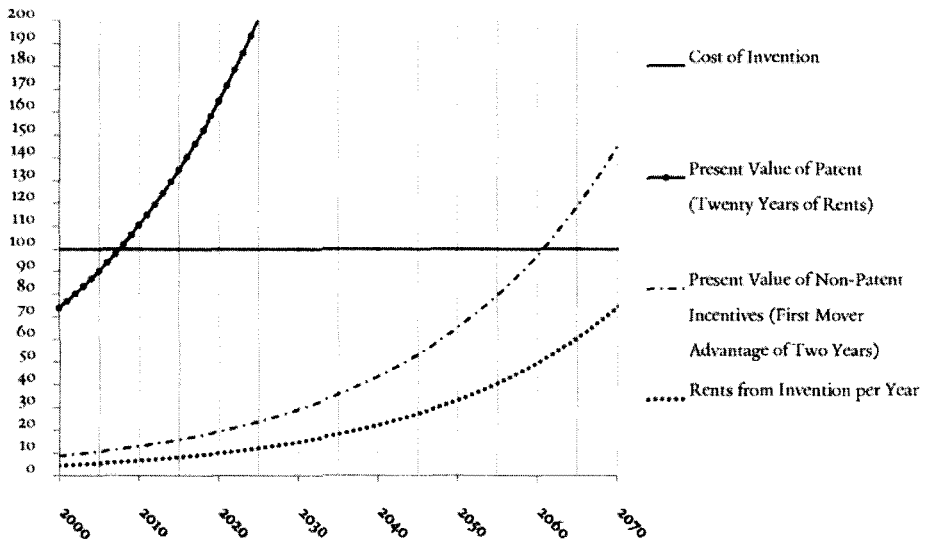
The costs of innovation are falling at 95% per year. Patent protection would induce innovation a few months prior to the time of innovation without patent protection.

By contrast, Figures 3, 4, and 5 show cases where the cost of innovation is not falling dramatically in time but all other parameters are the same as in Figure 2. These figures help explain why patents should generally issue in this case. In these cases, patent protection can induce earlier innovation by fifty years, where the cost of innovation is constant (in Figure 3); by just a little more than twenty years, where the cost of innovation is falling 6% per year (in Figure 4); or by about eight years, where the cost of innovation is falling by 20% per year (in Figure 5). The grant of the patent is unambiguously beneficial in Figures 3 and 4 because the patent advances the arrival of the technology by a period longer than, or about equal to, the patent life. Thus, the grant of the patent induces the invention sooner and either enriches, or at least does not diminish, the public domain. The situation shown in Figure 5 is a more difficult case as a matter of public policy. The innovation arrives substantially earlier with patent protection, but the patent's exclusive rights extend into a period when society could have had the innovation without any patent protection. Even though there is some tradeoff in this region, eight years might well still seem to satisfy the refined inducement standard, which permits

patents except where the innovation would be devised and disclosed soon in the absence of patent protection.

Figure 3.

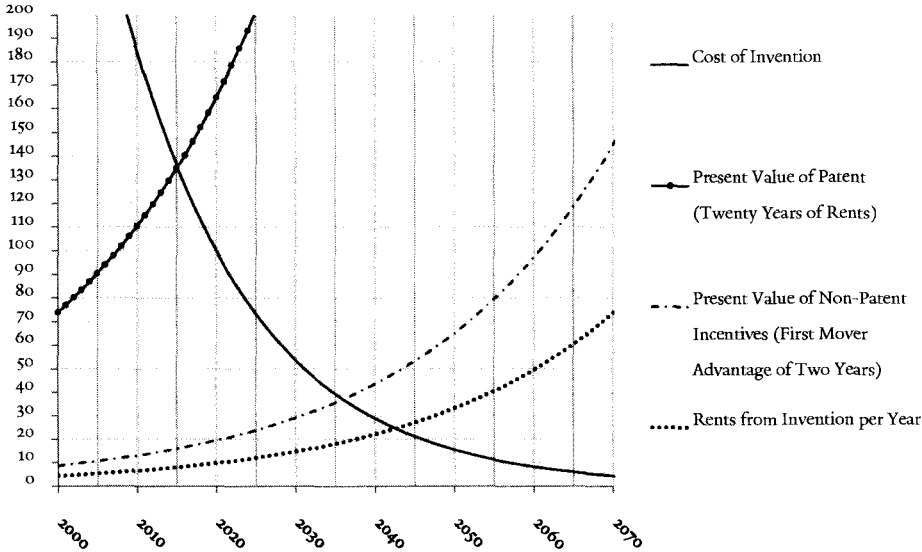
CONSTANT COST OF INNOVATION



The cost of innovation is constant. Patent protection would induce innovation fifty years prior to the time of innovation with a two-year first-mover advantage but no patent protection.

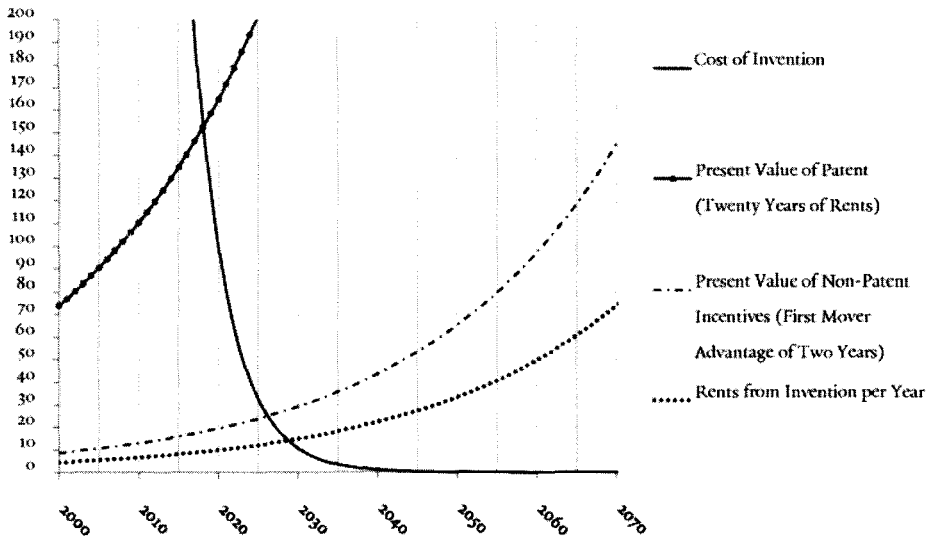
THE INDUCEMENT STANDARD OF PATENTABILITY

Figure 4.
SLOWLY DECLINING INNOVATION COSTS



The cost of innovation is falling slowly (6% per year). Patent protection would induce innovation twenty years prior to the time of innovation without patent protection.

Figure 5.
MODERATELY FAST DECLINE IN INNOVATION COSTS



The cost of innovation is falling moderately quickly (20% per year). Patent protection would induce innovation several years prior to the time of innovation without patent protection.

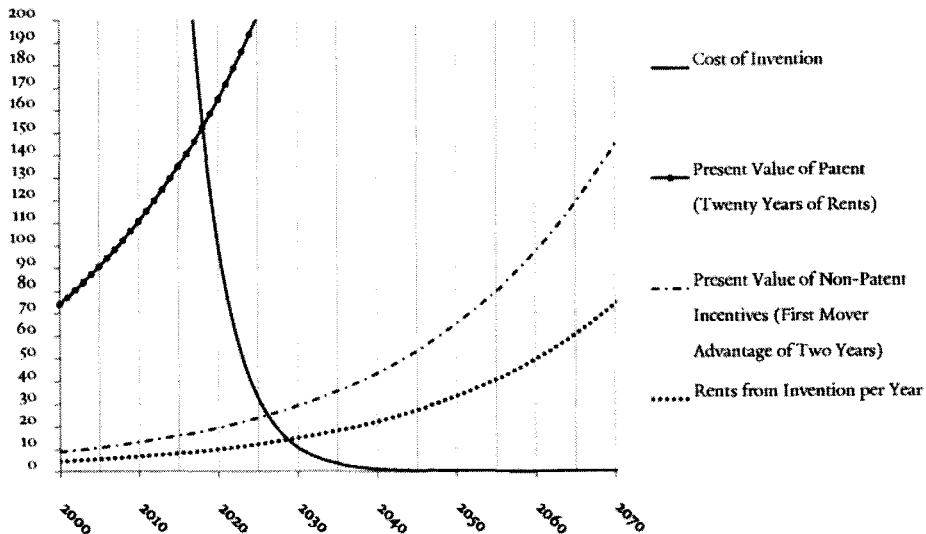
Figures 2 through 5 assume that nonpatent incentives were equal to two years' worth of rents on the innovation. Such nonpatent incentives could come from first-mover advantages, trademarks, copyright protection, or some other mechanism. If the nonpatent incentives are greater, the gap between the time of invention with and without patent incentives narrows, and patent protection is less successful in inducing innovation substantially earlier than it would otherwise be. Conversely, if the nonpatent incentives are smaller (for example, where technology is easily copied and any first-mover advantage is slight), then the temporal gap widens. The former point is illustrated in Figure 6, which assumes that nonpatent incentives are equal to five years' worth of rents on the innovation and otherwise reflects the same assumptions as Figure 4. Patents now induce innovation approximately twelve years instead of twenty years earlier. The results obtained from varying the strength of nonpatent incentives highlight the importance of courts' considering nonpatent incentives in implementing the inducement standard,¹⁴¹ but also shows that patents can

141. See *supra* Subsection I.D.2.

substantially accelerate invention even where nonpatent incentives at early invention are considerable.

Figure 6.

SLOWLY DECLINING INNOVATION COSTS WITH NONPATENT INCENTIVES EQUAL TO FIVE YEARS OF RENTS



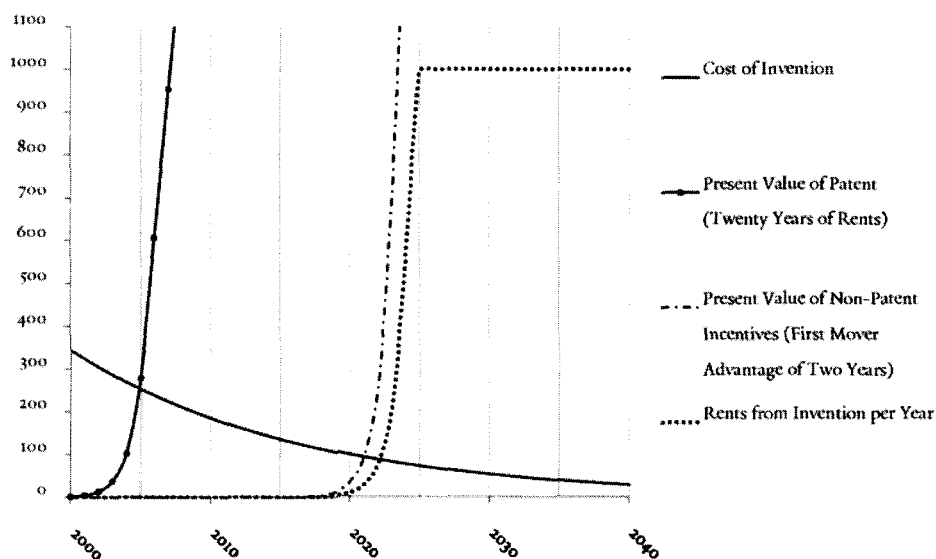
The cost of innovation is falling slowly (6% per year), and nonpatent incentives equal five years' worth of rents. Patent protection would induce innovation twelve years prior to the time of innovation without patent protection.

Another circumstance to be investigated is where the market for an innovation expands dramatically, as shown in Figure 7. The size of rents associated with the innovation is the heavy line rising dramatically after 2020; the other parameters are assumed to be changing at moderate levels, with the cost of invention declining at 6% and the discount rate holding at 6% through the period. At first glance, this scenario appears to satisfy the inducement standard or at least the inducement standard as modified to account for time, as the patent incentive causes the innovation to be devised and disclosed by patenting more than a decade earlier. Yet looks are deceiving here. While the innovation is *patented* at an early time, the use of the innovation—the actual practical benefit of the innovation—does not occur until much later. In this numeric example, while patenting occurs approximately in 2005, the innovation is not capable of any significant use until 2021 or 2022 (perhaps because some crucial piece of complementary technology is not yet available). As the innovation becomes capable of use—as the market for the innovation

grows—nonpatent incentives would induce creation and disclosure. In the example, this occurs in 2021.

Figure 7.

