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An Organizational Approach to the Design of Patent Law

Liza Vertinsky

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An Organizational Approach to the Design of Patent Law

Liza Vertinsky *

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INTRODUCTION

*Innovation today is characterized by diverse forms of collaboration, multidisciplinary problem solving, interconnected technologies, and complex products incorporating multiple inventions. The patent system must adapt to these changes.*¹

Faced with increasingly urgent demands for innovation to solve economic troubles and address natural and man-made crises, the Obama Administration has made national innova-

1. *Patent Reform in 111th Congress: Legislation and Recent Court Decisions: Hearing Before the Comm. on the Judiciary*, 111th Cong. 176 (2009) [hereinafter Kappos Testimony] (testimony of David J. Kappos, VP & Asst. GC IP Law & Strategy, IBM Corp.) available at <http://www.finnegan.com/files/upload/09-03-10Kappostestimony.pdf>.

tion strategy central to its platform for change.² Organizational innovation is a key part of this national strategy.³ But despite the repeated mention of patent reform as part of the national innovation strategy, discussions about patents continue to be marginalized by government decision-makers in their decisions about how to change the organization of economic activities to improve innovation outcomes.⁴ Moreover, while the prolonged debates about patent reform offered ample opportunity for lawmakers to tie changes to patent law to broader innovation goals, patent reforms that respond directly to innovation objectives are notably absent from the recently enacted Leahy-Smith America Invents Act.⁵

I argue that this disconnect between government policies focused on the “organization” of innovation, on the one hand, and patent policies focused on returns to innovators and the costs of patent “monopolies” on the other, is symptomatic of broader problems with the design of patent policy.⁶ Despite

2. See NAT'L ECON. COUNCIL, A STRATEGY FOR AMERICAN INNOVATION: DRIVING TOWARDS SUSTAINABLE GROWTH AND QUALITY JOBS (2009), available at <http://www.whitehouse.gov/administration/eop/nec/StrategyforAmericanInnovation/>.

3. Strategies for enhancing U.S. competitiveness include regional clustering, new modes of public-private partnerships, removing barriers to the formation of new businesses, and other efforts to support desired forms of economic organization. See *Startup America: Obama Administration Comments*, WHITE HOUSE, <http://www.whitehouse.gov/issues/startup-america-public#4> (last visited Oct. 10, 2011) (discussing initiatives designed to spur new forms of collaboration and to support entrepreneurship).

4. See NAT'L ECON. COUNCIL, *supra* note 2, at 15 (providing an overview of the national innovation strategy and including the patent system to provide higher patent quality, faster processing, and more transparency in the patent process).

5. Leahy-Smith America Invents Act, Pub.L. 112–29 NO.112–29, 125 Stat. 284 (2011). Complaints about the patent system have focused primarily on patent quality, delay in processing patents, and the cost of litigation. *E.g.*, Julie A. Hedlund, *Patents Pending: Patent Reform for the Innovation Economy*, INFO. TECH. & INNOVATION FOUND., May 2007, available at <http://www.itif.org/files/PatentsPending.pdf>. The Leahy-Smith America Invents Act responded to some of these concerns, although the jury is still out on the effectiveness of these changes. Significant changes include a switch from a “first to invent” to a “first to file” system and elimination of interference proceedings, eliminating the best mode requirement, limiting false marking suits, expanding prior user rights, and the development of new post-grant opposition proceedings. But the changes do little if anything to change the direction of patent policy.

6. In talking about “patent policy” I am using the term loosely to encompass decisions made by legislators, agencies such as the USPTO, DOJ and FTC, and, to a lesser extent, courts, about the objectives of patent law and the

decades of study and debate we remain largely in the dark as to how, and in what ways, patents change behavior. The absence of definitive conclusions about whether and how patents improve or impede innovation makes it difficult to overcome the political constraints on effective change.⁷ As a result, opportunities to facilitate different processes of innovation through patent law change continue to be missed.⁸

In this Article, I argue that patent policy-makers have been looking in the wrong direction in their efforts to improve both the functioning and the relevance of the patent system. They have focused too much on using patents to address presumed sources of general market failure in otherwise competitive markets, taking the structure of economic activities as given and essentially ignoring the effects of patents on economic organization.⁹ I argue that policy-makers should instead be focusing on the ways in which patents impact the organization of

ways in which patent laws should be interpreted, applied, and changed in light of those objectives.

7. See Jay P. Kesan & Andres A. Gallo, *The Political Economy of the Patent System*, 87 N.C. L. REV. 1341, 1348–90 (2009) (examining the political process that shapes patent law change, including the different interest groups and their respective abilities to influence patent legislation); Robert W. Hahn, *The Economics of Patent Protection: Policy Implications from the Literature* 6–14 (Oct. 2003) (AEI-Brookings Joint Ctr. for Regulatory Studies, unpublished working paper), available at <http://ssrn.com/abstract=467489> (to access article, select One-Click Download).

8. As already noted, the Leahy-Smith America Invents Act is notable for the changes it does not make to the patent system rather than for the changes that it does make.

9. See Ted Sichelman, *Commercializing Patents*, 62 STAN. L. REV. 341, 343–44 (2010) (arguing that much of existing patent law can be explained in terms of efforts to provide ex ante incentives to invent, ignoring the problems involved with downstream commercialization). The importance of patents as tools supporting the organization of innovation is becoming the subject of increasing attention in the patent literature, beginning with the early work of Kitch and his prospect theory but expanding beyond to explore other ways in which patents shape or hinder the organization of economic activities. Examples include, without limitation: Dan L. Burk, *Intellectual Property and the Firm*, 71 U. CHI. L. REV. 3 (2004); Paul J. Heald, *A Transaction Costs Theory of Patent Law*, 66 OHIO ST. L.J. 473 (2005); Scott Kieff, *Coordination, Property & Intellectual Property: An Unconventional Approach to Anticompetitive Effects and Downstream Access*, 56 EMORY L.J. 327, (2006); Robert P. Merges, *Intellectual Property Rights and the New Institutional Economics*, 53 VAND. L. REV. 1857 (2000); and Jonathan M. Barnett, *Intellectual Property as a Law of Organization* (USC CLEO Research Paper No. C10-10, 2010), available at <http://ssrn.com/abstract=1623565> (to access article, select One-Click Download).

innovation processes and the functioning of markets for innovation.¹⁰ I suggest that this change in the orientation of patent policy is essential in order to improve the relevance of patents for innovation policy, and I describe what an alternative organizational approach to the design of patent law might look like.

The organizational approach to patent law that I describe draws from tools and methodologies of New Institutional Economics (NIE) that have become influential in reshaping how other disciplines, including economics, sociology and history, approach the regulation of economic behavior. In particular, my approach applies to patent law key insights from Nobel-prize winners Oliver E. Williamson on the organization of economic behavior in the face of imperfect information and opportunism, and Douglass C. North on limited institutional capacities and the political economy of institutional change. I argue that Williamson's perspective on the regulation of economic behavior in the face of bounded rationality and opportunism has particular relevance for the analysis of those human arrangements supporting innovation. The problems of imperfect and asymmetric information, opportunism, and appropriability that drive Williamson's approach are inherent in the process of innovation, as amply illustrated by current concerns over the "valley of death" for cutting age discoveries and complaints about patent trolling and patent hold-up problems as stifling innovation. Williamson offers an implementation of these concepts that can be readily generalized to patents and economic organization.¹¹ North's in-

10. Examples of how patents alter the organization of innovation include work by Jonathan Barnett on intellectual property as the law of organization. See, e.g., Barnett, *Intellectual Property as a Law of Organization*, *supra* note 9. Barnett focuses on the role of patents in enabling firms to make efficient decisions about firm scope, facilitating disintegration where there are benefits from specialization. *Id.* This paper pursues the same line of reasoning that Barnett offers, but pushes the analysis to a more foundational level. I argue that the transactional effects of patent law should be at the center of patent policy, and I pursue the implications of this view for the design of patent law. Cf. Joshua S. Gans & Scott Stern, *Is There a Market for Ideas?* (2009) (unpublished working paper), available at <http://ssrn.com/abstract=1334882> (to access article, select One-Click Download) (examining conditions under which a market for technology or ideas will emerge and operate efficiently).

11. Indeed, many of the existing applications of NIE to patents borrow from Williamson's approach. See F. Scott Kieff, *Removing Property from Intellectual Property and (Intended?) Pernicious Impacts on Innovation and Competition*, in COMPETITION POLICY AND PATENT LAW UNDER UNCERTAINTY: REGULATING INNOVATION 416 (Geoffrey A. Manne & Joshua D. Wright eds., 2011). See generally Barnett, *supra* note 9 (focusing on patents as facilitating vertical disintegration); Heald, *supra* note 9 (demonstrating the transaction

sights on the limitations of institutional capacity and the political economy of rule design are also essential in the design of effective patent policy.¹² Any possibilities for patent law change must be examined in light of the characteristics, entrenched interests and past practices of those making and implementing patent laws.¹³ Thus, for example, the competing and complementary interests of the United States Patent and Trademark Office (USPTO), Congress and the courts become important factors in policy design.¹⁴

Under the organizational approach, transactions, rather than inventions, are the basic units of analysis. By making this switch in the starting point for analysis, patent policy-makers redirect their attention away from individual incentives to invent and towards supporting productive relationships between participants in alternative processes of innovation. Innovation here is to be construed broadly, including not only invention, but also development, new ways of deploying existing technologies, commercialization, adoption, and use.¹⁵ Policy-makers are asked to examine patent laws from within the existing system of formal and informal rules that determine the cost and feasibility of alternative paths for producing and using innovation. Patents can modify this institutional environment by changing the decisions that economic actors make about whether and how to participate in processes of innovation and markets for innovation. Examples include decisions about specialization, vertical integration, and the sustainability of different forms of cooperation and collaboration.¹⁶ This approach can be used to move closer to the real world picture of how patents impact be-

cost approach).

12. See Douglass C. North, *New Institutional Economics and Development* 1 (1993) (unpublished working paper), available at <http://www2.econ.iastate.edu/tesfatsi/NewInstE.North.pdf>.

13. Kesan & Gallo, *supra* note 7, 1357–66.

14. Jonathan Masur, *Regulating Patents*, 2010 SUP. CT. REV. 275, 278–79 (2010) (arguing for institutional solutions to patent performance, advocating transfer of substantive rule making authority to the USPTO).

15. Christopher T. Hill, *The Post-Scientific Society*, ISSUES IN SCI. & TECH., Fall 2007, at 79 (argues that the most significant innovations now come from the novel organization of economic activity); Robert P. Merges, *A Transactional View of Property Rights*, 20 BERKLEY TECH. L.J. 1477, 1514–15 (2005) (argues that property's "transactional" role is an increasingly important part of the economy).

16. The existing patent literature includes many examples of how patents inform these kinds of decisions. See, e.g., Barnett, *supra* note 9.

havior in a way that can inform effective rule design.¹⁷

Adopting this way of thinking about patent law can improve policy decisions in significant ways. First, if patent policy is specifically designed to respond to flaws in human decision making, such as limited information and opportunism, it will be more robust in addressing these flaws. By placing decision-makers at the center of the analysis and recognizing the different mechanisms through which rules both influence and are influenced by human behavior, this approach can identify and encompass a broader range of functions for patents, including those often overlooked or ignored.¹⁸

Second, the organizational approach focuses specifically on how to align patent policy more closely with broader innovation goals.¹⁹ By providing a commonality of purpose, that of using economic organization to increase innovation, this approach provides a way of mapping patent policy more readily into the areas of concern in national innovation policy.²⁰ For example, patent laws can be evaluated to determine whether they facilitate or hinder clustering, public-private partnerships, and other types of arrangements that are the focus of current national innovation strategies. Moreover, once the value of patents to national innovation objectives can be demonstrated, political

17. The dangers of including too much, as opposed to too little, context in the analysis of legal rules is clear. See Eric A. Posner, *Economic Analysis of Contract Law After Three Decades: Success or Failure?*, 112 YALE L.J. 829, 838–39 (2003) (arguing that the economic analysis of contract law fails because of its indeterminacy). New Institutional Economics has been relatively successful in the development of analytical tools that capture and examine empirical regularities, moving between observation and abstraction.