MARKET SHOCK SCENARIO



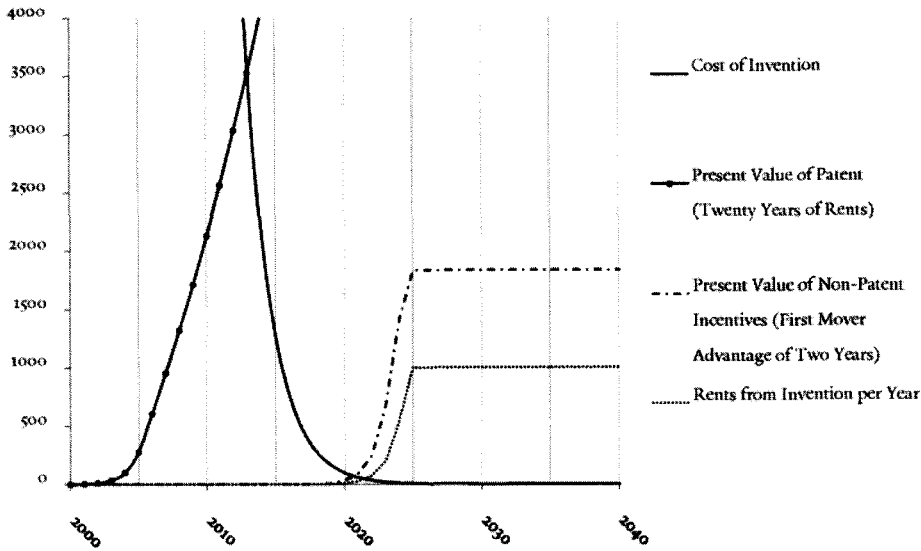
The market for innovation experiences exponential growth from 2020–2025, while cost of innovation is falling slowly (6% per year). Patent rights induce innovation long before innovation is useful in the market.

The scenario depicted in Figure 7 may, moreover, be overly optimistic in favor of patents. Allowing a patent will have little social benefit, because the patent merely induces innovation at a time when it is not yet useful, but granting the patent might seem to have little social cost: the patent will expire relatively soon after the time when the innovation begins to be used in the market. A more realistic account, however, would recognize that someone patenting inventions years before those inventions may be useful faces great uncertainty about which patents ultimately will be useful.¹⁴² Many early patents will cover inventions that turn out to be worth little or nothing because of market or technological developments in the interim. Thus, the cost of developing a patent on an invention that will be useful years in the future

¹⁴² See generally Christopher A. Cotropia, *Describing Patents as Real Options*, 34 J. CORP. L. 1127 (2009) (exploring the implications of recognizing the option value of patents).

should be adjusted to take into account the costs of patenting other inventions that turn out to be commercially useless. These costs will be greater the further in advance of possible commercialization patenting occurs. Figure 8 models this by assuming that the cost of innovation declines by 40% per year, as awareness of what inventions will be commercially useful increases.

Figure 8.
SCENARIO INVOLVING MARKET SHOCK AND RAPIDLY FALLING INNOVATION COST



The market for innovation experiences exponential growth from 2020 to 2025, while cost of innovation is falling rapidly (40% per year). Patent rights induce innovation long before innovation is useful in the market, and the patent remains in force many years after the innovation would have been created and disclosed without the patent inducement.

With these assumptions, patent protection will induce the innovation at a time closer to when the need arises, though still substantially before the innovation would be created absent patent protection. In the example, patenting will induce the innovation in 2012, and then the patent will last until 2032. The patent will thus extend several years after the technology has matured, the innovation is widely used, and the rents associated with the patent are high. The social benefit of the earlier innovation is minimal, and the competition to obtain the patent succeeds only in pushing back the time of innovation to a point when producing the invention is unnecessarily expensive because of the uncertainty about whether it will be useful.

In sum, the competition to innovate should mean that, if the rewards associated with twenty years of patent exclusivity are much greater than nonpatent rewards, then patents will generally be successful in inducing innovation at a much earlier time. That general conclusion is subject to one important exception and one important caveat. The exception occurs where the cost of inventing is falling rapidly. In that circumstance, patent protection may not advance the time of innovation much. This exception produces the important insight that was missing from Judge Posner's analysis in *Roberts*. Patents are most likely to fail the inducement standard where the innovation has recently become obvious—that is, where the costs of innovating have recently and dramatically declined. Perhaps Judge Posner's intuition was that mechanical patents are generally obvious, but in fact the relative lack of successful improvements to standard mechanical tools tends to point to nonobviousness.

The final caveat is that even where the patent does succeed in inducing much earlier innovation, the early innovation may be socially worthless if the innovation will not be marketed for some time. This caveat leads us to our third refinement of *Graham*'s inducement standard—that the inducement standard must focus not merely on whether the patent induces earlier creation of new information but on whether the patent can be expected to induce earlier invention in practical terms. We now turn to that point.

C. *Invention*

The *Graham* standard seeks to identify “those inventions” that are patent-induced. But what is meant by “invention”? The Supreme Court has sometimes stated that “[t]he disclosure required by the Patent Act is ‘the *quid pro quo* of the right to exclude.’”¹⁴³ That formulation might suggest that the mere paper disclosure in a patent application should be viewed as an “invention” for purposes of applying the inducement standard: if the promise of a patent yields a filed patent application years before the invention would have been created without any patent inducement, then perhaps the inducement standard should be viewed as satisfied.

Yet while some Supreme Court pronouncements focus on *disclosure* of information as the public good generated by the patent system, other statements from the Court emphasize the practical benefits obtained by the public. Thus, for example, the Court in *Brenner v. Manson* maintained that

143. *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc.*, 534 U.S. 124, 142 (2001) (quoting *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 484 (1974)).

“[t]he basic *quid pro quo* contemplated by the Constitution and the Congress for granting a patent monopoly is the benefit derived by the public from an invention with substantial utility.”¹⁴⁴ *Brenner* is widely understood as holding that a substantial utility is a necessary element of “invention” under the Patent Act.¹⁴⁵ Under that formulation, the inducement standard should look to whether the possibility of a patent has induced not mere disclosure but useful public benefits. Such public benefits arise only if the invention leads not merely to earlier disclosure but also to earlier practical application. Acceleration of the disclosure of an invention ordinarily serves no social goal if the mere paper disclosure will not accelerate the actual arrival of an invention in the marketplace. The patent system should thus distinguish purely speculative patent applications from applications that are prophetic in the sense that they herald the arrival of important new technologies, but do so by meaningfully accelerating the arrival of those technologies.

1. *Speculative Patents*

This theoretical point is best illustrated by an example. Consider U.S. Patent 7,346,850, a “[s]ystem and method for iconic software environment management.”¹⁴⁶ This patented software innovation generates a “graphical thumbnail” image of what a document would look like if it were to be opened in a particular program.¹⁴⁷ The innovation is useful because it gives users a quick preview of the document’s appearance without the bother of launching the program. The innovation does, however, demand additional computing resources—such as memory and CPU cycles—to provide the preview, and the preview will not be helpful unless it is done quickly. In 1998, when the patent application was first filed, this innovation may have been impractical given the speed and memory capacity of most computers of the time. Later, as computers

^{144.} 383 U.S. 519, 534 (1966).

^{145.} See, e.g., *Janssen Pharmaceutica N.V. v. Teva Pharms. USA, Inc.* (*In re* ’318 Patent Infringement Litig.), 583 F.3d 1317, 1324 (Fed. Cir. 2009) (describing *Brenner* as requiring that “inventions must have ‘substantial utility’ and ‘specific benefit exist[ing] in currently available form’” and holding that even correct speculation is not a patentable invention); see also MERGES & DUFFY, *supra* note 3, at 228 (noting that, under the holding of *Brenner*, “establishing a utility is considered necessary to achieve an invention”); Michael J. Meurer, *Patent Examination Priorities*, 51 WM. & MARY L. REV. 675, 684 n.34 (2009) (describing the utility doctrine articulated in *Brenner* as “relat[ing] to the question of whether the inventor has actually completed an invention”).

^{146.} U.S. Patent No. 7,346,850, at [54] (filed June 12, 1998) (issued Mar. 18, 2008).

^{147.} *Id.* at [57] (abstract).

improved, the feature became more practical, and the feature unsurprisingly has now been introduced commercially.¹⁴⁸

Let us assume that but for the inducement of a patent this preview innovation would not have been devised and disclosed until 2003 or so—a half decade after the 1998 filing date of the application, which is the patentee’s nominal “invention” date. Should the innovation be considered nonobvious? Not necessarily. If the practical implementation of the innovation has been advanced little by the inducement of the patent, then the social tradeoff is similar to what we graphically represented in Figures 7 and 8 in Section II.B. The disclosure of the invention occurs very early in time, but the actual arrival of the invention in practical terms changes little. Such patents might be called speculative patents, which do not disclose much nonobvious information helpful in realizing an invention but rather mere prognostications about future needs and capabilities.

A more difficult case involves the controversial patents at issue in the Blackberry litigation.¹⁴⁹ Those patents were generally directed to various elements of an “electronic mail system with RF communications to mobile processors.”¹⁵⁰ Whether or not such a mail system was easy to imagine in 1991, any difficulty probably existed in part because many crucial elements of such a system were then in their infancy. Certainly, the inducement standard ought not discriminate against a patent merely because the inventor is so remarkable as to produce an invention years ahead of when it would otherwise be produced, provided that—and this is the crucial point—the earlier production of the information provides a substantial benefit to society by accelerating the arrival of the invention in practical terms.¹⁵¹ Yet if the technological contributions are sufficiently small in comparison to the total effort needed to generate a commercial product, then granting a patent may not accelerate the arrival of the invention and might even delay it.

An alternative solution to the problem of speculative patents is for the law to impose a much more robust demonstration of practical utility as a prerequisite for obtaining a patent. For example, Michael Risch argues in a recent article that patents should not be granted unless the applicant

148. See, e.g., *The Taskbar (Overview)*, MICROSOFT, <http://windows.microsoft.com/en-us/windows-vista/the-taskbar-overview> (last visited Dec. 14, 2010) (describing the preview feature in Microsoft Windows 7).

149. *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1287 (Fed. Cir. 2005) (setting forth the family of related patents asserted against RIM’s Blackberry system).

150. U.S. Patent No. 5,436,960, at [54] (filed May 20, 1991) (issued Aug. 1, 1995).

151. Such an inventor already pays a price in a reduced patent term. See Duffy, *supra* note 110, at 444.

demonstrates that, at the time of patent application filing, “there is a market for the invention,” and “the invention can be manufactured at a cost sufficient to fulfill market demand.”¹⁵² Risch makes clear that, under his proposal, many ideas would remain unpatentable until they were commercially realized. While such a heightened utility requirement has its attractions, it also has significant drawbacks. In particular, the heightened utility requirement would likely bar patents on pioneering research that has no immediate commercial application but that will substantially accelerate the time of ultimate commercialization. Current utility doctrine allows for patents on such inventions, provided that they can produce some “credible,”¹⁵³ “specific[,] and substantial” – but not necessarily commercial – utility.¹⁵⁴ The nonobviousness requirement then provides the more flexible means by which patents may be denied to paper inventions that seem to embrace more speculation than technical achievement.

In sum, because society should gain some benefit if it is to tolerate the costs associated with granting a patent, the inducement standard focuses on the practical or commercialized invention, not merely a paper description of the invention. Three caveats are critical. First, the inducement standard does not insist that the patentee commercialize the invention or even that the patentee find someone who will commercialize the invention. Some commentators have proposed “innovation patents,”¹⁵⁵ which would insist that one commercialize an invention before receiving a patent on it, and some countries employ “working requirements,”¹⁵⁶ under which patentees must engage at least in some minimal commercialization activity. These, however, can have perverse consequences, as patentees may inefficiently engage in commercialization simply to meet the legal requirement. In addition, it may be difficult to determine what constitutes sufficient activity.¹⁵⁷ Under the economic approach, the patentee is rewarded for the technological accomplishment and is not

152. Michael Risch, *Reinventing Usefulness*, 2010 BYU L. REV. (forthcoming 2011) (manuscript at 38), available at <http://ssrn.com/abstract=1568063>.

153. *In re Cortright*, 165 F.3d 1353, 1356 (Fed. Cir. 1999).

154. *In re Fisher*, 421 F.3d 1365, 1367 (Fed. Cir. 2005).

155. William Kingston, *Innovation Patents and Warrants*, in PATENTS IN PERSPECTIVE 68, 70 (Jeremy Phillips ed., 1985); William Kingston, *The “Thesis” Chapters*, in DIRECT PROTECTION OF INNOVATION 1 (William Kingston ed., 1987). For a discussion, see Ted Sichelman, *Commercializing Patents*, 62 STAN. L. REV. 341, 398-400 (2010).

156. For a history, see Janice M. Mueller, *The Tiger Awakens: The Tumultuous Transformation of India’s Patent System and the Rise of Indian Pharmaceutical Innovation*, 68 U. PITT. L. REV. 491, 593-97 (2007). The United States has long eschewed working requirements. See *Cont’l Paper Bag Co. v. E. Paper Bag Co.*, 210 U.S. 405, 429 (1908).

157. See Sichelman, *supra* note 155, at 397 (assessing incentives provided by working requirements).

required to commercialize it. The patentee might well commercialize the patent and use this as evidence of acceleration, but commercialization is not required, and such evidence in any event is not dispositive because the patentee might have commercialized the invention even without a patent.¹⁵⁸ Meanwhile, commercialization by others who did not have the patent may be evidence against acceleration because this suggests that commercialization might have occurred even without the patentee's development, but such evidence could count in the opposite direction where the commercializers appear to have copied the invention or lost a patent race.

Second, the courts need not even be confident that the invention will in fact be commercialized. All that matters is whether, if the invention turns out to be worth commercializing, the patent likely did substantially accelerate commercialization. If commercialization never occurs, then the patent will be worthless and is not worth worrying about.¹⁵⁹ What the inducement standard seeks to block is the granting of a patent when a technological contribution represents only a tiny portion of the total effort that would be required for commercialization and the patent incentive did not accelerate such commercialization.

Third, the inducement standard nonetheless should not be seen as an inherent block to the granting of patents where a single commercialized product reflects many patents. The combination of many patents into a single product creates serious challenges for patent law and theory, and some commentators have worried that "patent thickets" may create an "anticommons" that will retard rather than advance innovation.¹⁶⁰ Perhaps there are some areas of technology in which products encompass many patents and one can conclude that commercialization generally would occur at more or less the same pace even absent patent inducement. If so, the inducement theory would suggest that many such patents are invalid. But there may be other areas

158. See *infra* Subsection III.B.2.b.

159. There may still be some social costs to such patents, although the high cost of applying for a patent means that there would be little incentive to apply for patents on inventions almost certain not to be commercialized within the patent term. See Jonathan S. Masur, *Costly Screens and Patent Examination*, 2 J. LEGAL ANALYSIS, Winter 2011, at 8 (noting that patents of "low private value and low (or negative) social value [may] increase the search costs and risk imposed on commercial firms").

160. See Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698 (1998) (discussing the anticommons problem in the patent context). But see Richard A. Epstein & Bruce N. Kuhlik, *Navigating the Anticommons for Pharmaceutical Patents: Steady the Course on Hatch-Waxman*, (Univ. of Chi. Law Sch. John M. Olin Law & Econ., Working Paper No. 209, 2004), available at http://ssrn.com/abstract_id=536322 (arguing that patent thickets are not a serious problem).

where many technologies are combined and where in fact the patent incentive is critical to development of all these technologies collectively. The inducement standard should apply to the group of patents as a whole, and patents should be granted. Holdouts and other familiar problems of patent licensing may ensue,¹⁶¹ but our goal in this Article is not to overcome them.

What is particularly worrisome from our perspective is the case in which a patent contributes nothing other than prophecy or perhaps something that is relatively trivial but nonetheless the patent claims something critical to future invention. This situation is especially likely when a patent reads like an idea—maybe it would be great to allow a user to view a miniature version of a document by moving one’s computer mouse over an icon, or to allow email by wireless phone—and simply describes some of the steps that any competent practitioner would quickly realize one would need to take to make the project work. The patent literature sometimes notes that the possibility of designing around a patent decreases a patentee’s ability to hold out for large undeserved sums,¹⁶² but speculative patents can cover fundamental (if simple) aspects of a technology such that they will be difficult to invent around. These patents are worrisome because they may in fact retard commercialization, as the patentee may credibly insist on a substantial portion of the rents from a new technology. Moreover, they may be a waste from a transaction costs perspective. The possibility of such valuable patents encourages prospective patentees to imagine technological capabilities that might exist in the future and describe how they might be used, whether or not such prophecy has beneficial economic consequences.

2. *Kitch’s Prospect Theory*

We are, of course, not the first patent theorists to focus on the significance of commercialization to the patent standard. Most famously, Edmund Kitch in 1977 advanced a prospect theory of the patent system, arguing that the granting of a patent may be useful because the grant of the patent itself may

161. Possible remedies include antitrust law, see Thomas F. Cotter, *Patent Holdup, Patent Remedies, and Antitrust Responses*, 34 J. CORP. L. 1151 (2009), and private ordering, see F. Scott Kieff & Troy A. Paredes, *Engineering a Deal: Toward a Private Ordering Solution to the Anticommons Problem*, 48 B.C. L. REV. 111 (2007).

162. See, e.g., Alan Devlin, *Indeterminism and the Property-Patent Equation*, 28 YALE L. & POL’Y REV. 61, 67 (2009) (noting that inventing around is one antidote to irrational holdouts). But see Ian Ayres & Gideon Parchomovsky, *Tradable Patent Rights*, 60 STAN. L. REV. 863, 874-75 (2007) (noting that inventing around often may be impractical).

promote commercialization.¹⁶³ A patent on a nascent technology, Kitch argues, can “increase[] the efficiency with which investment in innovation can be managed,”¹⁶⁴ can give the patentee “an incentive to make investments to maximize the value of the patent without fear that the fruits of the investment will produce unpatentable information appropriable by competitors,”¹⁶⁵ and can facilitate contracting.¹⁶⁶ More recently, F. Scott Kieff has amplified Kitch’s analysis by focusing on how granting of a patent on new technology may tend to promote commercialization of that technology.¹⁶⁷ For both Kitch and Kieff, then, patents can accelerate commercialization.

It might seem that an inference based on the importance of commercialization is that patenting should wait until after commercialization so that there are incentives to take this step. Yet in fact, the literature on the prospect theory suggests the opposite, for two distinct reasons. First, an inventor who holds a patent may be more likely to commercialize than an inventor who hopes to have a chance of receiving a patent after commercialization.¹⁶⁸ Second, when an inventor holds a patent before commercialization, there is likely to be less duplication in commercialization efforts.¹⁶⁹ The ex post effects of this may be equivocal; sometimes duplication in commercialization is what we call “competition.”¹⁷⁰ But, the ex ante effect of early patenting is that the invention is likely to be made earlier, when inventors anticipate that if patents are awarded relatively early, the amount that they might lose in a patent race is limited.¹⁷¹ If the race is not simply to create an invention but to create and then commercialize the invention, then the race will not be as attractive to enter because the expected costs of entry are higher. This argument suggests that the prospect approach of granting patents on nascent

163. Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977).

164. *Id.* at 276.

165. *Id.*

166. *Id.* at 277-78.

167. F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697 (2001).

168. *Id.* at 710.

169. See Duffy, *supra* note 110, at 444 (discussing “the prospect features of the patent system—particularly the preference for the grant of patent rights early, before most of the resources have been committed to developing the technology and before much wasteful duplication can occur”).

170. See Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 872 (1990).

171. Duffy, *supra* note 110, at 469-75.

technologies may be useful not solely for its ex post effects but also for its ex ante effects.

The ex ante effect of accelerating invention, however, is not a social benefit if it does not also translate into acceleration of commercialization. A promise of a prospect patent surely leads to speculative patents being issued earlier than they otherwise would but to no useful end. Our analysis thus suggests a distinction between a speculative patent and a prophetic prospect patent that reflects a significant technological advance. Granting a prospect patent on an invention may be appropriate when commercialization efforts will follow thereafter, as then the promise of the patent accelerates invention and the resulting commercialization. Even if commercialization will not follow immediately, a prospect patent will be appropriate if, by some time after commercialization would be expected to occur, the invention would not have been created in the absence of the patent system. The inducement standard thus separates cases in which the ex ante prospect theory rationale supports patenting from those in which it does not.

The more traditional ex post rationale for prospect theory, however, could be advanced against our approach and in favor of speculative patents. Under this theory, even if a speculative patent reflects no or minimal technological advance, the granting of a property right may accelerate commercialization. We should, the theory goes, grant speculative patents because it is useful to grant property rights to someone as a way of spurring additional discovery. The most straightforward approach is then to grant the property rights over a technological area to the first person who recognizes the future existence of that area. Moreover, a benefit of granting rights in this way is that potential patentees will compete to recognize future technological areas first. As a result, the patent will be awarded to the party who agrees to take the patent right for the shortest possible patent term.¹⁷²

We acknowledge potential benefits to such an approach but believe that the costs exceed the benefits.¹⁷³ Once such a patent exists, the patent holder will have greater incentive to work on solving relevant technological and market problems because the initial patent increases the share of producer surplus that

172. However, even granting the proposition that patents will accelerate commercialization ex post, there is a disadvantage to this proposal. The usable portion of the patent term may end up being so small that there is little incentive to commercialize. See Michael Abramowicz, *The Danger of Underdeveloped Patent Prospects*, 92 CORNELL L. REV. 1065 (2007) (providing an overview of this problem).

173. See Michael Abramowicz, *The Uneasy Case for Patent Races over Auctions*, 60 STAN. L. REV. 803 (2007).

the patent holder can expect to receive.¹⁷⁴ But the incentive of other parties to work on the technological problems may be reduced if they believe that they will have to pay a tax to the first patent holder. This latter consideration may help explain the findings of those who have cast empirical doubt on the proposition that consolidating property rights tends to accelerate invention.¹⁷⁵ Although we cannot purport to resolve the problem conclusively, we suspect that granting property rights over a technological area to someone who has done nothing to accelerate development will likely reduce rather than increase overall investment in the technology.¹⁷⁶

This suggests that one should not grant a patent unless the inventor has solved a relatively significant percentage of the technological problems that need to be solved before commercialization can occur or unless others have already done so and the inventor has contributed one of the missing pieces. In these cases, the invention itself will generally—though not always—accelerate commercialization, and the ex post effects of granting a patent seem likely to accelerate invention as well. Once an inventor has worked out a large portion of a puzzle and possesses at least a blocking right against anyone else who might complete another piece of the puzzle,¹⁷⁷ this inventor will have strong incentives considerably stronger than those of anyone else to complete the puzzle and commercialize it. By contrast, a speculative patent holder's best strategy may be to do nothing, hope that others will do the hard work of invention and commercialization, and then sue for infringement. This is, of course, the story of a "patent troll," a nonpracticing entity that has contributed little technology but hopes to use patenting as a source of profit.¹⁷⁸ The inducement standard could thwart this strategy, while still preserving the ability of those who have made genuine technological contributions to be nonpracticing entities who license their technology to others.

3. *Merges's Model of Nonobviousness*

Perhaps the most significant obstacle in the existing legal literature to our interpretation of the *Graham* inducement standard lies in a classic article on the

174. Duffy, *supra* note 110, at 483-91.

175. See Merges & Nelson, *supra* note 170, at 894-97.

176. See Abramowicz, *supra* note 173, at 845-47 (explaining how an auction design might stimulate additional research spending).

177. For discussions of blocking patents, see *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1364-66 (Fed. Cir. 2010); and Robert Merges, *Intellectual Property Rights and Bargaining Breakdown: The Case of Blocking Patents*, 62 TENN. L. REV. 75 (1994).

178. See *supra* note 24 and accompanying text.

economics of the nonobviousness standard, written by Robert Merges.¹⁷⁹ The article is an obstacle because Merges explicitly addresses the question that the literature has otherwise largely ignored—whether the degree to which an invention increases the probability of commercial success is relevant to the obviousness test—and concludes that it is not relevant. We will nonetheless argue that Merges’s broad argument in fact supports our position and then refute the specific argument that Merges makes against considering commercial success in the obviousness inquiry.

Merges’s model shows that patent protection may augment the incentives of an individual inventor to undertake technological experiments and then to bring these experiments to market. For Merges, the nonobviousness requirement rewards inventions that reduce uncertainty about the probability of success.¹⁸⁰ If initially a research path seems to have only a small probability of producing a successful technical result, but after some set of costly experiments a successful result is achieved, then the invention resulting from the research path is likely to count as nonobvious because the probability of success is now considerably higher. Merges recognizes that firms often will innovate without patent protection, for example because of first-mover advantages, but patent protection can increase incentives to take on low-probability or high-cost projects.

Merges’s approach is not a restatement of the inducement standard of patentability. Indeed, although he identifies the *Graham* approach as “[t]he conventional ideal standard of patentability,”¹⁸¹ he identifies an objection that would be powerful without our view of *Graham* as promoting inventions that accelerate technology, arguing that “very few patents would be granted today under this standard, since so few industries consider patents essential.”¹⁸² Nonetheless, Merges’s approach is conceptually consistent with the *Graham* approach under our interpretation. His preferred standard “rewards one who successfully invents when the uncertainty facing her prior to the invention makes it more likely than not that the invention won’t succeed,”¹⁸³ and he would measure uncertainty “from the perspective of the average skilled

179. Robert P. Merges, *Uncertainty and the Standard of Patentability*, 7 HIGH TECH. L.J. 1 (1992).

180. *Id.* at 29-32.