18. Examples include transformative effects on potential entrepreneurs and expressive functions that reflect and encourage norms of information sharing or retention. Timothy R. Holbrook, *The Expressive Impact of Patents*, 84 WASH. U. L. REV. 573, 575–76 (2006).

19. Ted Sichelman makes the interesting point that the current system of private law damages for patent infringement is inconsistent with a public law goal of using patents to increase innovation. He argues that patent law remedies should be designed to promote the types of levels of innovation that are most beneficial to society instead of being used to compensate for private wrongs inflicted on private parties. Ted Sichelman, *Purging Patent Law of Private Law Remedies*, 4–5 (2011) (unpublished working paper), available at http://www.law.stanford.edu/display/images/dynamic/events_media/Ted%20Sichelman%20%20Purging%20Patent%20Law%20of%20Private%20Law%20Remedies.pdf. I also argue that patent law should be designed in light of innovation outcomes, and suggest that one way to do this is to make the organization of innovation the central focus of patent policy.

20. See Barnett, *supra* note 9; see also Robert P. Merges, *supra* note 15, at 1516.

barriers to the integration of patent policy will be easier to overcome.

Third, the approach provides a platform for integrating many current patent law theories and related proposals for patent reform into a form that can lead to more definite policy guidelines.²¹ It offers a starting point for gathering the insights that integrating existing work relating to patents and economic organization within a single framework can yield. The approach can be used to integrate and build on seemingly different and even conflicting patent law theories which, in some cases, are simply different and interrelated aspects of the same kinds of behavior. For example, proposals to use patent reform to reduce transaction costs need to be examined in connection with studies of alternative private market adjustments to avoid the same transaction costs and studies which point to different types and reasons for transaction costs. Proposals for industry tailoring can be evaluated in terms of how closely differences in the needs of distinct innovation processes correlate with industry differences.²² This approach also provides a basis for selecting among and refining patent reform proposals.²³

Fourth, the organizational approach explicitly takes into account the bounded information processing and analytic capacities of rulemakers, as well as those subject to the rules, and incorporates the political economy of rulemaking and enforce-

21. Economist Jaffe concludes that “robust conclusions regarding the empirical consequences for technological innovation of changes in patent policy are few” because other factors drive innovation. Adam B. Jaffe, *The U.S. Patent System in Transition: Policy Innovation and the Innovation Process*, 29 RES. POL’Y 531, 531 (2000). Hahn similarly concludes that “[t]he most general lesson to be gleaned from the patent literature is that there are few general lessons.” Hahn, *supra* note 7, at ii. This paper lays the groundwork for a larger project that involves exploring how different pieces of the literature on patents and economic organization can be integrated as part of a broader theory of patents and the patent system.

22. See JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK 156–57 (2008) (describing industry difference in litigation-based enforcement); Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Policy*, 89 VA. L. REV. 1575, 1576–78 (2003).

23. See Roberto Mazzoleni & Richard R. Nelson, *Economic Theories About the Benefits and Costs of Patents*, 32 J. ECON. ISSUES 1031, 1032 (1998) (suggesting the need to sort out the context of innovation presumed in different theories and to map out the empirical domains where the different theories are relevant); see also Heald, *supra* note 9, at 473 (discussing the predominate view of patent law in an effort to push beyond it).

ment into the design of reform strategies.²⁴ It can be used to evaluate divergent opinions on what the process of change should look like, in particular whether courts, legislators, or a USPTO with expanded lawmaking authority should take a leading role in changing the direction of patent law.²⁵

Part I of this Article explores the limits of the traditional law and economics approach to patent law and the implications of these limits for current patent policy design. Part II provides a brief background on NIE and explains how the tools and methodologies of NIE can be used to address the limitations of traditional patent law approaches to innovation and patent reform.²⁶ Part III describes the proposed organizational approach to patent law, outlining the methodology and providing a framework to guide its application to the strategic design of patent law. Under the organizational approach the focal points of patent policy design become developing patent laws that are: (1) responsive to the needs of alternative innovation processes and the different motivations of entrepreneurs; (2) designed to reduce the propensity for behaviors which are most costly to the organization of economic activities (i.e. those behaviors involving defection from agreed upon norms or rules of behavior); and (3) robust to constraints on rule design and implementation and sensitive to alternative mechanisms for regulating behavior. Part IV illustrates how the organizational approach can be used to inform the design of patent law in response to contemporary challenges facing the current patent system. This Article concludes that adopting an organizational approach to

24. Some reform proposals focus solely on the administration of patent law rather than the substance of the rules; they examine the comparative strengths and limits of alternative rule making processes. *See e.g.*, Michael J. Burstein, *Rules for Patents*, 52 WM. & MARY L. REV. 1747, 1758–61 (2011) (examining the problem of patent reform as a problem of effective administration and advocating for greater rulemaking authority).

25. *See, generally*, DAN L. BURK & MARK A. LEMLEY, *THE PATENT CRISIS AND HOW COURTS CAN SOLVE IT* 95–108 (2009); Stuart Minor Benjamin & Arti K. Rai, *Fixing Innovation Policy: A Structural Perspective*, 77 GEO. WASH. L. REV. 1, 32–54 (2008).

26. *See generally*, Douglass C. North, *A Recommendation on How to Intellegently Approach Emerging Problems in Intellectual Property Systems*, 5 REV. L. & ECON. 1131 (2009) (discussing the role of NIE in helping to develop a more effective, responsive system of regulating innovation). The existing patent literature includes a number of existing applications of NIE to patent law, and one benefit of the organizational approach is its ability to integrate these contributions in a way which yields new insights into how patent policy should be changed.

patent policy is essential in the design of a more effective, and relevant, patent system.²⁷

I. THE ASSUMPTIONS BEHIND OF TRADITIONAL APPROACHES AND WHY THEY MATTER

The Constitution, from which U.S. patent law derives, presupposes that patents can increase innovation for the public good.²⁸ Resting on this foundation, the traditional justification for the patent regime in the United States has been largely a utilitarian one based on the public goods aspect of invention.²⁹ Patent policy has been dominated by economic models which focus on the incentive effects of creating property rights around intangibles within a market-based economy.³⁰ Alternative justifications, including natural rights theories of property, have been relegated to the side lines.³¹ While a number of different non-incentive models of patents have been explored, as further discussed in Part II, these models have remained relatively isolated and disconnected from mainstream policy agendas.³² Part I provides a brief summary of the mainstream approaches and highlights the ways in which their limiting assumptions constrain effective patent policy design.

27. This paper provides the methodological foundation for a larger project that examines how patents function as tools for organizing innovation. Adopting an organization based approach to patents and innovation along the lines that I suggest here offers a promising way of uncovering how patent policy should respond to contemporary changes in the innovation landscape such as the increasing volume and complexity of public-private partnerships and other forms of collaboration, patent pooling, and standard setting.

28. In Article I, Section 8, the U.S. Constitution provides: "Congress shall have Power . . . To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." U.S. CONST. art. I, § 8.

29. Peter S. Menell, *Intellectual Property: General Theories*, in ENCYCLOPEDIA OF LAW AND ECONOMICS 129, 130 (Boudewijn Bouckaert & Gerrit de Geest eds., 2000), available at <http://encyclo.findlaw.com/1600book.pdf> (noting the dominance of the principal theoretical theory of utilitarianism in justifying protection of technical inventions).

30. Kieff, *supra* note 9, 398–406 (summarizing the conventional majority view on intellectual property regimes).

31. *But see* E. Richard Gold, *The Reach of Patent Law and Institutional Competence*, 1 U. OTTAWA L. & TECH. J. 263, 265–267 (2003) (arguing that there is an increasing strain of libertarian theory in U.S. patent law, with its roots in natural rights).

32. *E.g.*, Heald, *supra* note 9 (discussing non-incentive based models of patents and providing a non-incentive based justification for patents).

A. MAINSTREAM THEORIES OF PATENTS

The dominant theory underlying much of today's patent law and policy is the "reward theory" of patenting.³³ At its most basic, this theory explains that patents provide necessary incentives for invention by allowing inventors to appropriate the returns from their efforts at the cost of restricting use of the resulting inventions.³⁴ The "reward theory" is supplemented by the "disclosure theory" of patenting, which suggests that by providing property rights in discoveries to inventors, patents will allow inventors to disclose their information without fear that the benefits of the information will be appropriated.³⁵

Recognizing the importance of downstream investments in exploiting new inventions, a second main branch of theories has focused on the functions of patents in providing incentives for the development and commercialization of inventions. This branch includes Edmund W. Kitch's well known "prospect theory," which examines the role of broad, strong patent property rights in ensuring efficient investment in and management of downstream innovation.³⁶ Other approaches focus more specifically on the need to induce the development and commercialization of early stage inventions where much of the investment and problems of appropriability occur after the initial discovery has taken place and are undertaken by different organizations.³⁷

These mainstream theories of patents diverge in their concern for upstream investment versus downstream development of the invention, and in the types of market failure that justify the need for patent rights. But they share a similar starting

33. Kieff, *supra* note 9, at 398–406.

34. Without patents—or so the incentive theory of patents goes—either the invention would be kept as a trade secret, limiting access to the idea, or others would be able to freely copy and use the inventions at lower cost, resulting in an under-supply of inventions and follow on innovation.

35. According to Kieff, conventional views of patents are largely based on three dominant incentive theories of IP: (1) some version of the "incentive to invent" and "disclose" theories treated together under the rubric of "reward," (2) the "prospect" theory; and (3) the commercialization theory. Kieff, *supra* note 9, at 398–406; *see also* Rebecca Eisenberg, *Patents and the Progress of Science*, 56 U. CHI. L. REV. 1017, 1024–28 (1989) (discussing alternative theories).

36. For further explanation of the prospect theory, see Edmund Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977). According to prospect theory, strong patent rights protect the incentives of the invention owner to make investments that maximize the value of the patent.

37. Mazzoleni & Nelson, *supra* note 23, at 1040.

point based on an abstract and relatively homogenous market-based paradigm of invention populated by rational actors who produce invention products. Moreover, the focus remains on whether monopoly via patent rights is required to address market failure due to appropriability, uncertainty, or increasing returns to scale,³⁸ and whether it is required at the point of invention or in the subsequent path of development and commercialization.³⁹ This shared foundation and the assumptions on which it rests have important consequences for the current approach to patent policy. One of the main results is a neglect of the importance that organization plays in innovation outcomes.

B. SHARED LIMITATIONS OF THE MAINSTREAM THEORIES

Three shared assumptions inherent in traditional approaches to patent law account for their limited ability to explain when and how patents influence innovation in reality: (1) reliance on a simplified world of rational actors; (2) use of perfect competition as a benchmark against which to evaluate policy alternatives; and (3) reliance on an abstract, mass market production model of innovation.

1. The Simplified Story of Market Failure in a World of Rational Actors

Traditional theories of patents operate in a world of competitive markets and rational actors, allowing their proponents to stick to relatively narrow market failure stories of invention in input and product markets.⁴⁰ While these theories rely on stories about how patents change the behavior of inventors, restrictive assumptions of perfect rationality assume away characteristics of human decision-makers that affect how patents

38. See KENNETH J. ARROW, ECONOMIC WELFARE AND THE ALLOCATION OF RESOURCES FOR INNOVATION (1959), available at <http://www.rand.org/pubs/papers/2006/P1856.pdf>.

39. See e.g., Ted M. Sichelman, *Markets for Patent Scope*, 1 IP THEORY 42 (2010) (arguing that divergent views of patent scope can be explained in terms of divergent views about how well markets for R&D and commercialization work).