181. *Id.* at 19.

182. *Id.* Even in some industries that do not consider patents essential, patents may accelerate invention and commercialization.

183. *Id.* (emphasis omitted). Merges’s model, however, does not establish the fifty percent success probability level as always the relevant threshold for judging nonobviousness.

inventor in the field.”¹⁸⁴ When a research path appears unlikely to produce a successful invention, incentives to undertake that research path may be inefficiently low in the absence of patents. If the probability is sufficiently low, first-mover advantages may be inadequate and inventors will not undertake such research. Thus, the inventions that are induced by patent law will generally be those that *ex ante* appear to be low probability. Merges also recognizes that cost may be important.¹⁸⁵ Although he would not make cost central to the patentability standard, he argues that the patentability threshold should be lower “for very high-cost research.”¹⁸⁶ Our interpretation of the *Graham* test recognizes central roles for both uncertainty and cost because, in the absence of patent protection, either a low probability of success or a high cost of experimentation would generally significantly delay commercialization.

Although we believe that the inducement standard, properly conceived, provides a better integrated explanation of, and justification for, the nonobviousness standard than do separate focuses on probability and cost, Merges’s model provides support for our approach. We agree that when an experiment has a high probability of succeeding and is relatively inexpensive, patent law is not needed to induce the resulting invention. Our chief improvement on Merges’s model is our focus on whether invention accelerates the date of commercialization, which makes his static model dynamic and embraces concerns about both probability and cost. Merges’s model nonetheless provides indirect support for this variation on the inducement standard. One justification for patentability, Merges notes, is that patents may increase not only the incentive to engage in technological experimentation but also the incentive to engage in development and commercialization of the results of experiments. It should be a small step from this recognition to our argument that the nonobviousness standard should be designed to exclude from patentability inventions that would not significantly accelerate commercialization.

“The model,” he writes, “shows that patents may have a greater impact on incentives to *develop* than incentives to *invent*. Once a promising result is in hand, the heightened payoff from a patent more directly affects the expected value of developing the product.”¹⁸⁷ Merges’s model thus shows that factoring

184. *Id.* at 20.

185. Merges cites the case of “a fairly certain experiment, leading to a product likely to succeed in the market, but involving very high experimentation costs and/or costs of commercial failure.” *Id.* at 32.

186. *Id.* at 4; *see also id.* at 43-55 (arguing that such a lower threshold would likely only affect risk-averse firms that require an extra incentive to conduct risky research).

187. *Id.* at 33.

commercial uncertainty into the obviousness inquiry improves efficiency, moving the patent system closer to a hypothetically ideal system from the perspective of the *Graham* inducement standard. The patent system should be willing to count an invention as nonobvious when the invention and its development sufficiently lower uncertainty about the ultimate success of a research path, including consideration of commercial uncertainty. For Merges, in sum, “the key factor is the level of uncertainty facing the inventor just prior to the crucial experiment leading up to the patent.”¹⁸⁸

Perhaps surprisingly, then, Merges does not conclude that the probability of commercial success should affect the definition of nonobviousness. He asks: “Why focus on uncertainty at the initial experimental stage, when uncertainty at the second, or commercialization stage, can also drive expected returns below the break-even point, hence discouraging perhaps useful research?”¹⁸⁹ Merges offers “two primary reasons,”¹⁹⁰ developed in just two brief paragraphs, as to why reduction in commercial uncertainty should not be relevant to a nonobviousness assessment.

The first argument is that there is “intrinsic social value [in] producing information in the face of highly uncertain technical challenges.”¹⁹¹ In contrast, he claims that “information about what the market desires would seem to produce relatively few positive externalities.”¹⁹² Merges’s assertion, however, is irrelevant to the issue of whether nonobviousness should be judged by the extent to which an invention reduces commercial uncertainty. When technological experimentation reduces uncertainty, it will also have the effect of reducing commercial uncertainty. Thus, analysis of the degree to which an invention reduces commercial uncertainty is a measure of the technological achievement. Even if, contrary to our argument below, there is no social value to encouraging information about the marketplace, it may still be useful to measure technical achievement in commercial terms. Just as cost-benefit analysis seeks to use dollars as a common metric for aggregating a wide range of considerations, so too is reduction of commercial uncertainty a useful measure of technological achievement.

188. *Id.*

189. *Id.* at 34.

190. *Id.*

191. *Id.*

192. *Id.* For an argument that free rider problems may also prevent optimal production of information about what the market desires, see Michael Abramowicz & John F. Duffy, *Intellectual Property for Market Experimentation*, 83 N.Y.U. L. REV. 337, 346–51 (2008).

Nominally in support of his first argument – but instead making an entirely separate argument – Merges states that “assess[ing] commercial or market uncertainty . . . would seem to be even more difficult than assessing technical uncertainty, as in the current patent system.”¹⁹³ As will be revisited below, assessing commercial uncertainty, and in particular the degree to which an innovation has reduced such uncertainty, presents a timing challenge because patents are often awarded before commercialization. Nevertheless, if patent decisionmakers can assess in hindsight whether scientists would have believed that a particular approach would be successful, however, why should they not be able to assess in hindsight whether businesspeople would have thought that an approach would be successful? Just as a firm might be able to produce internal evidence that its scientists doubted that a particular approach would work (for example, because they initially tried some other approach), so too might a firm be able to produce evidence that potential funders were skeptical that the business could succeed. Indeed, there is a good reason that commercial success is sometimes called objective evidence of nonobviousness; and sometimes (though not all the time) it may be assessed more objectively than purely technological information by a court.¹⁹⁴

Finally, Merges argues that a promising experiment produces valuable information “*even if it never leads to a viable commercial product.*”¹⁹⁵ One interpretation of this argument is that measuring the degree to which an invention is expected to accelerate commercialization is a poor measure of technological achievement and thus of the degree to which an invention should be thought of as nonobvious. We agree that many technically remarkable inventions never will in fact lead to viable commercial products because some other requirement for successful commercialization, such as consumer demand, will never materialize. Properly conceived, the inducement standard demands measuring not absolute value, but relative value in comparison to the experimentation needed for complementary technologies.¹⁹⁶ We suspect that our approach would deny patentability to significant advances only when those advances are so abstract that it seems almost impossible that they could accelerate technology. Such advances might be unpatentable subject matter regardless.¹⁹⁷

193. Merges, *supra* note 179, at 34.

194. See *infra* Subsection III.B.2.

195. Merges, *supra* note 179, at 34.

196. See *infra* text following note 251.

197. See *Bilski v. Kappos*, 130 S. Ct. 3218, 3229–31 (2010) (confirming that abstract ideas are unpatentable under 35 U.S.C. § 101 (2006)).

III. ADMINISTERING THE INDUCEMENT STANDARD

Still confronting us is the task of moving from the *Graham* inducement standard to a functional doctrinal definition. This task reflects at least two challenges. The first challenge is that even if the inducement standard is the appropriate theoretical basis for distinguishing obvious from nonobvious inventions, decisionmakers might have trouble applying the test directly. It might even seem to invite dangerous inconsistency to ask decisionmakers to imagine a hypothetical world without patent incentives, in part because different people might have different opinions about the effect of patent protection on innovation. Even so, the *Graham* inducement standard can generate a structured approach that provides guidance on nonobviousness to decisionmakers as they develop legal standards. Moreover, the structured approach should be largely familiar. As the statute demands, we would begin by asking decisionmakers to consider what would be obvious to a person having ordinary skill in the art, though decisionmakers would be instructed that an entity could count as a person, and the question would be whether, absent patent incentives, this person would find it economically obvious to undertake the research necessary for success.

The second challenge results from our argument that nonobviousness should depend on the extent to which a patent accelerates commercialization. Commercialization, we have argued, ought not be required in advance of patenting because such an extension of patent races would tend to postpone invention.¹⁹⁸ Nevertheless, depending on the circumstances, commercialization might serve as evidence either in favor of or against inducement.¹⁹⁹ It might appear, however, that even if evidence from market experiments is theoretically relevant, patent law simply cannot take that information into account because market experimentation generally occurs after a patent is granted. But we believe that common law rules can give extra credit in the validity determination to a patentee who has engaged in commercialization not likely to have occurred in the absence of receipt of a patent and can penalize a patentee when others who were not seeking patent protection commercialize the invention. The key is that courts often will be differently situated from examiners and may be able to take into account evidence not available when granting patents. Indeed, the courts have developed a series of objective indicia

198. See *supra* notes 155-157 and accompanying text.

199. It will militate in favor of inducement where the patentee promptly commercializes and no one else does, and against inducement where one or more other parties commercialize but the patentee does not.

of nonobviousness, which the *Graham* Court²⁰⁰ (perhaps regrettably) labeled “secondary considerations.”²⁰¹ The secondary considerations as understood by courts today make more sense in light of the inducement theory, and an appreciation of the role of commercialization can further clarify and improve how the courts apply the secondary considerations.

Thus, in addition to asking decisionmakers to consider the obviousness question from the perspective of the person having ordinary skill in the art, courts ideally should offer further guidance on the secondary considerations. Our analysis would continue to place considerable emphasis on many of the traditional secondary considerations of nonobviousness, such as a long-felt need for an invention and the failure of others. An additional consideration of nonobviousness that we would add to the inquiry is the cost of the experimentation leading to the invention. This is not dispositive, as the relevant factor is what the invention would have been expected to cost, but it is helpful evidence. Meanwhile, we would recast the most historically important of the secondary considerations, commercial success, so that the relevant question would be unexpected commercial success, which tends to show that a risky project would not have been undertaken without patent incentives. Finally, we would add several considerations of obviousness, guided by our analysis of the competitive dynamics of the patent system.²⁰² For example, the fact that there was a positive demand shock shortly before the invention would tend toward obviousness, as would be a rapidly declining cost of invention. In total, this would provide considerable guidance to decisionmakers beyond what they receive now, without changing the overall structure of the obviousness inquiry.

The approach that we suggest, though representing a shift in emphasis to which the courts would need to acclimate, would be more administrable than the current system. First, we avoid the inevitable confusion that results from doctrinal incoherence. As we have shown, at present courts nominally apply a cognitive approach to nonobviousness but then smuggle economic

200. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966).

201. The courts' weight on secondary considerations is sufficiently great that the label “secondary” can be misleading. See Kevin Rhodes, Comment, *The Federal Circuit's Patent Nonobviousness Standards: Theoretical Perspectives on Recent Doctrinal Changes*, 85 NW. U. L. REV. 1051, 1068-76 (1991). These considerations may be even more important under recent case law. See Amanda Wieker, *Secondary Considerations Should Be Given Increased Weight in Obviousness Inquiries Under 35 U.S.C. § 103 in the Post-KSR v. Teleflex World*, 17 FED. CIR. B.J. 665 (2008).

202. See *supra* Section II.B.

considerations into the analysis.²⁰³ Second, the different parts of our test, the PHOSITA analysis and the secondary considerations, are more cohesive. Today, it sometimes seems that the two parts of the nonobviousness inquiry are almost unrelated,²⁰⁴ but we emphasize that each part is a tool for addressing the fundamental question of patent inducement. Third, our test provides more guidance than existing tests, because it highlights fundamental policy choices. Current decisionmakers receive essentially no guidance on how nonobvious an invention must be, but our insistence that decisionmakers consider whether technology is substantially accelerated provides structure to the inquiry. We do not say definitively what counts as “substantial,” but the duration of the patent term is a natural point of comparison, and we invite decisionmakers to compare the dynamic benefit of any estimated number of years of acceleration with the static costs of the patent term. Fourth, our approach better takes advantage of the natural comparative advantages of patent examiners and courts, and we identify situations where courts should be less deferential because relevant information would not have been available to examiners.

A. Methodological Questions

1. Heuristics Versus Direct Application

Past commentators have embraced the inducement standard as a theoretical account of the purpose of the obviousness doctrine but have assumed that the standard would not be administrable.²⁰⁵ This observation makes sense on the assumption that decisionmakers would simply be told to apply the inducement standard in an open-ended fashion. The Supreme Court, in propounding the inducement standard, was not insisting that decisionmakers apply it directly in an unstructured way. Rather, the Court recognized the inducement standard was a useful description of what common law courts had been trying to achieve in developing the obviousness doctrine. Our call is for this evolutionary process to continue. Appellate judges developing frameworks for the obviousness test should see the inducement standard as a polestar, as should PTO officials developing guidelines for examiners. District judges or patent examiners could,

203. See *supra* Subsection I.A.2.

204. See, e.g., *Endress + Hauser, Inc. v. Hawk Measurement Sys. Pty. Ltd.*, 892 F. Supp. 1107, 1115-17 (S.D. Ind. 1995) (separating the two parts of the analysis into two unintegrated, separately numbered sections).

205. See *supra* notes 13-14 and accompanying text.

and ideally should, consider the inducement standard directly. Having a deeper theoretical understanding of the nonobviousness inquiry should tend to improve decisionmaking. Our goal, though, is to refine the existing administrative framework of the nonobviousness inquiry to nudge decisionmakers toward taking into account relevant concerns, even if they reflect little on first principles in day-to-day patent administration. Our approach emphasizes heuristics like the PHOSITA and secondary considerations of nonobviousness that should work tolerably well even when decisionmakers are unaware of the justifications for these heuristics.

There are several reasons to prefer this approach over one that seeks to use the inducement standard as an unfiltered doctrinal test. First, we recognize the need for caution in attempts to solve the nonobviousness problem merely by conjuring up a perfect verbal explanation of what it means to be nonobvious. Switching from a cognitive approach to a more pragmatic one may help ground the inquiry, but any definition must ultimately be interpreted by a patent examiner or a judicial decisionmaker. The extent to which subtle distinctions in a definition actually affect legal decisionmakers is an empirical question.²⁰⁶ It is not clear how much of a difference instructing the decisionmaker to apply the inducement standard would make. Decisionmakers might well make serious errors. Even the best definitions may be somewhat prone to cognitive errors such as hindsight bias.²⁰⁷ But providing heuristics can lead to more consistent decisionmaking, even if the heuristics are an imperfect approximation of the underlying theoretical concept.

Second, for some inventions it may be impractical for decisionmakers to try to identify the market conditions at the time of an invention in a way that would be helpful to apply our definition. In principle, the relevant inducement standard question is how long it would take for the *market* to have produced a particular invention absent patent incentives, but a decisionmaker may have little information about the market beyond the inventor. And yet another layer of complexity would result from trying to determine how firms might have acted differently in the absence of patent law. As a result, it is useful to have a

206. For a recent argument that administrative law doctrines have almost no effect on the outcomes of cases, see Richard J. Pierce, Jr., *What Do the Studies of Judicial Review of Agency Actions Mean?*, 63 ADMIN. L. REV. 77 (2011).

207. See Gregory N. Mandel, *Patently Non-Obvious: Empirical Demonstration that the Hindsight Bias Renders Patent Decisions Irrational*, 67 OHIO ST. L.J. 1391 (2006) (discussing the problem of hindsight bias in the patent context). The inducement standard presents a problem of hindsight, as once the technology is developed, decisionmakers might imagine that one would not need the patent system to develop it. It might seem to add to this the challenge of foresight, as the decisionmakers must anticipate whether the invention would accelerate commercialization, at least in cases in which commercialization has not already occurred.

test that allows the decisionmakers at least initially to have a more limited focus, while also taking into account objective proxies for market conditions. We do not rule out the possibility that sometimes in high-end patent litigation, it might be appropriate for expert economists to testify directly on the inducement question. In the ordinary case and at least initially, however, decisionmakers must be able to focus on a relatively small number of easily digested pieces of information.

Third, asking decisionmakers to apply the inducement standard directly would be a revolution. It is hard to see how such a revolution would take place. Even though the Supreme Court has embraced the standard, it seems unlikely that the Court could properly insist that decisionmakers consider the standard directly. If a jury must make a validity determination,²⁰⁸ for example, it would be awkward for the Supreme Court to invalidate jury instructions that included the text of § 103. What the Court can do by embracing the inducement standard is persuade lower courts that, if they do not give adequate attention to the inducement standard, then there is a risk that they will reach incorrect results that superior courts will reverse. Our goal is to show how some modest clarifications of principles that decisionmakers already apply can steer them in the right direction. The changes we recommend still might not seem modest to someone who is steeped in current practices, but we believe that these changes will be less tumultuous than the current path of maintaining nonobviousness as an essentially cognitive inquiry but injecting into the analysis considerations that are undoubtedly economic in nature.

2. Courts Versus Agencies

A significant debate in patent law concerns the relative importance of the PTO and of the courts in deciding questions of patent validity. On one side, Mark Lemley has argued that the PTO should be rationally ignorant. Recognizing that it has a relatively small amount of time in which to decide whether to issue a patent, the office might grant some patents despite some

²⁰⁸ Although patent validity in general, and obviousness in particular, are issues of law, *see* *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966), current Federal Circuit case law allows juries to render verdicts on obviousness questions, *see, e.g.,* *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1234 (Fed. Cir. 1989) (“It is established that the jury may decide the questions of anticipation and obviousness . . .”). The Federal Circuit case law on this point conflicts with the decisions of other circuits rendered before the creation of the Federal Circuit. *See, e.g.,* *Sarkisian v. Winn-Proof Corp.*, 688 F.2d 647, 651 (9th Cir. 1982) (en banc) (holding that because obviousness is a question of law, jury verdicts on the issue must be considered advisory only and that “[t]he court must, in all cases, determine obviousness as a question of law independent of the jury’s conclusion”).

uncertainty about whether invalidating prior art might be found, leaving the courts a role to play in invalidating the patent.²⁰⁹ F. Scott Kieff has gone still further, arguing that the patent system should be replaced with a registration system.²¹⁰ With appropriate fee-shifting rules,²¹¹ Kieff maintains that the courts should be trusted with complete responsibility for validity determinations. On the other side are those who insist that it is critical for investors to know whether a patent is valid before they back either the patent-protected product or one that might be accused of infringement.²¹² This view implies that the courts should almost always defer to PTO decisions. Existing law is somewhere between these extremes. The Federal Circuit grants a strong presumption of patent validity, even where the PTO never considered allegedly invalidating prior art,²¹³ but it is still not uncommon for a court to find a patent invalid.²¹⁴ That courts sometimes disagree with the PTO's nonobviousness determinations,²¹⁵ and that the Federal Circuit often disagrees with the

209. See Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495 (2001).

210. See F. Scott Kieff, *The Case for Registering Patents and the Law and Economics of Present Patent-Obtaining Rules*, 45 B.C. L. REV. 55 (2003).

211. *Id.* at 119-20 & n.278.

212. The Supreme Court, however, has sometimes adopted relatively vague and uncertain rules despite this concern. See *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 732 (2002) ("Each time the Court has considered the doctrine [of equivalents], it has acknowledged this uncertainty as the price of ensuring the appropriate incentives for innovation, and it has affirmed the doctrine over dissents that urged a more certain rule.").

213. *24 Techs., Inc. v. Microsoft Corp.*, 507 F.3d 1340, 1354-55 (Fed. Cir. 2007) (holding, consistent with a long line of Federal Circuit precedents, that clear and convincing evidence is needed to invalidate a patent even where the PTO failed to consider the relevant art). We believe that this doctrine conflicts with basic principles of administrative law. Courts generally presume the actions of administrative agencies to be valid. See, e.g., *Citizens To Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 415 (1971) ("Certainly, the Secretary's decision is entitled to a presumption of regularity."); *Hynes v. Grimes Packing Co.*, 337 U.S. 86, 101 (1949) ("An administrative order is presumptively valid."). But that presumed validity yields entirely "if the agency has . . . entirely failed to consider an important aspect of the problem." *Motor Vehicle Mfrs. Ass'n of the U.S. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983).

214. See Kimberly A. Moore, *Judges, Juries, and Patent Cases: An Empirical Peek Inside the Black Box*, 99 MICH. L. REV. 365, 380, 390 tbl.4 (2000) (reporting patents held invalid in thirty-three percent of 1151 validity determinations in U.S. patent trials from 1983 to 1999). It may be dangerous to extrapolate too much from this statistic, as cases that are tried may be a nonrepresentative sample of all disputes. See Peter Siegelman & Joel Waldfogel, *Toward a Taxonomy of Disputes: New Evidence Through the Prism of the Priest/Klein Model*, 28 J. LEGAL STUD. 101 (1999) (offering empirical support for the proposition that plaintiff win rates will be a function of structural parameters, such as the parties' uncertainty, given the existence of settlement before trial).

215. See, e.g., *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324 (Fed. Cir. 2009).

determinations of lower federal courts, reinforces the view that the existing obviousness test allows for a great deal of disagreement.

Regardless of whether the economic approach increases or decreases the predictability of the obviousness test, it might appear likely to increase the divide between the PTO and the courts. We have argued that commercialization activity, both by the patentee and by other parties, may be relevant to the inducement standard. Patent applications are generally filed before commercialization, however, and the patent PTO then must make a decision whether to award a patent before commercialization evidence fully develops. The courts, meanwhile, should generally be in a better position to analyze commercialization, both because adjudication will generally take place years after a patent is issued²¹⁶ and because judges may have more time to consider this evidence than harried examiners generally do. Application of the inducement standard, one might worry, will create two laws of nonobviousness, one in the administrative agency and one in the courts.

This need not, however, be cause for concern. There are good reasons for the PTO and the courts to share the task of determining patent validity, and conventional wisdom holds that it makes sense to have an early determination of nonobviousness by the agency and a later, more thorough review by the courts.²¹⁷ This conventional wisdom makes even more sense once the obviousness test is viewed in economic rather than purely cognitive terms. If, after all, the only question is whether a hypothetical person at a hypothetical time would understand that a particular technological solution exists for some problem, then it might seem strange to delay decisionmaking, aggravating concerns about hindsight bias.²¹⁸ If all the prior art is presented to an examiner, the additional time that courts have to consider evidence might seem to have little relevance. When obviousness is conceived in purely cognitive terms, the question is whether one who knows the prior art will easily conceptualize the invention, and it might seem that a quick reaction to that question best allows the decisionmaker to simulate the mindset of the inventor.²¹⁹ If the inducement

216. See, e.g., SAMSON VERMONT, LITIGATION RISK ANALYSIS: THE ECONOMICS OF PATENTS AND LITIGATION, Part IV, http://www.hunton.com/files/tbl_s47Details/FileUpload265/388/Risk_Reward_4.pdf (last visited Jan. 30, 2011) (stating that for the average litigated patent, final judgment is not rendered until 12.3 years after the patent application was filed).

217. See Lemley, *supra* note 209, at 1510 (arguing that, at the margin, spending more money on litigation makes more sense than spending more money on improved patent searches).

218. See *supra* note 207 and accompanying text.

219. Cf. MALCOLM GLADWELL, BLINK (2005) (arguing that instantaneous decisions are sometimes better than reasoned ones). But see Richard A. Posner, *Blinkered*, NEW REPUBLIC, Jan. 24,

standard suggests that an economic approach is more appropriate than a cognitive one, and if the economic approach requires more analysis, we should be willing to accept a greater discrepancy in roles for the agency and the courts.

We doubt, however, that explicit adoption of an economic approach would increase the discrepancy significantly. The courts, after all, have already incorporated economic considerations into the process of evaluating patent validity. One vehicle through which they do this is the secondary considerations of nonobviousness, and in particular the consideration that is most frequently asserted in litigation, commercial success.²²⁰ Although PTO procedure allows examiners to take into account commercial success,²²¹ timing problems may often prevent patent applicants from reporting it. A discrepancy thus already exists, and as long as the heuristics that we recommend hew reasonably closely to the existing secondary considerations, agency and judicial decisions should be no more discrepant than previously. Indeed, the adoption of a cohesive obviousness test may present an opportunity to make agency and judicial decisions less discrepant, even if timing issues prevent the agency from taking some of the secondary considerations into account. Adoption of the economic approach allows all of the secondary considerations to be conceived in terms of the inducement standard, and so as long as the agency can take into account some of the secondary considerations the agency and the courts may be more likely to agree. Agency-court disagreement may be greater when the agency conceives of nonobviousness in cognitive terms while the courts alone add into the mix a number of primarily economic factors.

B. A Structured Economic Inquiry

The existing framework for applying the obviousness doctrine can, with minor extensions and adjustments, accommodate the inducement standard's insights. An economic approach retains the statute's focus on the person having ordinary skill in the art but considers not simply what this person would think about technology but also the economic incentives that this person faces. Subsection III.B.1 elaborates on this inquiry, and Subsection III.B.2 explains how the secondary considerations of nonobviousness can reinforce the economic approach.

2005, at 27, available at <http://www.tnr.com/article/blinkered> (critiquing Gladwell's argument).

220. See *infra* Subsection III.B.2.b.

221. See, e.g., U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE § 716.03 (8th ed. 6th rev. Sept. 2007), available at <http://www.uspto.gov/web/offices/pac/mpep/mpep.htm>.