40. Arrow argues that there are three main sources of market failure in the competitive market paradigm, increasing returns to scale, inappropriability, and uncertainty, and that all three are present in markets for information. ARROW, ECONOMIC WELFARE AND THE ALLOCATION OF RESOURCES FOR INNOVATION, *supra* note 38, at 10.

might actually alter behavior. In doing so, they largely ignore the different mechanisms by which patents may alter behavior in the production and use of innovation.⁴¹

2. Perfect Competition as a Benchmark

A second limitation is the benchmark used by traditional theories for evaluating rule change. In evaluating the impact of patents, a model of perfect competition serves as the benchmark against which other forms of market activity can be compared and the efficiency costs of departure from perfect competition identified. This use of a perfect world as a benchmark for comparing alternative policies limits the scope for incremental improvement and excludes considerations of feasibility in policy design. As Ronald Coase warns,

[c]ontemplation of an optimal system may . . . provide techniques of analysis that would otherwise have been missed. . . . But in general its influence has been pernicious. It has directed economists' attention away from the main question, which is how alternative arrangements will actually work in practice. It has led economists to derive conclusions for economic policy from a study of an abstract model of a market situation. . . . Until we realize that we are choosing between social arrangements which are all more or less failures, we are not likely to make much headway.⁴²

Recent efforts to look at patent law in the context of imperfect competition move in the right direction,⁴³ but it is clear that a more comprehensive shift in the benchmarks used for comparing policy choices is needed. Part of this shift should in-

41. See, e.g., James Anton & Dennis Yao, *Expropriation and Inventions: Appropriable Rents in the Absence of Property Rights*, 84 AM. ECON. REV. 190 (1994) (examining the role of patents in enabling trade in technological information); Nancy T. Gallini & Ralph A. Winter, *Licensing in the Theory of Innovation*, 16 RAND J. ECON. 237, 238 (1985) (“[B]y protecting property rights, patents here open the market for trade in technological information.”); Robert P. Merges, *Expanding Boundaries of the Law: Intellectual Property and the Cost of Commercial Exchange*, 93 MICH. L. REV. 1570, 1590–91 (1995) (discussing how IP rights can reduce transaction costs).

42. Ronald H. Coase, *The Regulated Industries: Discussion*, 54 AM. ECON. REV. 194, 195 (1964).

43. Herbert J. Hovenkamp, *The Intellectual Property-Antitrust Interface* (U. Iowa Legal Studies, Research Paper No. 08-46, 2008), available at <http://ssrn.com/abstract=1287628> (to access article, select One-Click Download) (stressing the importance of evaluating IP laws within specific market contexts); Mark A. Lemley, *A New Balance between IP and Antitrust*, 13 SW J. L. & TRADE AM. 237 (2007) (arguing for the importance of evaluating rules such as private property orderings within their market context and using different forms of regulation to ensure the competition needed to make the rules effective).

clude incorporating limits in the process for effecting legal change, since the goal should be to compare feasible policy options.

3. Homogenous Processes of Innovation

Mainstream theories of patent law generally presume a paradigm of innovation based on a uniform “innovation production” process driven by rational actors responding to market incentives. This view of innovation, what one scholar has termed a “mass market seller-based” paradigm of innovation, flows naturally from the neoclassical market-based approach to patents and shares its limitations.⁴⁴ It leaves no room for differences in the processes by which innovation may take place, the nature and implications of the resulting innovations, and the different stages of development in the innovation life cycle.⁴⁵ As a result, very different types of economic activities and arrangements are lumped together.⁴⁶ The means and the processes of innovation are often collapsed with the end, the resulting innovation and its effects.⁴⁷ Inventive efforts are viewed as fungible, and the benefits of the incentives provided by patents are characterized primarily in terms of increased innovation output.⁴⁸ There is no room in such an approach for puzzling over how to respond to the problems that asymmetric information, bounded rationality, and opportunism pose for coordinating the activities that together result in innovation.

In sum, mainstream theories fail to explore how patents impact economic behavior in contexts that adequately reflect

44. Katherine J. Strandburg, *Evolving Innovation Paradigms and the Global Intellectual Property Regime*, 41 CONN. L. REV. 861, 895 (2009) (suggesting a new approach to international patent law to address different modes of innovation such as user innovation and open and collaborative innovation practices).

45. See ARROW, ECONOMIC WELFARE AND THE ALLOCATION OF RESOURCES FOR INNOVATION, *supra* note 38; WILLIAM D. NORDHAUS, INVENTION, GROWTH, AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE 93–115 (1969).

46. Gaia Bernstein, *In the Shadow of Innovation*, 31 CARDOZO L. REV. 2257, 2260 (2010) (“Innovation occupies a central place in intellectual property legal scholarship. As much as it is relished and pursued, however, it is almost never critically explored.”).

47. See Stuart Macdonald, *When Means Become Ends: Considering the Impact of Patent Strategy on Innovation*, 16 INFO. ECON. & POL’Y, 135, 143–48 (2004).

48. Cf. Strandburg, *supra* note 44, at 881.

the characteristics and needs of systems of innovation and core attributes of the human decision-makers who shape them.⁴⁹ While recognizing that some level of abstraction from reality is inevitable, and even essential in policy design, mainstream approaches ignore too many critical aspects of the complex activities that drive innovation and the actors who engage in them. As a result, mainstream theories provide inadequate guidance for environments characterized by rapidly changing technologies and complex and diverse paradigms of innovation.⁵⁰ The limitations of the traditional approaches to patent law have been reflected in the limited and mixed results produced by the empirical literature seeking to quantify the effects of patents on innovation and economic growth.⁵¹ This lack of definitive empirical results can be attributed, at least in part, to the lack of richer models of innovation in patent law and the corresponding paucity of variables connecting changes in patent law with changes in economic behavior.⁵²

While the broader law and economics literature points out other, non-incentive based functions that patents might play, including communication and signaling functions,⁵³ coordination functions,⁵⁴ and accounting functions,⁵⁵ such functions have not been adequately incorporated into mainstream approaches for analyzing patents and innovation. I argue that one of the reasons for this is the absence of a general methodology

49. See e.g., ARTI RAI, STUART GRAHAM & MARK DOMS, U.S. DEP'T OF COM., PATENT REFORM: UNLEASHING INNOVATION, PROMOTING ECONOMIC GROWTH & PRODUCING HIGH-PAYING JOBS 3–5 (2010), available at http://2001-2009.commerce.gov/s/groups/public/@doc/@os/@opa/documents/content/prod01_009147.pdf.

50. See Kappos Testimony, *supra* note 1, at 8 (advocating for patent reform in the face of unprecedented technological change and static patent laws).

51. Jaffe, *supra* note 21, at 531 (demonstrating that empirical literature is inconclusive on whether stronger patents increase or decrease innovation); see also Hahn, *supra* note 9, at 2 (concluding that the economics literature yields few general lessons for patents).

52. See e.g., Michelle Gittelman, *A Note on the Value of Patents as Indicators of Innovation: Implications for Management Research*, 22 ACAD. MGMT. PERSP., Aug. 2008, at 26.

53. Patents might be used to signal the value of intangible assets by firms seeking financing, for example. Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625 (2002) (exploring the signaling role of patents and arguing that patents allow disclosure of R&D capacity and value of human capital to attract investment and licensing opportunities).

54. See, e.g., Kieff, *supra* note 9, at 398–406.

55. Heald, *supra* note 9.

for examining the systemic effects of patents on processes of innovation.⁵⁶ The existing literature has remained largely peripheral to core decisions about patent law and policy as a result of its fragmented nature and challenges in operationalizing many of the insights that it contains, with a resulting loss in opportunities for more effective policy design.⁵⁷

In this paper I am proposing an approach that does not dismiss, but rather builds on the traditional law and economics approaches to patent law. It takes the existing neoclassical-based framework and relaxes key assumptions about rational actors, perfect competition, and costless transactions to accommodate the institutional environments in which innovation takes place. In Parts II and III, I suggest that it is possible to relax these assumptions and incorporate the context of innovation in a way that is still tractable and susceptible to modeling and testing. By allowing for a more contextualized analysis of how innovation takes place, the approach makes it easier to identify and act upon opportunities for improving innovation outcomes through patent law change. By providing a theoretical framework grounded in the analysis of transactions, the approach provides for analytical tractability.

II. EXPANDING BOUNDARIES THROUGH NEW INSTITUTIONAL ECONOMICS

NIE has been used to explain the evolution of and opportunities for improvement in our current systems of regulating interactions between economic actors in a growing number of areas, most particularly that of economic development. In this Part, I explore how NIE methodologies can address the challenges of effective patent policy design.⁵⁸ I begin with a description of the core concepts underlying NIE, and I then focus specifically on the contributions made by Williamson and North

56. As an example, the role of patents as devices for signaling firm value may arise initially due to asymmetric information, but may become more significant as norms of venture capital investment emerge. Patents may, over time, become a proxy for more difficult calculations of value in early stage financing. Models which focus on only one mechanism—such as an incomplete contract story or a business norm story—give us an incomplete picture of what patents are doing.

57. See Mazzoleni & Nelson, *supra* note 23, at 1036–38.

58. See Ronald Coase, *The New Institutional Economics*, 88 AM. ECON. REV. 72 (1998).

and explain how these contributions are particularly useful in formulating an alternative methodology for patent law design.

A. CORE CONCEPTS OF NEW INSTITUTIONAL ECONOMICS

NIE is best understood as a research movement that provides a new way of analyzing economic phenomena built around a set of shared beliefs, or principles, about how to study economic behavior and performance.⁵⁹ It encompasses different methodologies and areas of focus. NIE scholars build on, modify, and extend neoclassical economic theory to provide a central role for “institutions,” which can be variously understood as “the humanly devised constraints that structure human interaction.”⁶⁰ or the “prescriptions that humans use to organize all forms of repetitive and structured interactions.”⁶¹ They incorporate the roles of formal rules—such as property rights and patent rights—and informal rules—such as norms of sharing information, their governance, organizations, and the multiple dimensions, motivations, and limitations of human actors in order to explain economic phenomena.⁶² They see economic activities as being embedded within an institutional framework, and the central purposes of NIE include explaining the determinants of institutions and their evolution over time and evaluating their impact on economic performance.⁶³ Differences in economic systems are explored and explained in light of their institutions and institutional environment. Coase, Williamson,

59. Paul L. Joskow, *Introduction to New Institutional Economics: A Report Card*, in *NEW INSTITUTIONAL ECONOMICS: A GUIDEBOOK* 1, 3 (Eric Brousseau & Jean-Michel Glachant eds., 2008).

60. Douglass C. North, Washington University, Prize Lecture for the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel: Economic Performance Through Time, Part II (Dec. 9, 1993), http://nobelprize.org/nobel_prizes/economics/laureates/1993/northlecture.html.

61. See ELINOR OSTROM, UNDERSTANDING INSTITUTIONAL DIVERSITY 13 (2005). Ostrom’s work focuses on the use of collective action, trust and cooperation in managing common pool resources.

62. Claude Ménard, *Methodological Issues in New Institutional Economics*, 8 J. ECON. METHODOLOGY 85, 86 (2001) (examining the methodological challenges that face NIE, including moving from the analysis of transaction costs to the dynamics of innovation); Peter G. Klein, *New Institutional Economics* 3 (1998) (unpublished working paper), available at <http://ssrn.com/abstract=115811> (to access article, select One-Click Download) (providing an overview of NIE).

63. See Ronald H. Coase, University of Chicago, Prize Lecture for the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel: The Institutional Structure of Production (Dec. 9, 1991), http://nobelprize.org/nobel_prizes/economics/laureates/1991/coaselecture.html.

and North are considered to be the founders of NIE, and their work informs our understanding of the core concepts of NIE.