1. Obviousness of the Invention to a PHOSITA

Ideally, the PHOSITA obviousness test²²² should reflect a central insight of the inducement standard: that whether an invention is obvious depends on how costly an experiment would be and the probability that the experiment would be successful. The obviousness test should generally protect inventions that are expensive to generate, either because an experiment that might produce the invention is itself expensive or because it is unlikely to lead to the invention. Fortunately, the PHOSITA obviousness test can accommodate these insights as long as the test no longer isolates the PHOSITA's state of mind regarding technology from economic considerations. The required addition to the test would be that an invention should be considered obvious when a PHOSITA would have considered it obvious that it would be worth trying the experiments needed to obtain the invention in question, even if it would be impossible to obtain a patent on the results or keep them a trade secret.²²³ This approach is consistent with the "easily discovered" definition of obvious and simply turns the PHOSITA into a person (or an entity)²²⁴ with economic common sense as well as technological knowledge.

This approach embraces the inducement standard by insisting that the decisionmaker consider what the PHOSITA would have done absent patent incentives or the protection of trade secrecy. As such, we are vulnerable to some of the concerns that we had about simply instructing decisionmakers to apply the inducement standard, though we think that these concerns are not as severe. This instruction would keep the court's focus on the PHOSITA, while ideally noting that an entity can be a "person." An expert might well testify about what such a person thought about economic feasibility, for example by noting the investments in machines and personnel that would have been necessary to accomplish an experiment. But we would not need a phalanx of market experts expounding on market structure and projections. If this principle were clarified in common law, it could easily be absorbed into practice without worrying about how decisionmakers would interpret an entirely new framework.

222. See *supra* Subsection I.A.1.

223. Note that the question is not whether the PHOSITA would have tried the experiment personally. It might be that any individual PHOSITA would conclude that the experiment is so obvious that some other PHOSITA would likely do it. The question is whether it would be worth the effort of some PHOSITA, even if imperfect information leaves some slim possibility that no one will actually do the experiment on the assumption that others are doing it.

224. See *supra* Section I.A.

The law can nudge decisionmakers to consider inducement by turning the PHOSITA into someone with ordinary sensitivity to the economic realities of innovation without patents. This approach avoids turning the PHOSITA into an economic superman or superwoman, one who understands all economic models or has perfect economic foresight. The PHOSITA instead becomes closer to the reasonable person of tort law. In practice, tort decisionmakers do not ordinarily perform detailed cost-benefit analyses to realize the Hand formula,²²⁵ and there is similarly no reason to worry that giving the PHOSITA some economic common sense will open the floodgates so that sophisticated economic models will be needed to make everyday patent decisions. We would not necessarily prohibit such modeling; perhaps in the rare case such modeling might be helpful. But the experience of tort law at least suggests that just because a hypothetical reasonable person takes into account economic considerations does not mean that the legal regime must be interpreted in a way that provides full employment for economists.

Our PHOSITA is of course a hypothetical entity, as an objective standard necessarily requires. But we do not think it is any more hypothetical than the PHOSITA of present patent law, and indeed we suspect that our changes might allow emergence of a PHOSITA that is somewhat less hypothetical than the present one. The present PHOSITA, we have noted, is assumed to have a perfect knowledge of all prior art but ordinary creativity in assembling disparate pieces of this art.²²⁶ Our move away from a cognitive test suggests less emphasis on what the PHOSITA knows and more emphasis on what the PHOSITA can discover and on how much such discovery would cost. An implication is that more emphasis should be placed on a well-known piece of prior art than on one that is in a journal obscure even to experts in the relevant fields. Similarly, more emphasis should be placed on a piece of prior art that can be easily found with Internet searches than on one that, rather than use common words in a field, invents its own lexicon in such a way as to hide the invention from all but the most determined searcher.²²⁷ All prior art would, of course, remain relevant to the novelty inquiry,²²⁸ but the inquiry into obviousness would more closely track the experience of real scientists who

225. See Stephen G. Gilles, *The Invisible Hand Formula*, 80 VA. L. REV. 1015, 1020 (1994) (noting that it is puzzling that jury instructions do not generally reference the Hand Formula directly).

226. See *supra* Subsection I.A.1.

227. See *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366-67 (Fed. Cir. 2002) (noting that patentees can define terms as they choose).

228. 35 U.S.C. § 102 (2006) (setting forth the novelty requirement).

attempt to discern the prior art as a step to solving a technical problem.²²⁹ This refinement of the PHOSITA test is independent of our primary suggestions, as one could conceive of an omniscient PHOSITA who also takes into account economic concerns, but the possibility helps show that our approach need not make the PHOSITA test more hypothetical and less administrable, and indeed it might well have the reverse effect.

A counterargument is that the PHOSITA test is settled doctrine and any major change in the conception of the PHOSITA will be unsettling. We agree, but it does not appear that patent doctrine can continue merrily along in any event given developments in the Supreme Court. In particular, the courts must flesh out the *KSR* decision's recognition that an invention could be obvious because it is obvious to try.²³⁰ The Federal Circuit has already moved in this direction, sensibly recognizing the relevance of factors such as the cost of experimentation.²³¹ But the result of these case law developments is doctrinal disjointedness that will persist as long as the courts combine a cognitive definition of nonobviousness combined with ad hoc doctrines importing economic considerations.

Consider the following example: even in the absence of a patent system, there would be AIDS researchers, working both for philanthropic causes and for companies that might hope to achieve some commercial benefit by being the first to introduce such a vaccine (for example, because of the benefits of trademark protection).²³² If it became obvious to such researchers, for example because of some scientific discovery, that it would be worth trying to perform the set of research steps, even without a patent incentive, then any resulting vaccine should count as obvious. But if it would not be obviously worthwhile for these scientists to devote their scarce research funds to a research path that would have led to the invention, then the resulting invention should count as nonobvious. The PHOSITA concept thus implicitly takes into account expected cost and expected probability of success. An inventor who develops a

229. In many industries, such scientists themselves may appear hypothetical, as lawyers commonly advise scientists not to consider issued patents for fear that they might expose themselves to willful infringement liability. See Mark A. Lemley & Ragesh K. Tangri, *Ending Patent Law's Willfulness Game*, 18 BERKELEY TECH. L.J. 1085, 1100-02 (2003) (explaining how willful infringement doctrine interferes with patent law's disclosure function).

230. See *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007); *supra* text accompanying note 52.

231. See *In re Kubin*, 561 F.3d 1351 (Fed. Cir. 2009); *supra* text accompanying notes 69-70.

232. The standard, of course, is objective, so philanthropic inventors should be as eligible for patents as anyone else. Even inventors who seek to promote the public domain sometimes may seek patents. See, e.g., Grant Gross, *Red Hat: Our Software Patents Are Defensive, and We'll Share*, LINUX.COM (May 29, 2002), <http://www.linux.com/archive/articles/23154> (explaining Red Hat's decision to seek software patents).

theory to try a research path that others would not have considered should be able to obtain a patent, whether this is because the research path would have been seen as too expensive, too unlikely to produce a positive outcome, or simply because the research path was so clever that individuals without a patent incentive would not likely have conceived of it. A proper understanding of the “obvious to try” concept flows naturally from our approach.

A virtue of this approach is that it takes into account the cost of the time of the person having ordinary skill in the art. One problem with the PHOSITA approach as generally conceived is that, even once we take into account the potential cost of executing the experiment, it might seem that the cost of the PHOSITA is not directly relevant. The test asks whether the invention would have been obvious to someone with ordinary skill in the art, not what the person charges or how many hours (or how many such people) achieving the result would require. Case law sometimes sets a somewhat arbitrary level for the education level or experience of the PHOSITA,²³³ without considering whether someone at that threshold would have sufficient incentives to innovate in the absence of patent protection. Worse, ordinary skill is likely to be set higher in fields where patent incentives have induced the hiring of highly skilled and expensive researchers,²³⁴ thus ratcheting up the patentability standard for fields that are inherently difficult to practice, even where no one would be practicing absent patent incentives. Our approach does not do this. Whether an experiment is worth the time of a PHOSITA depends implicitly on the alternative uses of a PHOSITA’s time. If a PHOSITA would have thought it better to work on other matters without the patent or trade secret incentive for a particular invention, that is enough for patentability.

Our approach to the PHOSITA test also conveys the appropriate baseline, a world in which the inventor makes decisions to invent but for reasons other than patent and trade secrecy. The inducement standard asks whether there would have existed alternative incentives (such as first-mover advantages and copyright law) for the invention. But we do not expect decisionmakers to read the business literature on first-mover advantages²³⁵ or to acquaint themselves

233. See, e.g., *Bose Corp. v. JBL, Inc.*, 112 F. Supp. 2d 138, 155 (D. Mass. 2000) (specifying that the PHOSITA “would have worked as a loudspeaker designer for two to three years”).

234. See Joseph P. Meara, *Just Who Is the Person Having Ordinary Skill in the Art? Patent Law’s Mysterious Personage*, 77 WASH. L. REV. 267, 280-81 (2002) (noting that the education level required will be higher for “those involved in drug discovery” than those involved “in the art of fly wraps for the legs of horses”).

235. See, e.g., Roger A. Kerin, P. Rajan Varadarajan & Robert A. Peterson, *First-Mover Advantage: A Synthesis, Conceptual Framework, and Research Propositions*, J. MARKETING, Oct. 1992, at 33, 34-39 (1992) (providing overview of literature); Marvin B. Lieberman & David B.

with more modern versions of Stephen Breyer's calculations about copyright incentives.²³⁶ We suspect, for example, that decisionmakers would be more wary of a software invention if presented with testimony indicating that either the patentee or its rivals intended to produce the product embodying some process in any event—in other words, that patenting was a secondary consideration. We also suspect that decisionmakers could be made to understand that pharmaceutical research is so expensive and so easily copied that nonpatent incentives to conduct it are ordinarily quite limited.

We do not mean to imply that the construct of a hypothetical person with economic common sense is perfect. There may be situations in which it could lead the decisionmaker astray, though it should be possible for common law decisionmaking and instructions to decisionmakers to limit this danger. Take, for example, the situation in which only the top experts in a field would recognize the wisdom of a particular approach, but they would do so even absent any inducement of patents. If, for example, some development in topology would have led a number of Nobel Prize-winning physicists to conceive of a particular invention even without patent protection, then those Prize winners ought to set the level of ordinary skill. This type of situation will not emerge often, but imagining it emphasizes that, in theory, the level of skill in the art may depend on the importance of the problem to be solved. This is the case particularly for inventions that are the result of intellectual contemplation. Highly trained scientists are likely to offer at least some analysis on extraordinarily important problems even without patent protection. If such scientists surely would have made a particular intellectual contribution without the inducement of patents, then the only relevant question should be whether it would be obvious to try any necessary follow-up experimentation in the absence of the patent system. An economic approach should thus permit the PHOSITA to be defined at a very high level of skill, even in some circumstances where the monetary incentives for invention are low.

In addition to constructing the PHOSITA as a person having ordinary economic sense, we also would make three subtle refinements that clarify the appropriate obviousness inquiry under the statute. First, as previously mentioned, we would construe "ordinary" skill to mean the level of skill that would exist without patent inducements. Currently, in litigation, the level of ordinary skill receives relatively little attention, with the parties often simply

Montgomery, *First-Mover Advantages*, STRATEGIC MGMT. J., Summer 1998, at 41, 42-47 (same).

236. See Stephen Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs*, 84 HARV. L. REV. 281, 294-95 (1970) (estimating costs for a first publisher and a copier).

stipulating that the relevant skill level is that of a Ph.D. researcher in the relevant field.²³⁷ That approach invites courts to treat *ordinary* as meaning *average*, which is incorrect and produces strange policy results. If the possibility of patents induces an industry to make more investments in research by hiring smarter and better-educated researchers, the law should reward the industry's investment with more patents, not punish it with an excessively stringent nonobviousness standard.

A second refinement is that the "art" relevant to the inquiry must hone in on the invention's exact contribution, or set of contributions, with the scope of the art resolved by reference to the economic incentives in the field. For example, if a software patent involves a complex structure for organizing interactions among different code modules, the relevant art may seem to be software architecture rather than merely software programming. But the decisionmaker should ask the further question whether specialists in software architecture would exist absent patent protection. If such specialists would not exist, then the PHOSITA may be much more of a generalist, with less ability to modify computer architecture. Also advances in some fields may typically depend on the collaborative efforts of several specialists. For example, the design of new surgical tools may require collaboration between surgeons and metallurgists. As a group, the collaborative entity might have a high degree of skill in both surgery and metallurgy, but the decisionmaker should ask whether, in the absence of patents, such collaborations would exist. If not, the PHOSITA may be a person with skill in the art of either surgery or metallurgy, but not both.

A third and final refinement demands rigorous attention to the scope of the "invention" at issue, with the overarching goal being to discourage speculative patents of the sort discussed above.²³⁸ Suppose, for example, that a 2011 patent application claims software for determining the order in which clothes removed from a dryer should be folded, taking into account factors such as the susceptibility of the fabric to wrinkles and the location of each item of clothing in the pile. In theory, such software could be used today to advise people doing laundry about the order in which to fold their clothes, but there would be

237. See, e.g., Herbert F. Schwartz, *KSR v. Teleflex: The Nonobviousness Requirement of Patentability*, 17 *FORDHAM INTELL. PROP. MEDIA & ENT. L.J.* 875, 909 (2007) (stating that sometimes "people just punt on it and they stipulate that the person of ordinary skill in the art has a Ph.D. in nuclear engineering, and then people go on to something else"). There are cases, however, in which the issue is litigated. See Meara, *supra* note 234 (providing an overview of doctrine and criticizing the tests as not well connected to the concerns of the obviousness doctrine).

238. See *supra* Section II.C.

almost no market for the software because people can readily make such decisions on their own. It is possible, though, that in a few years, robots will be able to fold laundry,²³⁹ and of course, the robots would need good software. How should the nonobviousness of the clothes-folding software be evaluated?

We believe that the inducement standard provides relatively clear guidance on the question: in evaluating the nonobviousness of the clothes-folding software, the inventor should receive neither a bonus nor penalty because an important complementary technology to the invention does not exist. Thus, the decisionmaker should not fall into the trap of thinking that, because it is highly uncertain and speculative that laundry-folding robots will ever be commercialized, software for such robots must be especially nonobvious. The invention is the software, not the robots, so the inventor's task of proving obviousness should not be made easier merely because uncertainties associated with complementary technologies make ultimate commercial success remote. We believe that the decisionmaker can avoid this trap through a simple heuristic: the decisionmaker should assume that all complementary technologies (such the robots) do exist and then determine whether, with those complementary technologies in existence, it would be obvious for a PHOSITA even without patent incentives to develop the claimed invention. The answer may depend on the sophistication of the invention. Given the technology to fold laundry robotically, a PHOSITA undoubtedly would need some software for determining the order to fold it. The invention should thus receive a patent covering only claims that represent an accomplishment beyond what the PHOSITA would do without a patent incentive. Our approach would thus reject speculative patents—for example, to the patent applicant who has not done little more than recognize that if robots are ever developed to fold clothes, they will need software to know to be extra careful with linen—while recognizing the possibility that genuine technological accomplishments often occur in advance of commercial application.

2. *Secondary Considerations*

Although the construct of the PHOSITA is mentioned in § 103 itself and is thus well established in the law, the broader case law on nonobviousness is today in a somewhat uncertain state. The Federal Circuit formerly followed the so-called teaching-suggestion-motivation test, finding that one of these was

²³⁹. See RLLberkeley, (50X) *Autonomously Folding a Pile of 5 Previously-Unseen Towels*, YOUTUBE (Mar. 17, 2010), <http://www.youtube.com/watch?v=gy5g33SoGzo> (demonstrating a primitive prototype).

required to make an invention nonobvious.²⁴⁰ In *KSR v. Teleflex*,²⁴¹ the Supreme Court rejected the teaching-suggestion-motivation test, seemingly adopting a more flexible test of nonobviousness. *KSR* creates an interpretive vacuum. Perhaps in future cases, the Supreme Court or the Federal Circuit could seize upon the inducement standard of *Graham* to clarify case law. In addition to potentially leading to the changes in the conception of PHOSITA that we suggest above, the Court also could focus on refining the analysis of the secondary considerations of nonobviousness.

a. Considerations of Nonobviousness

Graham itself first coined the term “secondary considerations,” and recognized the legitimacy of using these factors in deciding obviousness.²⁴² Secondary considerations are therefore a natural doctrinal path for further development of the nonobviousness standard. Moreover, the Federal Circuit has placed considerable emphasis on the secondary considerations, and so increased focus on or clarification of these considerations need not be a great divergence from the status quo. The factor most commonly raised in litigation, and often most controversial in academic commentary, is whether the invention has produced commercial success.²⁴³ Another factor, which one commentator describes as “the most prevalent form of evidence of nonobviousness relied on by patent applicants during patent examination,”²⁴⁴ is whether the experiment producing the invention has produced “unexpected

240. See, e.g., *C.R. Bard, Inc. v. M3 Sys., Inc.*, 157 F.3d 1340, 1352 (Fed. Cir. 1998) (discussing the test). The inducement standard will lead to the same results as the old test in many cases. Where there is a teaching, suggestion, or motivation indicating that a particular approach is likely to produce success, often there will be enough incentive for someone to follow through on this teaching, suggestion, or motivation, even without patent protection. But the inducement standard shows that this will lead to both false negatives and false positives. Sometimes, even without a teaching, suggestion, or motivation in the prior art, and even without a patent incentive, an invention might have been developed early enough to allow commercialization on close to the same timetable. On the other hand, a teaching, suggestion, or motivation might be so uncertain or expensive to pursue with further research that such research would not have occurred without a patent incentive.

241. 550 U.S. 398 (2007).

242. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966).

243. See, e.g., *In re Sernaker*, 702 F.2d 989, 996 (Fed. Cir. 1983) (discussing the relevance of commercial success).

244. Harris A. Pitlick, *Some Thoughts About Unexpected Results Jurisprudence*, 86 J. PAT. & TRADEMARK OFF. SOC'Y 169, 169 (2004).

results.”²⁴⁵ Other factors include whether others tried but failed to create the invention or solve the same problem,²⁴⁶ whether there was a long-felt need for the invention,²⁴⁷ whether competitors have agreed to license the invention,²⁴⁸ whether others skilled in the art have approved of the invention,²⁴⁹ and whether infringers have copied the invention.²⁵⁰ Some of these factors, such as failure of others and long-felt need, could be easily considered by examiners as well as by courts, while others, such as licensing and copying, may be ascertainable only in litigation. Commentators have proposed additional secondary considerations, such as whether the invention has provided the inventor with market power.²⁵¹

The inducement standard approach supports these secondary considerations in general, while also suggesting caveats. Inventions, we have seen, will generally be patent-induced when the experiments leading to them are expected to have a low probability of success and/or to bear a high cost relative to the rents to be earned from invention. The decisionmaker considering the PHOSITA can directly consider the difference between the claimed subject matter and the prior art, and the secondary considerations can assist the decisionmaker by identifying objective signs of low probability, high cost experimentation. The secondary considerations should reflect an understanding of the economics of patent races so that the decisionmaker need not necessarily understand directly the details of such a model.

The secondary considerations are largely successful in directing decisionmakers to the correct inquiries. The focus on unexpected results, for example, is consistent with the point that low probability experimentation

245. See, e.g., *Takeda Chem. Indus. v. Alphapharm Pty., Ltd.*, 492 F.3d 1350, 1354 (Fed. Cir. 2007) (“[A]ny prima facie case of obviousness was rebutted by the unexpected results of [the product’s] non-toxicity.”).

246. See, e.g., *Knoll Pharm. Co. v. Teva Pharm. USA, Inc.*, 367 F.3d 1381, 1385 (Fed. Cir. 2004) (holding that the district court erred by failing to consider “evidence of the failure of others to develop [the product]”).

247. See, e.g., *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1054 (Fed. Cir. 1988) (finding evidence of a long-felt need).

248. See, e.g., *WMS Gaming, Inc. v. Int’l Game Tech.*, 184 F.3d 1339, 1360 (Fed. Cir. 1999) (quoting the lower court’s opinion that such licenses are “strong indicia that the patent is not obvious”).

249. See, e.g., *In re Piasecki*, 745 F.2d 1468, 1473 (Fed. Cir. 1984).

250. See, e.g., *Ecolochem, Inc. v. S. Cal. Edison Co.*, 227 F.3d 1361, 1380 (Fed. Cir. 2000) (“Another indicia of non-obviousness is . . . the copying that occurs [after a product is released].”).

251. See Andrew Blair-Stanek, *Increased Market Power as a New Secondary Consideration in Patent Law*, 58 AM. U. L. REV. 707 (2009).

should generally be rewarded, though it does not directly take into account cost. The fact that others have tried and failed supports the notion that success was uncertain, though it does not consider whether success would have remained uncertain between the time of invention and commercialization. The consideration of long-felt need for the invention, however, helps compensate for this deficiency, because if such a need long existed there is a good chance that the invention would be ready for commercialization. The approval of others points to the expected difficulty of the task; others having ordinary skill in the art would likely not admire efforts that, even in the absence of patent incentives, they themselves might well have taken. Licensing and copying sometimes may be an indication that independent invention would be difficult, but because decisions of others reflect their view of patent law we must ensure that we do not place so much weight on this consideration as to make obviousness doctrine circular.

A decisionmaker animated by the inducement standard ideally should not simply assign some weight to each of the secondary considerations. Rather, the various secondary considerations are useful clues in helping the decisionmaker apply the inducement standard. They should be seen as probative and understood as interdependent. For example, even if the inventor has not had any commercial success, evidence that others have copied the invention and had commercial success might help the inventor establish that other factors necessary to commercialization were present and yet that competitors could not figure out how to proceed on their own. Evidence of commercialization by others would point in the opposite direction if it seemed that the others had developed the invention independently, another secondary consideration.

A textual counterargument to this interpretation of the secondary considerations might insist that any proxy for the cost of experimentation should be irrelevant. The last sentence of § 103(a) states: "Patentability shall not be negated by the manner in which the invention was made."²⁵² Some commentators see this sentence as indicating that the courts must consider only the end product of invention, not the process by which the invention was produced.²⁵³ As others have noted,²⁵⁴ however, and as the official legislative

252. 35 U.S.C. § 103(a) (2006).

253. See, e.g., Varu Chilakamarri, *Structural Nonobviousness: How Inventiveness Is Lost in the Discovery*, 10 VA. J.L. & TECH. 7, 11-12 (2005).

254. See, e.g., George M. Sirilla, 35 U.S.C. § 103: *From Hotchkiss to Hand to Rich, The Obvious Patent Law Hall-of-Famers*, 32 MARSHALL L. REV. 437, 511-12 (1999) (recounting Judge Rich's recollection as the principal drafter of the Patent Act).

history prominently confirms,²⁵⁵ the sentence was a reaction to case law indicating that patentability must reflect a “flash of genius,”²⁵⁶ and it makes clear that inventions resulting from detailed experimentation were also entitled to patentability. The inducement standard, meanwhile, would not prevent patentability of inventions reflecting a flash of genius, as long as the expected cost of invention was high. Section 103 does not state that evidence of the manner of invention cannot be considered; its passive wording indicates that the manner of invention may be relevant but cannot alone be sufficient to determine patentability. The fact that the inducement standard is objective²⁵⁷ helps make sense of this puzzle. It does not matter how the inventor arrived at the invention, but the expected difficulty of producing the invention is central to the obviousness doctrine.

This analysis at least counters the argument that a factor such as long-felt need should not be relevant because long-felt need is a proxy for the cost of experimentation and the statute deems the cost of experimentation irrelevant. Properly understood, long-felt need is a proxy for the expected cost of experimentation. This understanding also suggests that the actual cost of experimentation should join the pantheon of secondary considerations. Quite possibly, the last sentence of § 103 explains why courts have not adopted cost as a secondary consideration. Once the inducement standard places the secondary considerations into economic context and clarifies the relevant factor of experimentation’s expected, rather than actual, cost, it should be possible to consider the actual cost of experimentation as a proxy for expected cost. There is some danger that because of hindsight bias decisionmakers might place too much weight on this consideration and refuse patentability for experiments that turned out to be low cost or grant patentability because of unnecessary high costs. But a very high actual cost of experimentation should at least be allowed as evidence, although not necessarily dispositive, of nonobviousness.

b. Considerations of Commercial Success

But what of the frequently raised, and most controversial, of the secondary considerations: commercial success? Before he advocated the prospect theory

255. “The second sentence states that patentability as to this requirement is not to be negated by the manner in which the invention was made, that is, it is immaterial whether it resulted from long toil and experimentation or from a flash of genius.” *Graham v. John Deere Co.*, 383 U.S. 1, 16 n.8 (1966) (discussing 35 U.S.C.A. § 103 annot. 1952 (West 2004)).

256. *Hamilton Standard Propeller Co. v. Fay-Egan Mfg. Co.*, 101 F.2d 614, 617 (6th Cir. 1939) (“The patentee did not display any flash of genius, inspiration or imagination . . .”).

257. See *supra* Subsection I.D.1.

of the patent system,²⁵⁸ Edmund Kitch was skeptical of the use of commercial success evidence.²⁵⁹ One basis for his skepticism is that only patents on commercially successful products will be litigated.²⁶⁰ Later, Kitch defended the commercial success criterion based on the development of his prospect theory, noting that “[t]he fact that a product or process within the terms of the patent claim is commercially successful tells the court that the patent serves as the foundation for a series of now valuable contract rights.”²⁶¹ This argument, however, cannot easily justify the use of commercial success to determine nonobviousness, because obvious inventions, if sufficiently valuable, can also serve as a foundation for contract rights.