The focus of NIE, to the extent there is a single focus for a loosely grouped set of analytical approaches, is on coordination of economic activities through formal and informal rules, and on the alternative governance structures within an institutional environment that are a product of political, historical, economic and social forces.⁶⁴ Property rights and patent rights are formal institutions designed to describe the boundaries of, and allocate control rights over, the disposition and use of resources. Formal rules interact with informal rules, such as norms and customs regarding fairness and business attitudes, to create the “institutional environment,” or set of background constraints, that guide transactions.⁶⁵ North draws an analogy between the institutional environment and the rules of a game, with institutions defining and limiting the set of choices available to individuals.⁶⁶ Individuals or individual entities enter into agreements to govern their specific relationships in light of the background rules.⁶⁷ These arrangements are often referred to as governance structures, and include the use of contracts and different types of public and private bureaucracy as alternative ways to organize economic activities.⁶⁸ Governance involves the interaction of public and private orderings; public ordering can be viewed as the “rules of the game,” while private ordering can be viewed as the “play of the game.”⁶⁹ Organizations can be understood as groups of people and the arrangements those people create to coordinate their collective actions, and include firms, government entities, universities, families,

64. NIE provides multiple methodologies for studying economic behavior, including a combination of mathematical modeling, case studies, econometric modeling, and experiments to test alternative theories. See Joskow, *supra* note 59, at xxxix-xli (exploring the methodologies of NIE). NIE encompasses diverse work on transaction costs, agency costs, property rights, incomplete contracts, social costs, collective action, and hierarchy and organization. See, e.g., Brian Dollery, *New Institutional Economics and the Analysis of the Public Sector*, 18 REV. POL'Y RES. 185 *passim* (2001).

65. See North, *supra* note 60.

66. *Id.* at Part III.

67. See, e.g., OLIVER E. WILLIAMSON, THE MECHANISMS OF GOVERNANCE 4–5 (1996).

68. See, e.g., *id.* at 5.

69. See Oliver E. Williamson, *The Lens of Contract: Private Ordering*, 92 AM. ECON. REV. 438, 438 (2002).

and other collective structures.⁷⁰ Organizations are not only players in the game, but are also involved in shaping and changing the rules of the game; “[i]t is the interaction between institutions and organizations that shapes the institutional evolution of an economy.”⁷¹

As an example of what these terms mean in practice, the Bayh-Dole Act changed the rules regarding ownership of inventions developed using public funding, allowing universities and other research entities to elect title to patents obtained for such inventions—a change in the rules of the game.⁷² As a result, universities and other research entities began to work in new ways with industry partners, including licensing arrangements and other forms of collaboration previously unavailable—a change in governance, or how the game is played.⁷³ The effects of this rule change took place within an institutional environment that has modified the behavioral responses to the rule change in ways that are still being explored.⁷⁴

B. WILLIAMSON’S METHODOLOGY

While much of the work done in NIE takes the form of a particular theoretical and/or methodological approach to economic behavior, Williamson is one of the few to offer both a broad analytical framework for studying the organization of economic activity and a way of operationalizing his conceptual framework.⁷⁵ Williamson provides a system-based approach to the study of economic activity, anchoring individual transactions within a social, legal, economic, and political context.⁷⁶ Alternative mechanisms for coordinating economic activity are examined in the face of bounded rationality, opportunism, and

70. See Joskow, *supra* note 59, at 5–6 (discussing the core principles of the NIE research approach).

71. North, Economic Performance through Time, *supra* note 60, at Part III.

72. See Bayh-Dole Act, 35 U.S.C. §§ 202–212 (2006).

73. See Jerry G. Thursby & Marie C. Thursby, *University Licensing and the Bayh-Dole Act*, 301 SCI. 1052, 1052 (2003) (emphasizing that while it is clear that licensing has an effect on university technology transfers, more research is needed to fully understand the impacts licensing brings to the research environment).

74. See *id.* (explaining that though licensing by universities has increased dramatically, the effects on the research environment are unclear).

75. See Oliver E. Williamson, *The New Institutional Economics: Taking Stock, Looking Ahead*, 38 J. ECON. LITERATURE, 595, 595–96 (2000).

76. See *id.* at 596–97.

the vulnerabilities that arise in exchange transactions.⁷⁷ At the core of his approach is the notion that we can best understand economic activity through an analysis of the organizational structures, or institutions, by which exchange under conditions of scarcity takes place.⁷⁸ Transactions, rather than composite goods and services, are seen as the fundamental unit of analysis.⁷⁹ These transactions occur in settings that limit trading partners and trade opportunities based on existing relationships, knowledge, sunk investments, and other aspects of asset specificity.⁸⁰ Multiple dimensions of transactions are studied, thus connecting very different theories of human behavior and its determinants.⁸¹ I argue that the problems Williamson struggles with help to illuminate the problems that patent policy-makers should be struggling with. His insights are critical in understanding when and why governance matters in processes of innovation.

Given the importance of human actions and decisions in the process of innovation, a core part of the analysis of patents and innovation must include the study of human attributes that are likely to influence both types and levels of innovative activity as well as downstream use of new innovations (e.g. through adoption of new technologies, or changes in preferences towards new goods). Simon, one of the pioneers in the study of the decision making process within economic organizations, makes reference to two key attributes of human actors: their cognitive ability and self-interestedness.⁸² Williamson reflects these attributes in his own way through concepts of

77. *See id.* at 600–01.

78. *See id.* at 595–96. The term “New Institutional Economics” was originated by Williamson, and its best known representatives are Williamson, North, and Coase. Coase, *supra* note 58, at 72.

79. *See* WILLIAMSON, *supra* note 67, at 6–7.

80. *Id.*; *see also* Herbert Hovenkamp, *Harvard, Chicago, and Transaction Cost Economics in Antitrust Analysis*, 55 ANTITRUST BULL. 613, 626 (2010).

81. WILLIAMSON, *supra* note 67, at 6–7.

82. Herbert A. Simon, *Human Nature in Politics: The Dialogue of Psychology with Political Science*, 79 AM. POL. SCI. REV. 293, 303 (1985) (stressing that policy-makers should be prepared to address the key attributes of human actors in fashioning theories that depend on particular views of human decision making); *see also* Herbert A. Simon, *Rationality in Psychology and Economics*, 59 J. BUS. S209, S223–S224 (1986); Oliver E. Williamson, *Human Actors and Economic Organization*, 6–8 (Università degli Studi di Siena, Working Paper No. 247, 1999), available at ; North, *Economic Performance through Time*, *supra* note 60, at Part II.

bounded rationality, transaction costs, and uncertainty.⁸³ As he describes, “[a]ttributes of human actors that bear crucially on the lens of contract/governance are cognition, self-interest, and foresight (where the last can be considered an extension upon cognition).”⁸⁴ Human actors act with bounded rationality, meaning that they respond rationally in the face of imperfect information and the need to economize in making decisions—they attempt “rationally to cope.”⁸⁵ They act with self-interest, meaning that routine activities occur in a spirit of cooperation give way to a more calculative orientation as the stakes for defection increase.⁸⁶ The capacity for “feasible foresight” allows parties to limit some of the negative effects of this opportunism by constructing mechanisms that allow for credible commitments to behave cooperatively.⁸⁷

To operationalize this transaction cost approach, Williamson emphasizes a focus on specific phenomena, such as the paradigmatic NIE problem of vertical integration.⁸⁸ “The transaction is made the basic unit of analysis, and is thereafter dimensionalized (with emphasis on asset specificity, contractual disturbances (uncertainty), and frequency).”⁸⁹ The focus is economizing on transaction costs through the alignment of transactions and their different attributes with governance structures, which diverge in their cost and competence.⁹⁰ The framework is one of contracting, and the results are susceptible to empirical testing.⁹¹ This methodology provides an important departure from the traditional approaches to patent theory described in Part I; it is seeking to build a contextualized understanding of behavior out of a collection of observations that form the basis for modeling and testing, rather than starting with a general theory that relies on empirical support based on limited data such as research and development (R&D) spending and patents filed.

83. See Williamson, *supra* note 82, at 3–5.

84. Oliver Williamson, *Transaction Cost Economics: An Introduction* 9 (Econ. Discussion Papers, No. 2007-3, 2007) available at <http://www.economics-ejournal.org/economics/discussionpapers/2007-3> (to access article, select download PDF).

85. *Id.*

86. *Id.* at 9–10.

87. *Id.* at 10.

88. *Id.* at 16.

89. *Id.* at 17.

90. *Id.* at 12.

91. *Id.* at 17–18.

C. NORTH AND THE POLITICAL ECONOMY OF INSTITUTIONS

North begins from a very different vantage point, and with different objectives in mind. He looks at different national economies as a whole, and explores differences in their paths of economic development and opportunities that they may have for changing their adaptive efficiency as new conditions arise.⁹² He focuses on the political economy of rule design and implementation, exposing the various limits of existing decision making structures and the influence of politics, unequal bargaining power, and ideologies on institutional change.⁹³ North's work suggests the need to integrate the limitations of institutional capacity into the analysis of rule design.⁹⁴ It is not just those subject to the rules, but also those designing and implementing the rules who are subject to bounded rationality and opportunism; there is no implication that the resulting institutions are efficient.⁹⁵ Instead, ideas and ideologies play important roles in shaping institutions and in limiting possibilities for change.⁹⁶ This suggests a second best approach to policy making, in which patent laws are selected not only for their impact on organizational structure, but also for their robustness to special interests and to errors in implementation.⁹⁷ Thus, the emphasis in the organizational approach is on rule-making in a second best world.

92. See Douglass C. North, *Institutions*, 5 J. ECON. PERSP. 97, 102–08 (1991).

93. See *id.* at 108–11.

94. See Douglas C. North, *New Institutional Economics and Development* 1 (1993) (Working Paper), available at <http://www2.econ.iastate.edu/tesfatsi/NewInstE.North.pdf>.

95. *Id.*

96. *Id.* at 7–8.

97. See Kesan & Gallo, *supra* note 7, at 1341–42; Mark A. Lemley, *Can the Patent Office Be Fixed?* 1–3 (Stanford L. & Econ., Working Paper No. 396, 2010), available at <http://ssrn.com/abstract=1668203> (to access article, select One-Click Download); cf. Henry N. Butler & Larry E. Ribstein, *Legal Process and the Discovery of Better Policies for Fostering Innovation and Growth* 1–5 (Ill. Program in L., Behavior, and Soc. Sci., Working Paper No. LBSS11–06, 2011), available at <http://ssrn.com/abstract=1739312> (to access article, select One-Click Download) (suggesting that jurisdictional choice principles could effectively address issues of special interest capture of policy through market principles).

D. USING NEW INSTITUTIONAL ECONOMICS TO REORIENT PATENT POLICY

The questions asked by NIE scholars, including work done on incomplete contracts, decisions about vertical integration, and theories of the firm, arise with particular force in the context of situations where intellectual property rules come into play.⁹⁸ NIE theories explore the impact of alternative rules, particularly property rights, in addressing the challenges of coordination, such as reducing information costs, increasing certainty in transactions, reducing the costs of bargaining and exchange, preventing free riding, and controlling negative externalities.⁹⁹ There is a growing body of theoretical and applied work in the patent literature suggesting that patent rights, along with other formal rules, play important roles in determining the existing structures within which innovation occurs and the performance of these structures.¹⁰⁰ Applied

98. See Burk, *supra* note 9, at 3 (“In a so-called information age, where the most important assets of firms increasingly are intangible assets, one might expect that property-based theories of the firm would be readily applied to intellectual property.”); Kieff, *supra* note 9, at 330 (“The tools NIE uses to conduct comparative institutional analyses have played a central role in the scholarly debate within property theory about the shifts that occur over time among property regimes. . . . [But] the basic case for or against formal property rights for IP backed up by property rules has largely escaped the attention of the NIE literature.”) (footnote omitted); Merges, *supra* note 9, at 1877 (2000) (“Property rights, firms, institutions, governments: all of these are the subject of extensive study by social scientists operating within the [New Institutional Economics] framework. It is time to integrate the study of IPRs into this framework.”).

99. The NIE research agenda is focused on how institutions (such as the laws governing property rights) matter and how they change over time. See *e.g.*, Coase, *supra* note 58.

100. For important work at the intersection of patents and NIE see Anton & Yao, *supra* note 41, at 190–192 (analyzing the ability of independent inventors to negotiate with firms in the absence of patent protection); Barnett, *Intellectual Property as a Law of Organization*, *supra* note 9, at 3; Jonathan M. Barnett, *Sharing in the Shadow of Property: Rational Cooperation in Innovation Markets* 1 (Univ. S. Cal. Center in Law, Econ., & Org. Research Paper No. C08–22, 2008), available at <http://ssrn.com/abstract=1287283> (to access article, select One-Click Download) (explaining that sharing of intellectual property can lower transaction costs, but requires a framework to operate within); Burk, *supra* note 9, at 3 (2004) (examining intellectual property laws in light of theories of the firm); John F. Duffy, *The Marginal Cost Controversy in Intellectual Property*, 71 U. CHI. L. REV. 37, 37–39 (2004) (drawing analogies between IP and public utility regulation, and revisiting Coase’s critique of proposals for public subsidies to reduce costs to marginal cost in the context of IP); Gallini & Winter, *supra* note 41, at 238 (exploring the role of patents in opening markets for trade in technological innovation); Paul J. Heald, *Trans-*

work, including both historical studies of specific inventions and markets, such as the study of the steam engine, and case studies of specific markets or industries, such as the semiconductor industry, enrich the contextual framework for studying the intersection of patents and economic behavior.¹⁰¹ Higher level theories based on specific applications of NIE tools play an important role in identifying specific functions that patents might play in facilitating or reducing the cost of innovation activities.¹⁰² Such functions include reducing transaction costs, facilitating the transfer of information, and allowing parties to coordinate their actions.¹⁰³ A third body of relevant work dis-

action Costs and Patent Reform, 23 SANTA CLARA COMPUTER & HIGH TECH. L.J. 447, 448 (2007) (arguing that effects on transaction costs need to be studied carefully in any attempt at patent reform); Kieff, *supra* note 9, at 328–30 (focusing on the link between property rule treatment and coordination); Mark Lemley, *Ex Ante Versus Ex Post Justifications for Intellectual Property*, 71 U. CHI. L. REV. 129, 129 (2004) (arguing that ex post justifications for the existence of intellectual property are misleading); Clarisa Long, *Information Costs in Patent and Copyright*, 90 VA. L. REV. 465, 471 (2004) (examining the relationship and implications of intellectual property and information costs); Merges, *Expanding Boundaries of the Law: Intellectual Property and the Cost of Commercial Exchange*, *supra* note 41, at 1590–91 (discussing how intellectual property rights lower transaction costs); Merges, *Intellectual Property Rights and the New Institutional Economics*, *supra* note 9. For a study of specific innovation structures addressing key issues relevant to patent policy design, see, for example, Carliss Y. Baldwin & Eric von Hippel, *Modeling a Paradigm Shift: From Producer Innovation to User and Open Collaborative Innovation 1* (Harvard Bus. Sch. Working Paper No. 10–803,2009), available at <http://www.hbs.edu/research/pdf/10-038.pdf> (arguing that collaborative innovation and innovation by individuals both need to be addressed by policymakers). This list is illustrative of the general trends in this area and is not meant to be exhaustive.

101. Examples of historical studies include: Christine MacLeod & Alessandro Nuvolari, *Patents and Industrialization: An Historical Overview of the British Case, 1624–1907*, at 2–3 (Laboratory Econ. & Mgmt., Working Paper Series 2010), available at <http://www.lem.sssup.it/WPLem/files/2010-04.pdf> (examining the historical connection between patents and industrialization); Alessandro Nuvolari, *Collective Invention during the British Industrial Revolution: the Case of the Cornish Pumping Engine*, 28 CAMBRIDGE J. ECON. 347, 349 (2004) (emphasizing the importance of collective invention, rather than intellectual property rights, in the invention of the steam engine). Examples of case studies include: Peter C. Grindley & David Teece, *Managing Intellectual Capital: Licensing and Cross-Licensing in Semiconductors and Electronics*, 39, Vol. 2 CAL. MGMT. REV. 8 (1997).

102. For mid-level theories, see Barnett, *supra* note 9, at 1 (allowing for more efficient specialization economies); Heald, *supra* note 9 (discussing transaction cost-reducing functions of patent law); Kieff, *supra* note 9, at 345–46 (explaining the coordination function of intellectual property).

103. See, e.g., Anton & Yao, *supra* note 41, at 190–192; Barnett, *supra* note

cusses the political economy of the patent system and its implications for patent reform.¹⁰⁴

These different approaches demonstrate the potential that the analytical tools of NIE have to shed light on new aspects of patent law, but the literature lacks a foundation that can connect specific empirical studies and the insights of theoretical models to each other and to more comprehensive models of innovation.¹⁰⁵ The absence of such a foundation has limited the reach of NIE to influence patent policy. A key objective in developing a methodology and framework for thinking about patents and the organization of innovation is to promote the integration of existing results and the connection of these results with both the real life systems within which different kinds of innovation take place and the legislative, administrative, and judicial systems that determine the directions of patent law. Applying the insights from this literature to inform patent policy, the central inquiry for patent policymakers becomes one of determining what roles patents play in structuring, facilitating, or impeding desired processes of innovation.¹⁰⁶

100, at 1; Barnett, *supra* note 9, at 3; Baldwin & Hippel, *supra* note 100; Burk, *supra* note 9, at 3; Duffy, *supra* note 100; Gallini & Winter, *supra* note 41, at 238; Heald, *supra* note 9; Kieff, *supra* note 9, at 328–30; Lemley, *supra* note 100; Long, *supra* note 100; Merges, *Intellectual Property Rights and the New Institutional Economics*, *supra* note 9; Merges, *Expanding Boundaries of the Law: Intellectual Property and the Cost of Commercial Exchange*, *supra* note 41, at 1590–91.

104. See, e.g., Kesan & Gallo, *supra* note 7 (advocating for an analysis of the patent system's political economy in order to fully understand patent reform); Arti K. Rai, *Engaging Facts and Policy: A Multi-Institutional Approach to Patent System Reform*, 103 COLUMBIA L. REV. 1035, 1035 (2003) (exploring the importance of institutional design for patent policy).

105. See W. Patrick McCray, *Re-Thinking Innovation: A New Agenda for Academic Investigation*, SCI. PROGRESS (May 14, 2010), <http://www.scienceprogress.org/2010/05/re-thinking-innovation> (discussing the disconnected analysis of innovation and the need for a middle ground that makes extrapolation to real world innovation possible).

106. For examples of efforts made in this direction see Brett Frischmann, *Spillovers Theory and Its Conceptual Boundaries*, 51 WM. & MARY L. REV. 801 (2009–2010) (arguing that regulating the effects of the externalities-producing patent system requires an understanding of the varied institutions in which patents operate); see also Brett Frischmann, *The Pull of Patents*, 77 FORDHAM L. REV. 2143 (2008–2009) (explaining that changes in patent law are shifting the university research system to a more commercial orientation); Arti K. Rai, *The Information Revolution Reaches Pharmaceuticals: Balancing Innovation, Incentives, Cost, and Access in the Post Genomics Era*, 2001 U. ILL. L. REV. 173, 180 (2001) (arguing that genomic advances could reduce drug development costs enough to scale back pharmaceutical patent protection); Barnett, *Intellectual Property as a Law of Organization*, *supra* note 9, at 3–4 (arguing

III. A NEW ORGANIZATIONAL APPROACH TO PATENT LAW

I advocate an organizational approach to patents that is based on the premises that: (1) the organization of economic activity is an important determinant of innovation outcomes; (2) patents play a role in determining the organization of innovation; and (3) patent laws should be designed to support the operation and evolution of diverse socially beneficial processes of innovation.¹⁰⁷ The approach offers a way of implementing the insight that patents should be studied and evaluated in terms of their impact on processes of innovation, viewed in terms of transactional structures occurring within a particular institutional context. The first step in patent policy design is to characterize existing or potential desired transactional structures of innovation and the institutional environment within which they occur, and the second step is to explore the roles that patents play in the cost and feasibility of these structures. Opportunities for policy design involve relating conditions of innovation to design features of patent law within a given institutional context.¹⁰⁸

A. GUIDING PRINCIPLES

Several basic principles emerge from this perspective on patent policy to guide the design of patent law.

1. Support Systems of Innovation, Not Acts of Invention

Patent law should ultimately be about improving the performance of systems of innovation, not incentivizing acts of invention. Therefore, patents should be studied and evaluated in terms of their impact on processes of innovation. The character-

that patent rights create more efficient organizational forms).

107. The existing literature supports the view that patents can play an important role in shaping the transactional structure of production. *See, e.g.*, Barnett, *supra* note 9, Frischmann, *Spillovers Theory and Its Conceptual Boundaries*, *supra* note 106, Frischmann, *The Pull of Patents*, *supra* note 106, Arti K. Rai, *supra* note 106. The question of whether markets will select the most efficient paths of innovation or whether regulators should play a role in favoring one mode of innovation over another is beyond the scope of this Article. The organizational approach can accommodate both views. Indeed, the approach suggests that paths of innovation will be the product of some combination of public and private ordering.

108. *See, e.g.*, Ménard, *Methodological Issues in New Institutional Economics*, *supra* note 62, at 86–87.

istics of the innovation process and the institutional environment within which these activities occur provide the contextual framework within which patent rights are examined and design opportunities identified. This approach readily encompasses innovation from different sources, including not only producers but also public actors and user driven innovation. It also encompasses the entire process of innovation, from invention, design, and development, through to adoption and use.¹⁰⁹

2. Focus on Transactions as the Basic Units of Analysis

In order to understand how patents and other forms of regulation impact the organization of innovation we need to examine the transactional structures underlying different processes of innovation within their institutional context. Innovation can be understood as a process of creating something new and of value to a particular community.¹¹⁰ It is driven by human agents acting with self-interest and imperfect information, and it is shaped by the types of arrangements or transactions that they engage in with each other to exploit opportunities to benefit from exchange.¹¹¹ Patents, along with other institutions, are viewed as “humanly devised constraints that structure [perhaps imperfectly] political, economic and social interaction” in processes of innovation.¹¹² Patent laws and the systems of governance which enforce them influence the feasibility and cost of alternative ways of organizing human activities relevant to innovation.¹¹³

3. Respond to the Existing Institutional Environment and the Limits of Individual Decision Making

Patent law must be designed in light of the limitations on decision-makers and imperfections in the existing institutional environment. The assumption of rational actors with full in-

109. See, e.g., Brian Kahin, *Beyond the Box: Innovation Policy in an Innovation-Driven Economy*, SCI. PROGRESS (July 13, 2009), <http://www.scienceprogress.org/2009/07beyond-the-box> (exploring the understanding of innovation underlying government efforts such as the American COMPETES Act of 2007).

110. Cf. McCray, *supra* note 105.

111. Williamson, *The New Institutional Economics: Taking Stock, Looking Ahead*, *supra* note 75, at 600–01.

112. North, *supra* note 92, at 97.

113. See Barnett, *supra* note 9, Frischmann, *Spillovers Theory and Its Conceptual Boundaries*, *supra* note 106; Frischmann, *The Pull of Patents*, *supra* note 106; Rai, *supra* note 106.

formation is replaced with presumptions of bounded rationality that reflect the limited capacity people have to obtain and process information in most situations.¹¹⁴ Instrumental rationality is rejected (at least in part) and choices are instead based on mental models informed by values, norms, and experiences.¹¹⁵ Bounded rationality provides opportunities for opportunistic behavior in the face of incomplete contracts and imperfect contractual enforcement, and creates transactions costs in the coordination of economic activities.¹¹⁶ It is because of these imperfections that institutions and alternative modes of organizing economic activities become important; in the absence of these imperfections all activities could be conducted through market exchange and the use of enforceable contracts.¹¹⁷ Property rights and their interpretation become important because they necessitate and structure transactions and influence transaction costs as a part of the functioning of such markets.¹¹⁸ Perfect market benchmarks are replaced with comparisons of alternative outcomes in imperfect markets. As F. Scott Kieff explains:

NIE emphasizes the use of comparative institutional analysis to look at the different characteristics of institutions and what impact they have on individuals and organizations over time. Such an approach means we should ask not only what we want to achieve, but also which mix of formal and informal institutions will work better in achieving our set of goals.¹¹⁹

114. The concept of bounded rationality is attributed to Herbert Simon. See also Williamson, *The New Institutional Economics: Taking Stock, Looking Ahead*, *supra* note 75, at 600–01; Douglass C. North, *The New Institutional Economics and Development* at 1 (Wash. U. Working Paper, 1992), available at <http://129.3.20.41/eps/eh/papers/9309/9309002.pdf> (“What [NIE] abandons is instrumental rationality—the assumption of neoclassical economics that has made it an institution-free theory.”).

115. See Douglas C. North, *The New Institutional Economics and Third World Development*, in *THE NEW INSTITUTIONAL ECONOMICS AND THIRD WORLD DEVELOPMENT* 20–21 (John Harris et al. eds., 1995); see also North, *supra* note 114; Williamson, *supra* note 75, at 600–01.

116. See Williamson, *supra* note 75, at 600–01.

117. These same limitations apply to the institutions themselves, as North points out, resulting in the persistence of imperfect institutions, and the need for pragmatic approaches to policy design. North, *supra* note 115, at 17–18, 24–26.

118. See Heald, *supra* note 100; Merges, *Expanding Boundaries of the Law: Intellectual Property and the Costs of Commercial Exchange*, *supra* note 41, at 1590–91; Barnett, *Sharing in the Shadow of Property: Rational Cooperation in Innovation Markets*, *supra* note 100.

119. Kieff, *supra* note 9, at 339.

This emphasis becomes particularly important when evaluating the opportunities that patent laws offer as policy levers in improving economic outcomes in imperfectly competitive markets that are subject to other forms of public and private orderings.¹²⁰

4. Seek Robustness to the Political Economy of Rule Making and Engage in a Comparative Analysis of Alternative Rules

The political economy of rule design and the comparative analysis of alternative regulatory strategies within a given context are important parts of policy analysis. Those designing and implementing the rules are themselves subject to the limitations of bounded rationality and opportunism.¹²¹ Institutions will inevitably be imperfect, and opportunities for change will be constrained by path dependence and influenced by ideas and ideologies.¹²² The design and enforcement of patent laws are both shaped by the social, cultural, and political structures in which systems of innovation are embedded, and by cognitive processes such as ideologies regarding ownership and attitudes towards risk.¹²³ Alternative forms of regulation are evaluated in light of the existing institutional environment and the constraints operating on processes of rule change and adoption.¹²⁴

In evaluating institutions such as patent laws and how they change, the organizational approach retains the methodological individualism inherent in traditional neoclassical-based approaches.¹²⁵ Institutions such as patent laws are understood as “systems of rules created to offset uncertainty and risk by providing a social structure that allows humans to gain certain

120. See Coase, *supra* note 42, at 195. See also Nancy T. Gallini & Susan Scotchmer, *Intellectual Property: When Is It the Best Incentive System?*, 2 INNOVATION POL'Y & ECON. 51, 71–72 (2002) (asserting that private contracting can alter conclusions about optimal patent design and public and private instruments and this may be complementary in reducing social costs).

121. See North, *supra* note 115, at 17–18, 23.

122. See North, *supra* note 92, at 97–98, 109–110.

123. See North, *supra* note 115, at 18–20.

124. See Williamson, *supra* note 75, at 601.

125. NIE does not escape the limitations of methodological individualism. See, e.g., Robert B. Ahdieh, *Beyond Individualism in Law and Economics* 46–47 (Emory Pub. Law Research Paper No. 9–78, 2009), available at <http://ssrn.com/abstract=1518836> (to access article, select One-Click Download) (arguing that continuing methodological individualism limits understanding of institutions). In addition methodological individualism, may not adequately capture certain instrumental goals of patent law, such as goals that are based on natural rights.

control over their environment.”¹²⁶ They emerge as a result of cumulative individual choices that are continually reshaped by human beliefs and decisions.¹²⁷ Institutional contexts are seen as the collective result of institutions, or systems of rules, that emerge through individual choices.¹²⁸

In developing contextual models of economic activity, NIE draws liberally from many other disciplines, including law, history, organization theory, cognitive science, political science, sociology, and anthropology.¹²⁹ This encompassing approach is necessitated by the recognition that rules and the governance structures which enforce them are the imperfect, context dependent products of human actors, operating with limited cognitive competence in various historical, cultural, economic, and social contexts.¹³⁰ The use of a contextual framework encourages multi-disciplinary and inter-disciplinary methods of analysis that are much needed in patent policy.¹³¹ Innovation systems are influenced by overlapping and constantly evolving institutions from a variety of different fields, including science, politics and law.¹³² Policy-makers must understand these different institutions and their interactions. Moreover, they must consider institutional structures to bridge the cultural gaps, and to facilitate the flow of information between entities involved in rule development and enforcement, as well as the need to develop formal procedures for learning as part of the efficient evolution of institutions.¹³³

126. See DOUGLASS C. NORTH, INSTITUTIONS, INSTITUTIONAL CHANGE AND ECONOMIC PERFORMANCE (1990).; Claude Ménard, *Markets as Institutions Versus Organizations as Markets? Disentangling Some Fundamental Concepts*, 28 J. ECON. BEHAV. ORG. 161, 164–67 (1995).

127. See Williamson, *supra* note 75, at 598.

128. See Klein, *supra* note 62, at 3–7.

129. See *id.* at 1.

130. See Williamson, *supra* note 75, at 600–04; see also North, *supra* note 114, at 7.

131. See Natalia Boliari & Kudret Topyan, *Conceptualizing Institutions and Organizations: A Critical Approach*, 5 J. BUS. & ECON. RES. 1, 2–4 (2007), available at <http://journals.cluteonline.com/index.php/JBER/article/view/2507/2553>.

132. *Id.*

133. The costs of failing to achieve an effective integration of law and science are illustrated by a recent study of the criminal and scientific investigations that followed the United States anthrax scare in 2001. See Erin Murphy & David Sklansky, *Science, Suspects, and Systems: Lessons from the Anthrax Investigation*, 8 ISSUES IN LEGAL SCHOLARSHIP art. 3, 1–2 (2009).

B. FRAMEWORK FOR CHARACTERIZING THE INSTITUTIONAL ENVIRONMENT

According to the organizational approach, patents are one of many institutions that, together with governance structures, characterize the institutional environment within which transactions take place.¹³⁴ The institutional environment consists of five interconnected levels of social analysis which constrain behavior. These levels are: (1) “cognition,” or individual patterns of decision making under uncertainty, (2) “informal rules,” or “embedded institutions,” including the formation and effect of norms, values and conventions that shape the context of innovation, such as those governing the “production” of science and technological advance, and those influencing and constraining the evolution and effects of patent laws; (3) “formal rules,” or the “institutional environment,” the direct constraints on decision making, including patent rights and other formal rules relevant to processes of innovation; (4) “governance structures,” or “institutional arrangements,” such as firms, different market structures, government, and hybrid forms of collaboration; and (5) “institutions of resource allocation,” such as marginal changes in activity levels in response to stronger or weaker patent rights.¹³⁵ Opportunities for policy intervention occur at different levels of the framework. Interaction occurs between the different levels.¹³⁶ In some cases the interactions may strengthen the effectiveness of a policy change, but in other cases they may inhibit it. The framework provides a way of structuring the analysis that a policy maker would engage in when choosing between alternative patent laws, such as presumptive versus limited availability of injunctions against patent infringers, based on likelihood of achieving desired innovation objectives.

134. Williamson provides an analytical framework for examining changes in economic behavior that emphasizes the interaction between four levels of social analysis and the differential rates of change at different levels, and I adapt this framework to the needs of patent law. Williamson, *The New Institutional Economics: Taking Stock, Looking Ahead*, *supra* note 75, at 595–600; Williamson, *Human Actors and Economic Organization*, *supra* note 82, at 1–4, 34–35.

135. *See* Williamson, *supra* note 75, at 595–600.

136. These five layers of analysis are adapted from Williamson’s four levels of social analysis to fit the needs of patent law. Williamson’s four levels of analysis are embeddedness, the institutional environment, governance, and resource allocation. *See id.*

The alternative rules would be situated within the framework and then examined in light of connections with higher and lower levels of institutional constraints.

1. Cognition

This level of analysis looks at the mental models that govern individual behavior, and the intersection of the mental models with formal and informal rules.¹³⁷ Areas of particular relevance to innovation include the relationship between cognitive processes and formal and informal institutions in shaping decision making under uncertainty. The combination of ideology, understood as a shared set of mental models possessed by groups of individuals, and institutions may help agents to cope with complex decision making under conditions of uncertainty, for example.¹³⁸ Gaining a better understanding of how actors in processes of innovation respond to different kinds and magnitudes of uncertainty could help policymakers assess the relative costs associated with alternative types of uncertainty created by patent law.¹³⁹ Ideologies may influence the effectiveness of patents at motivating or deterring certain kinds of behavior. The relationship between patents and beliefs about autonomy, for example, may inform the ways in which people respond to them, both as developers and users of inventions.¹⁴⁰ People may be predisposed to behave in ways that support certain forms of cooperative production, and patents may operate either to support or to interfere with cooperative outcomes. Ideologies may also play an important role in the political-economic framework for understanding the nature and limits of existing institutions and the potential for positive change.¹⁴¹

137. Williamson describes this as an “evolutionary level in which the mechanisms of the mind take place.” *Id.* at 600.

138. Arthur T. Denzau & Douglass C. North, *Shared Mental Models: Ideologies and Institutions*, 47 *KYKLOS* 3, 3–4 (1994) (defining ideology, institutions, and mental models, and describing their interactions with one another).

139. See, e.g., Joshua S. Gans, David H. Hsu & Scott Stern, *The Impact of Uncertain Intellectual Property Rights on the Market for Ideas: Evidence from Patent Grant Delays*, *J. ECON. LITERATURE* 1, 1–3 (2006) (considering the impact of the IP system on the timing of cooperation and licensing by start-up technology entrepreneurs); see also BESSEN & MEURER, *supra* note 22, at 6–11 (discussing the importance of clear boundaries in patent law).

140. See ROBERT P. MERGES, *JUSTIFYING INTELLECTUAL PROPERTY* 2–8 (2011) (discusses importance of non-utilitarian principles in justifying patents).

141. See North, *Institutions*, *supra* note 93, at 109–111; DOUGLASS C.

Incorporating the cognitive level into the institutional environment provides an opportunity to explore both the importance of mental models in constraining behavior relevant to innovation, such as risk taking, and potential avenues for responding to these limitations through, for example, patent law change.¹⁴² Experimental economics, behavioral economics, and experimental psychology may provide underutilized avenues for exploring these aspects of human learning and decision making and their implications for the design of patent laws.¹⁴³

2. Embedded Institutions (Informal Rules)

Informal rules include the norms, values, customs, and conventions that shape behavior relevant to systems of innovation.¹⁴⁴ For example, they include both informal rules that influence how science and technology are “produced” and resulting innovations developed and deployed,¹⁴⁵ and informal rules that influence the evolution of patent laws and their effectiveness. Policy analysis under the organizational approach requires the study of the different aspects of the embeddedness of innovation—whether cultural, structural, or political—and the implications that the embeddedness has for patent policy.¹⁴⁶ Informal rules depend on existing political, social, and cognitive

NORTH, INSTITUTIONS, INSTITUTIONAL CHANGE AND ECONOMIC PERFORMANCE 85–86 (1990).

142. See Williamson, *supra* note 75, at 600.

143. Experimental psychology and behavioral economics may provide insights into how individuals respond to different risk-reward systems as well as on transformational aspects of creating ownership over intangibles. *E.g.*, Andrew W. Torrance & Bill Tomlinson, *Patents and the Regress of Useful Arts*, 10 COLUM. SCI. & TECH. L. REV. 130, 140–42 (2009) (discussing the use of games and simulations to investigate how actors respond to various patent situations).

144. See Williamson, *Transaction Cost Economics: How it Works; Where it is Headed*, 146 DE ECONOMIST 23, 26–29 (1998).

145. See, *e.g.*, BRUNO LATOUR, SCIENCE IN ACTION: HOW TO FOLLOW SCIENTISTS AND ENGINEERS THROUGH SOCIETY 15–17 (1987) (offering a contested approach to the empirical study of science and technology which emphasizes that science and technology must be studied “in the making,” and looking at the social construction of science through the study of laboratory processes and systems). While many may disagree with Latour’s view of the social construction of science, he offers a useful perspective on the different types of formal and informal rules that together channel economic activity.

146. Williamson, *supra* note 75, at 597. See *e.g.* Rochelle Cooper Dreyfuss, *Does IP Need IP? Accommodating Intellectual Production Outside the Intellectual Property Paradigm*, 31 CARDOZO L. REV. 1437, 1443–47 (2010) (offering an example of the importance of embedded analysis in the context of evaluating open systems of innovation).

structures for change and thus “deliberate choice of a calculative kind is minimally implicated.”¹⁴⁷ Since change at this level is slower and more difficult to control than change in subsequent levels, it is often neglected when exploring policy options.¹⁴⁸ But the constraints that informal rules place on opportunities for effective rule change are a critical part of the policy making equation.¹⁴⁹

Examining the interaction of patent laws, which are formal rules, with relevant informal rules requires attention to those features of the scientific and technological environments that are relevant to the production and sharing of knowledge. Different types of innovation processes may be organized around very different norms governing the production and use of knowledge, norms which are often in tension with patent rights. Efforts to understand this intersection have begun at the university level, where tensions arise between traditional academic norms of information sharing and the pull of commercial interests from licensing opportunities and industry collaborations.¹⁵⁰ Cross-country studies reveal the role of culture and social norms in determining the effectiveness of formal rules such as intellectual property laws.¹⁵¹ Cross-generational behavior is informative in exploring the power of informal norms in shaping behavior, even in the face of contradictory formal rules, particularly as new technologies and patterns of use emerge that clash with rules designed for very different technologies.¹⁵²

147. Williamson, *supra* note 144, at 27.

148. *Id.*

149. See Mark A. Lemley, *Ignoring Patents*, 2008 MICH. ST. L. REV. 19, 21–22, 32–34 (explaining that a complex system of norms has developed to deal with the deficiencies in patent law in many industries, making change to the law difficult).

150. See, e.g., Richard Jensen and Marie Thursby, *Proofs and Prototypes for Sale: The Licensing of University Inventions*, 91 AM. ECON. REV. 240 (2001) (possible loss in quality of research); Jerry Thursby and Marie Thursby, Policy Forum, *Where is the New Science in Corporate R&D*, 314 SCI. 1547 (2006) (frictions created by bargaining over IP); Rochelle Dreyfuss, *Protecting the Public Domain of Science: Has the Time for an Experimental Use Defense Arrived?*, 46 ARIZ. L. REV. 457 (2004).

151. See, e.g., Graeme B. Dinwoodie, *The Development and Incorporation of International Norms in the Formation of Copyright Law*, 62 OHIO ST. L.J. 733 (2001) (discussion in the context of copyright law that raises issues with application to patent law in the international context); John F. Duffy, *Harmony and Diversity in Global Patent Law*, 17 BERKELEY TECH. L.J. 685 (2002).

152. The use of file sharing technologies like Napster provides a good example. See NAPSTER, <http://napster.com> (last visited October 12, 2011).

Although mostly factors at this level are seen as constraints on formal rule change, formal rules can play a role in altering the context of innovation. Patents might alter not only the production of scientific discoveries, for example, but also the way in which science is understood.¹⁵³ Patents might also have a transformative effect.

3. Institutional Environment (Formal Rules)

This level includes both the evolution and application of patent rights and other formal rules relevant to innovation. The patent policy opportunities at this level involve making changes to patent rights to achieve desired objectives in light of the existing transactional structures of innovation.¹⁵⁴ Much of the NIE patent literature starts here, with questions about the roles of patent “property” rights in creating possibilities for exchange.¹⁵⁵ These branches of the literature have roots in Coase’s work on the importance of property rights in the presence of externalities,¹⁵⁶ with much of the work centering on the definition and enforcement of patent rights, and their intersection with contract laws.¹⁵⁷ Using the transaction as the basic

153. See, e.g., Peter Lee, Note, *Patents, Paradigm Shifts, and Progress in Biomedical Science*, 114 YALE L.J. 659, 662 (2004) (Examines the contribution of patents to the advancement of scientific theory—“the scientific community’s conceptual understanding of the basic structure and properties of natural phenomena.”).

154. This framework shares Williamson’s assumption that while recognizing that legal constructs such as the patent system are the product of evolutionary processes and “constrained by the shadow of the past,” the legal system nevertheless provides design opportunities. Williamson, *supra* note 75, at 598.

155. See, e.g., MERGES, *Institutions for Intellectual Property Transaction: The Case of Patent Pools*, in INTELLECTUAL PRODUCTS: NOVEL CLAIMS TO PROTECTION AND THEIR BOUNDARIES 5 (2001) (“Property rights are important because they necessitate and structure transactions.”); John F. Duffy, *Rethinking the Prospect Theory of Patents*, 71 U. CHI. L. REV. 439 (2004). Merges examines the intersection of property rights and contract and suggests two major contributions that property rights make to real world contracting—pre-contractual liability and enforcement flexibility. See also Merges, *supra* note 15.

156. See R. H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960) (explaining the importance of property rights in the presence of transaction costs); Armen A. Alchian & Harold Demsetz, *Production, Information Costs, and Economic Organization*, 62 AM. ECON. REV. 777, 783–85 (1972) (explaining the emergence of the firm in terms of information costs and looking at the impact of alternative allocations of property rights on problems inherent in team production).

157. See Williamson, *supra* note 75.

unit of analysis, alternative forms and allocations of patent property rights are compared in terms of their effects on ex ante incentives and the cost and feasibility of resulting production decisions.¹⁵⁸ Attention is paid, for example, to how patents enable the collection of information and property rights from different rights holders in the process of production.¹⁵⁹ Although patent rights diverge from property rights in some respects, they are often analyzed primarily as property rights in invention, leading to questions about how well patents perform as property rights within the given administrative system for awarding and enforcing them.¹⁶⁰

Theories of incomplete contracts, team production, and other property-based theories of patents explore different aspects of patents and their roles in structuring transactions, with direct implications for patent law. Paul Heald suggests, for example, that patents lower transaction costs by facilitating affirmative asset partitioning (shielding assets from creditors and heirs of the investors in a firm) and addressing problems arising from team production such as shirking and other opportunistic behavior by team members (reducing the cost of fencing and monitoring), through the establishment of a title registration system for the patentable information.¹⁶¹ Pursuant to this theory, we need to pay particular attention to how the title registration system is working.¹⁶² Scott Kieff suggests that enforcing patent rights as property rights will support positive forms of coordination needed for commercialization through a beacon effect (drawing together complementary users) and a bargain effect (facilitating the ability of multiple users to negotiate with each other).¹⁶³ Pursuant to this theory, treating patents as property rights will facilitate commercialization.

158. See, e.g., MERGES, *supra* note 155 (examining the emergence of intellectual property rights exchange institutions and the integration of institutions into existing theory).

159. Barnett, *supra* note 9, at 39–41 (demonstrating that weaker patent rights may increase the cost and reduce the opportunities for decentralized production by increasing the risks of disclosing the information that is imperfectly protected).

160. See BESSEN & MEURER, *supra* note 22, at 4 (discussing the extent to which patent rights are property rights).

161. See Heald, *supra* note 9, at 476–77.

162. See BESSEN & MEURER, *supra* note 22, at 51–55 (arguing for improvements to the title registration system).

163. See Kieff, *supra* note 9, at 333–34.

The “new property rights” literature centers around the idea that property rights become important where contracts are incomplete or otherwise difficult to enforce, either because of unforeseen contingencies, costs of writing contracts, or costs of enforcement.¹⁶⁴ In these cases, as illustrated by pioneers of the approach such as Oliver Hart, ownership of the underlying assets becomes critical in determining the level of investment in and the allocation of benefits from the assets.¹⁶⁵ This incomplete contracting approach has been usefully applied to explain observed patterns of ownership over patents, such as why firms contracting for research and development services might assign resulting patent rights to the firm providing the services.¹⁶⁶ Critical questions for contemporary patent policy include how patents can be used to address challenges of team production and collaboration between different organizations, particularly public-private partnerships.¹⁶⁷

The organizational approach provides a theoretical underpinning for many property rights-based proposals for patent reform, as described further in Part IV, by explaining when and why the predictability and allocation of property rights over inventions matters. It also anchors competing models, including those based on incomplete contracts, property rights, and transaction costs, in a larger framework that can accommodate

164. See discussion of new property rights in Merges, *supra* note 15, at 1484–85 (discussing that the New Property Rights approach was pioneered by Oliver Hart, Sanford J. Grossman, and John Moore). See generally Sanford J. Grossman & Oliver D. Hart, *The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration*, 94 J. POL. ECON. 691, 716 (1986); Oliver Hart & John Moore, *Property Rights and the Nature of the Firm*, 98 J. POL. ECON. 1119, 1121–25 (1990) (assessing the different costs of transactions carried out within a firm and those carried out through the market).

165. See Oliver Hart & John Moore, *Foundations of Incomplete Contracts*, 66 REV. ECON. STUD. 115, 132–35 (1999); Jean Tirole, *Incomplete Contracts: Where Do We Stand?* 67 ECONOMETRICA 741, 743–44 (1999) (examining how incomplete contracts literature can help us to understand economic phenomena such as the patent system, and taking stock of the strengths and limits of the literature).

166. See Merges, *supra* note 15, at 1484–85, for discussion of the New Property Rights approach and other examples. See also Ashish Arora & Robert P. Merges, *Specialized Supply Firms, Property Rights, and Firm Boundaries*, 13 INDUS. & CORP. CHANGE 451, 460–70 (2004); Philippe Aghion & Jean Tirole, *The Management of Innovation*, 109 Q.J. ECON. 1185, 1189–97 (1994).

167. See e.g., ROCHELLE DREYFUSS, *Commodifying Collaborative Research*, in THE COMMODIFICATION OF INFORMATION, (Neil Netanel & Neva Elkin Koran, eds., 2002) (examines challenges that commodification of ideas via patent rights creates for collaborative projects and the need to refine patent laws to address increasingly team based discovery).

the different mechanisms through which rules change behavior and compare alternative ways of achieving the same behavior.

4. Institutional Arrangements (Governance Structures)

While policy discussions on patent reform seem to be focused primarily on refinements to the formal rules through attention to issues of definition and enforcement of patent rights, many of the problems with the current patent system instead involve activities at the intersection of formal rules and governance structures. Not surprisingly, given the emphasis on challenges of organization in the face of uncertainty, opportunism and bounded rationality this intersection is where most of the current work on patents and NIE is located.¹⁶⁸

Governance concerns “the play of the game” through public and private orderings such as through contract, government fiat, or internalization within the firm. At their most basic level, governance structures can be characterized as alternative mechanisms for decision making and enforcement.¹⁶⁹ Analysis at this level involves: (a) uncovering the structure of transactions and the characteristics of alternative governance structures; and then (b) seeking to align transactions with governance structures in a way that promotes desired outcomes.¹⁷⁰ This mechanism incorporates organizational responses to ex post incentive problems such as costs and other limits on enforcement of rules. Exploring the ways in which activities are organized in light of existing formal rules and why, is a central part of this level of analysis.¹⁷¹ Starting with the simplest transaction, autonomous transacting via the market, we consider reasons for why this type of governance structure might be unavailable, what alternative structures might address the

168. Burk points to theories of the firm as underutilized tools for examining intellectual property law. Burk, *supra* note 9 (describing the major transaction costs that delineate the boundaries of the firm as coordination and agency costs).

169. Williamson, *supra* note 75, at 599.

170. *Id.* at 598–599.

171. Key questions at this level include: How do patents influence the costs associated with alternative governance structures? Do patents allow for certain ways of organizing activities that might otherwise be unavailable (e.g. allowing for decentralization)? Can a change in patent rights reduce the costs associated with a particular way of organizing innovation activities? Might patent rights impede certain types of organizational structures?

problems, and at what cost.¹⁷² More generally, governance structures can be compared in terms of multiple distinctive attributes—markets have very different attributes than direct regulation.¹⁷³ These attributes will impact the cost and feasibility of transactions.¹⁷⁴ Policy design includes examining the alignment of governance structure with transactional structure to produce desirable outcomes. Examples of policy strategies include reallocating transactions across alternative governance structures to reduce transaction costs—perhaps by increasing or decreasing the level of integration within a firm versus use of the market.¹⁷⁵ The literature on vertical integration and theories of the firm play an important role here.¹⁷⁶

Analysis includes not only public governance structures such as governments, courts, and agencies such as the USPTO and the United States International Trade Commission (ITC), but also private systems of contracting and enforcement such as markets, firms, and other forms of collaboration such as patent pools.¹⁷⁷ North's focus on the political economy of rulemaking reminds us that implementation of the rules will inevitably be imperfect and costly, that alternative governance structures will alter how the rules impact incentives and the structure of transactions, and that many activities will occur through pri-

172. See Williamson, *supra* note 75, at 603 (“We thus begin with autonomous contracting, which is the ideal transaction in both law and economics: ‘sharp in by clear agreement; sharp out by clear performance.’” (quoting Ian R. Macneil, *The Many Futures of Contracts*, 47 S. CAL. L. REV. 691, 738 (1974))).

173. *Id.* at 599.

174. *Id.*

175. *Id.*

176. *E.g.*, Martin J. Adelman, *The Supreme Court, Market Structure and Innovation: Chakrabarty, Rohm and Haas*, 27 ANTITRUST BULL. 457, 459–60 (1982); Dan. L. Burk & Brett H. McDonnell, *The Goldilocks Hypothesis: Balancing Intellectual Property Rights at the Boundary of the Firm*, 2007 U. ILL. L. REV. 575; Merges, *A Transactional View of Property Rights*, *supra* note 15; Merges, *Intellectual Property Rights, Input Markets, and the Value of Intangible Assets* (1999) (unpublished working paper), available at <http://www.law.berkeley.edu/files/iprights.pdf>; David J. Teece, *Firm Organization, Industrial Structure and Technological Innovation*, 31 J. ECON. BEHAV. & ORG. 193 (1986).

177. See, *e.g.*, Robert P. Merges, *Contracting into Liability Rules: Intellectual Property Rights and Collective Rights Organizations*, 84 CALIF. L. REV. 1293 (1996) (surveying the diverse institutions various industries have cultivated to handle intellectual property transactions, and arguing that repeat players can and do come up with private solutions to overcome transactional bottlenecks).

vate rather than public ordering.¹⁷⁸ The current debate over the role of regulators in limiting the royalty rates and other terms of private standard setting organizations provides a nice illustration of the debate over public versus private ordering.¹⁷⁹ Opportunities also arise for experimentation with new types of governance structures better adapted to the needs of particular transactions—such as different ways of separating ownership and control and new forms of public-private partnerships adapted to address particular kinds of market failures.¹⁸⁰

5. Institutions of Resource Allocation and Employment

Much of the traditional study of patent law and innovation has taken place at this level, the continuous adjustment of market participants to price and quantity signals as they optimize objective functions—production functions, typically, in the context of firms. This level encompasses the study of how changes in marginal conditions such as patent scope and patent term length or the expected value of a resulting invention-product will alter decisions about activity levels in the production and use of inventions.¹⁸¹ The tools of optimization theory provide useful avenues for exploring market adjustments in response to changes in rules or their enforcement.¹⁸² However, the decision-makers are operating subject to bounded rationality, and their allocation choices are constrained by the combination of rules and their mechanisms for enforcement. Understanding in more detail how markets adjust, and the costs associated with such adjustments, is a critical missing link both in enriching traditional optimization models, and in deep-

178. See Williamson, *Human Actors and Economic Organization*, UNIVERSITÀ DEGLI STUDI DI SIENA 3 (1999) (It.) (citing Douglass C. North, *Transaction Costs, Institutions, and Economic History*, 140 J. INSTITUTIONAL & THEORETICAL ECON. 7 (1984)).

179. See, e.g., Richard A. Epstein, F. Scott Kieff, & Daniel F. Spulber, *The FTC, IP, and SSOs: Government Hold-Up Replacing Private Coordination* J. COMPETITION L. & ECON. (forthcoming Mar. 2012).

180. See, e.g., Philippe Aghion & Jean Tirole, *Opening the Black Box of Innovation*, 38 EUR. ECON. REV. 701, 703–08 (1994) (describing the R&D process as including creators, financiers, owners, and users of the invention and endogenizing the governance of R&D and distribution of investments, patent rights, and profits among the actors to explore organization of R&D).

181. Williamson, *supra* note 75, at 597.

182. See, e.g., Arthur B. Treadway, *Adjustment Costs and Variable Inputs in the Theory of the Competitive Firm*, 2 J. ECON. THEORY 329 (1970) (discussing the economic affects adjustment costs have on competition).

ening transaction cost theories of patent law.¹⁸³ An important related area of empirical work lies in finding ways to identify and measure transaction costs, including a comparison of transaction costs relating to innovation activities in the presence and absence of patents.

6. Putting the Levels Together

Taken together, these levels and the interaction between them can be used to characterize the institutional environment within which different policy parameters can be studied, and this provides a framework within which policy choices can be evaluated and compared. The figure below provides an illustration of this framework.¹⁸⁴

183. See Liza Vertinsky, *Comparing Alternative Institutional Paths to Patent Reform*, ALA. L. REV. (forthcoming), available at <http://ssrn.com/abstract=1521137> (to access article, select One-Click Download); see also Barnett, *Sharing in the Shadow of Property: Rational Cooperation in Innovation Markets*, *supra* note 100 (discussing the role of private markets in shaping the limits on patent rights); Merges, *supra* note 15.

184. See Eva Lieberherr, *Policy Relevance of New Institutional Economics? Assessing Efficiency, Legitimacy and Effectiveness*, 5–7 (Ecole Polytechnique Fédérale de Lausanne, Working Paper No. 0906, 2009), available at <http://mir.epfl.ch/files/content/sites/mir/files/users/181931/public/wp0906.pdf>, for a further discussion of these levels.

Figure 1: Characterizing The Institutional Environment
Adapted from Williamson¹⁸⁵

Layers	Objectives	Pace of Change
<p>Cognition</p> <p>↓ ↑</p>	<p>Influence risk taking, entrepreneurship</p> <p>Spontaneous</p> <p>Limited opportunity for regulation</p>	<p>Very slow</p>
<p>Embedded Institutions</p> <p>Informal rules such as norms, values, and culture</p> <p>↓ ↑</p>	<p>Limited opportunity for regulation</p> <p>Importance of norms and norm building</p> <p>Long term development of institutional capacity</p>	<p>Very slow</p>
<p>Institutional Environment</p> <p>Formal rules: rules of the game. Examples: patent rights, property rights</p> <p>↓ ↑</p>	<p>Get institutional environment right (changing the rules)</p> <p>Opportunities for policy intervention through rule change</p>	<p>Moderate</p>
<p>Institutional Arrangements</p> <p>Governance structure: play of the game. Example: vertical integration</p> <p>↓ ↑</p>	<p>Get governance structure right (changing governance structure)</p> <p>Opportunities for policy intervention relating to choice and function of governance structures</p>	<p>Moderate</p>
<p>Institutions of Resource Allocation</p> <p>↓ ↑</p>	<p>Get marginal conditions right</p> <p>Opportunities for intervention: traditional demand and supply strategies, regulation directed at incentives and market failure</p>	<p>Rapid</p>

For the policy-maker, several important points emerge from this framework. First, the layers are interconnected. Changes made at any layer will influence the effect of other institutions. For example, formal rules may determine what types of governance structures are feasible. The effectiveness of changes may also be muted by other layers. For example, a rule

185. Williamson, *supra* note 144, at 26.

change designed to alter the ease of challenging a patent will have little effect if there are factors at the first level of analysis that constrain patent challenges, or if there are factors at the third level that make enforcement prohibitively expensive. The interaction between the mechanisms and the availability of multiple policy levers also suggests the need for policy coordination. For example, USPTO strategies for changing the relationship between the agency and patent applicants to encourage higher quality submissions need to be examined alongside proposed legislative changes, such as rules governing inequitable conduct. A formal rule change may have no effect on behavior if the behavior is controlled by strong norms that point in the other direction. Second, the relative importance of different layers for achieving desired changes in economic behavior will vary depending on the characteristics of the behavior and the specific institutional context in which it takes place. Changing risk-taking behavior or beliefs about entrepreneurial ability may be most heavily influenced by efforts at cognitive change and a change in norms, whereas increasing the ability of companies to specialize may be primarily a matter of the interaction of formal rule change with governance structures. Third, the policy tools and the opportunities for change vary significantly by level, with little scope for change at layer one and an opportunity for rapid and potentially significant change at layer five. Empirical studies are needed to determine which mechanisms predominate in different types of economic behaviors and thus, which policy variables are most likely to be effective.

IV. APPLICATIONS

This Part illustrates how the organizational approach works as a guide for patent law change through some examples that highlight areas in which the patent system is underperforming.

A. MAKING PATENT POLICY RELEVANT TO NATIONAL INNOVATION POLICY

Organizational innovation works in combination with technological innovation, and as technologies change, so do the organizations which develop and use these technologies.¹⁸⁶ The

186. Chandler's work on the emergence of new organizational forms points to the importance of organizational innovation working in tandem with technological innovation. *See, e.g.*, ALFRED D. CHANDLER, STRATEGY AND

organizational approach to patent law evaluates patents in terms of their ability to support efficient forms of economic organization. This includes responding to changing modes of organizing innovation. Pursuant to this approach, patent policy-makers are asked to start with the goal of facilitating alternative processes of innovation, and to investigate what roles patents are or might play in determining the cost and feasibility of these alternative processes.¹⁸⁷ As already discussed, the organization of economic activities plays an important part in Obama's National Innovation Strategy. By focusing on objectives that are driving the U.S. national innovation strategy, and by explaining how patents can help to achieve these objectives, patent policy can play a more central and effective role in innovation policy.¹⁸⁸ Not only will it be easier to integrate patent policy into broader decision making about innovation, but it will also be harder to justify political barriers which keep patent policy decision-makers out of the discussion.¹⁸⁹

Consider, for example, the role of patent policy as part of President Obama's energy innovation strategy. One key result of the National Innovation Strategy and the policy initiatives it has prompted is increased government spending, particularly in key sectors such as clean energy and health technologies.¹⁹⁰

STRUCTURE: CHAPTERS IN THE HISTORY OF THE INDUSTRIAL ENTERPRISE 309–15 (MASS. INST. OF TECH. ED., 1962).

187. Inroads in connecting patents to the structure of innovation have already been made. *Merges*, for example, examines the development of hybrid institutions formed to address transaction cost and valuation problems inherent in the reallocation of intellectual property rights that are necessary to create workable markets. See *Merges*, *supra* note 177 (applying NIE to case studies of performing rights societies, patent pools, and the Hollywood Script Registry in order to examine the institutional innovations that are designed to address challenges of creating collective rights mechanisms). Barnett examines whether markets will select intellectual property regimes most conducive to innovation. See Jonathan M. Barnett, *