In his earlier work, Kitch offers a persuasive argument that commercial success will not necessarily be a strong indication of nonobviousness, arguing that the chain of inferences from commercial success back to nonobviousness is long and weak:

First, that the commercial success is due to the innovation. Second, that . . . potential commercial success was perceived before its development. Third, the potential commercial success having been perceived, it is likely that efforts were made [by a number of firms] to develop the improvement. Fourth, the efforts having been made by men of skill in the art, they failed because the patentee was the first to reduce his development to practice.²⁶²

Moreover, Kitch showed that commercial success may point in the opposite direction. If a product would be commercially successful, there may be less need for a patent to induce its creation.²⁶³ “At the very least,” he argues, “these two arguments should cancel each other and leave commercial success with no role to play in a non-obviousness inquiry.”²⁶⁴

The reason that commercial success seems to produce equivocal results is that we are interested in the ratio of the private benefit provided by a successful experiment in the absence of the patent system to the cost of

²⁵⁸ Kitch, *supra* note 163.

²⁵⁹ Kitch, *supra* note 12, at 332-34.

²⁶⁰ “Since it is unlikely that patents that are not commercially successful will be brought to litigation, [considering commercial success] amounts to a suggestion that borderline cases be decided in favor of patentees.” *Id.* at 333.

²⁶¹ Kitch, *supra* note 163, at 283.

²⁶² Kitch, *supra* note 12, at 332.

²⁶³ *Id.* at 333-34.

²⁶⁴ *Id.* at 334.

experimentation.²⁶⁵ Actual commercial success provides some evidence that the expected degree of commercial success was high. That has two alternative implications. First, the nonpatent private benefit of successful experimentation may have been relatively high, tending toward obviousness. Second, there must have been either a great deal of experimentation (the inferential link that Kitch considers) or a low probability of success, tending either way toward nonobviousness. Our approach therefore provides support for Kitch's observation that the effects may crudely cancel out.

Commercial success thus seems intimately related to nonobviousness, but the relationship between them is not as simple as the current emphasis on commercial success in patent litigation would suggest. To unravel the puzzle of how to interpret commercial success evidence, we must consider not just the perspective of an individual inventor or firm but also market dynamics. Under stable conditions, the total combined economic effort of all firms racing for a particular invention will be equal to the present discounted value of the patent right. Each firm must consider not only whether experimentation will be successful but also what its probability is of winning the patent. Thus, where technology and markets develop roughly as expected, firms will earn on average zero economic profit.²⁶⁶ Where racing firms collectively earn large positive profits, something unexpected has occurred, and to determine the implications of that commercial success we must figure out the nature of the deviation from stable economic conditions.

To make commercial success relevant in the secondary considerations analysis, we must thus define clearly what type of success is relevant. What is relevant is the level of commercial success, taking into account the investments of both the inventor and all other racing firms, relative to expectations once sufficient information existed to justify (at least to the inventor) technological research and commercialization conditional on research success. Unexpectedly high commercial success defined in this way implies patent inducement and nonobviousness, while unexpected low commercial success implies the opposite. These implications, however, are relatively weak. Even where commercial success is high relative to expectations, for example, it might be that the expected level of commercial success was still large enough that development would have occurred even without a patent incentive. Indeed, if other firms independently invented, did not seek patent protection, and yet also enjoyed commercial success, the evidence of success should probably be

²⁶⁵. See *supra* note 251 and accompanying text.

²⁶⁶. See *supra* note 139 and accompanying text.

viewed as demonstrating *obviousness* because such evidence shows that other firms did not need the patent inducement to invent.

The evidence of unexpected commercial success that may thus be most relevant is evidence about the difficulty of obtaining funding for a research project. Suppose that a particular approach to research, which would be ready for commercialization if successful, was a marginal prospect for investors, so at the time of the initial investment, it was a close call as to whether any firm interested in pursuing this approach would be funded. The research eventually results, however, in a commercialized product for which a patent would be valuable. There is then a strong likelihood that if the patent incentive had not existed, the research and development would not have occurred. At times, relatively objective evidence of this, such as rejections from venture capitalists or memoranda indicating considerable skepticism within an organization about a particular approach, may be available, and such evidence could even be made available to patent examiners. Strong evidence of interest among potential funders may be more equivocal because it may be difficult to determine whether adequate interest would have existed absent the patent incentive.

c. Considerations of Obviousness

Unexpected commercial success, like the other secondary considerations that the courts have considered, thus may provide evidence of nonobviousness. Perhaps the absence of the secondary considerations provides some indirect evidence of obviousness, but it is also possible to devise secondary considerations that provide direct evidence of obviousness, consistent with the model we developed in Part II. These considerations become apparent when considering why an invention would not have been invented earlier if it was obvious. There are at least two possibilities. First, the cost of invention may have fallen rapidly. For example, if an invention depends on a research tool that did not exist until shortly before the research leading to the invention, the invention could not have been invented earlier. Similarly, an improvement patent cannot be invented before the patent that it is improving. Second, the benefits of invention may have risen rapidly. For example, the 9/11 terrorist attacks increased demand for security-related products, so the fact that a patent serving this demand was not invented earlier does not show nonobviousness. Such a recently felt need is the reverse of the long-felt need that can be a secondary consideration of nonobviousness. Another example can be found in *Honeywell International v. United States*.²⁶⁷ The disputed patent claim element in

²⁶⁷ 609 F.3d 1292 (Fed. Cir. 2010), *petition for cert. filed*, Oct. 8, 2010 (No. 10-491).

that case involved filtering part of the red-color band for night vision goggles, and the patent issued just as the government was deciding that filtering this color band would be useful for night vision goggles to be used by pilots flying fixed-wing aircraft.

The occurrence of an exogenous shock that decreases the cost of an invention or increases the benefit of an invention should count as a secondary consideration of obviousness. As with other secondary considerations, it cannot by itself resolve the issue. It is certainly possible, for example, that an improvement patent following closely after the original patent would not have been invented for a long time after the original absent patent incentives, and it should then count as nonobvious. But including such an exogenous shock as a secondary consideration will serve as a reminder to the decisionmaker that there is a possible reason for the failure of earlier invention. At least, it will avoid the danger that a decisionmaker will make the mistake of concluding that an invention is nonobvious because of the newness of the context. Furthermore, it will remind patent examiners to be especially vigilant in considering patent applications that follow major shocks. Such a secondary consideration might well have thinned the avalanche of patent applications that followed the development of the Internet.

The occurrence of near-simultaneous independent invention by a party that was not itself motivated by patents should also count as a strong secondary consideration of obviousness. Independent invention itself is equivocal because it could simply indicate the existence of a patent race.²⁶⁸ But where one party does not seek a patent and it appears that this failure to seek a patent is not simply a strategic gambit to deny the other party a patent, such evidence strongly suggests that a patent incentive was not needed to motivate the invention. For example, if an independent software programmer at a company that had a policy of never seeking patents developed a process at about the same time as a software company that sought to patent the process, it should be difficult for the latter to obtain a patent even if it was the first to invent. An important caveat is that if the independent inventor planned to keep the invention as a trade secret, such should not preclude patenting because the *Graham* test seeks to identify inventions that would not be “devised or disclosed” absent the patent system.

It may also be relevant, but far from dispositive, that there is a vibrant group of inventors working in the general area of the invention without

²⁶⁸ Our analysis thus differs slightly from that of T.J. Chiang, who persuasively explains the relevance of independent invention but places more weight on this consideration than we would. See Chiang, *supra* note 9, at 94-100.

seeking patents. Sometimes, this might suggest that, even absent the patent incentive, someone else would have developed the invention soon. For example, if an international open science consortium plans to sequence genomes from a number of species, the fact that a patent-induced inventor is able to sequence a genome first might not be enough to entitle that inventor to a patent. On the other hand, because there are so many plausible targets of investigation in the pharmaceutical field, the existence of some number of open source researchers is probably largely irrelevant, unless there is reason to believe they are near resolution of any particular problem. The vast majority of such research is likely to be patent-induced, even if there are some who eschew patents and many for whom patents are a significant incentive along with other incentives, such as the desire to obtain government grants.

CONCLUSION

We can conceptualize the inducement standard of patentability in at least three ways. The first is as a theoretical benchmark for evaluating nonobviousness determinations, but one so far removed from doctrine and practice as to be useless as a guide to the patent agency and the courts. We have argued for a second view: the inducement standard should directly influence the courts' continued common law development of the obviousness doctrine, and the standard may provide useful guidance in determining the patentability of individual inventions. Once nonobviousness is framed in economic rather than cognitive terms, the inducement standard becomes comprehensible and administrable within the existing doctrinal framework. So far, we have ignored a third approach—the application of the inducement standard on a macro level rather than a micro level to foreclose patenting to entire classes of inventions that, on average, seem unlikely to be patent-induced.²⁶⁹

At oral argument in a recent case on whether the entire class of business methods should be excluded from patentable subject matter, Justice Breyer suggested such an approach. “I don’t know whether across the board or in this area or that area patent protection will do no harm or more harm than good,” Breyer stated.²⁷⁰ Patent law, Breyer noted, induces inventors “to produce more”

269. For an article arguing the legal categories of the patentable subject matter doctrine should be restricted to exclude protection for “self-realizing” inventions, that is, those that would be developed even absent a patent incentive, see Alan Devlin & Neel Sukhatme, *Self-Realizing Inventions and the Utilitarian Foundation of Patent Law*, 51 WM. & MARY L. REV. 897 (2009).

270. Transcript of Oral Argument at 20, *Bilski v. Kappos*, 130 S. Ct. 3218 (2010) (No. 08-964).

and “to disclose,”²⁷¹ but it has two costs. The inventors will “charge a higher price, so people use the product less,”²⁷² and the property rights will create transactions costs.²⁷³ Breyer suggested that the outcome of the case should turn on whether business methods as a class need the inducement of patents to generate innovation, and that view was directly expressed in the concurring opinion that Breyer joined.²⁷⁴ But if the inducement standard can be properly applied, Breyer’s two minuses can be explicitly balanced against the benefits associated with acceleration of invention. And if one insists on acceleration by at least the length of the patent term, the minuses disappear altogether. There will be errors, of course, in applying any approach, but the inducement standard can work sufficiently well that the courts need not use the much blunter instrument of restricting patentable subject matter. A majority of the Supreme Court disagreed with Justice Breyer’s macro-level embrace of the inducement standard, refusing to impose a categorical ban on business method patents.²⁷⁵ Whatever the correctness of that decision, it makes it all the more important for the Supreme Court and lower courts to accomplish the *Graham* Court’s goal of granting patents only to “those inventions which would not be disclosed or devised but for the inducement of a patent.”²⁷⁶

The inducement standard would likely invalidate a relatively high percentage of patents in precisely those areas where patentable subject matter has become most controversial: business methods, software, and financial instruments.²⁷⁷ Two characteristics that these areas share are that many (though not all) innovations can be generated at lower cost and that there tend to be other incentives to innovate even in the absence of patents. Inventors in these areas do not wear lab coats, and innovation seems likely to require less experimentation of a more traditional scientific kind (which is frequently very expensive) and more intellectual experimentation (which may not be very expensive). The inducement standard easily accommodates such intellectual

271. *Id.* at 19.

272. *Id.*

273. “[T]he act of getting permissions and having to get permission can really slow things down and destroy advance.” *Id.* at 19-20.

274. *Bilski*, 130 S. Ct. at 3253-55 (Stevens, J., concurring in the judgment) (arguing that most business innovations will occur even without patent protection because “[i]nnovators often capture advantages from new business methods notwithstanding the risk of others copying their innovation”).

275. *Id.* at 3225-29 (majority opinion).

276. *Graham v. John Deere Co.*, 383 U.S. 1, 11 (1966).

277. For an article in favor of allowing patentability in general in these areas, see Michael Risch, *Everything Is Patentable*, 75 TENN. L. REV. 591 (2008).

experimentation, asking whether it would make sense to engage in the research process that produced a particular business method, software, or financial invention in the absence of a patent system. But in abandoning a cognitive approach, the inducement standard avoids the risk that a decisionmaker will conclude that because a complex and creative thought process was needed to arrive at the ultimate invention, the invention is by definition nonobvious. Moreover, it may be particularly easy to craft a speculative patent in these fields, for example by anticipating a type of business or software tool that will be useful in the future, and the inducement standard shows why these are invalid. By identifying the relevant baseline, which in the case of software includes the protections of copyright law, the inducement standard insists that inventions that would be routinely created not receive patent protection. But it does so in a much more nuanced way than a categorical ban, allowing the inducement standard also to improve decisionmaking in less controversial areas of patenting.

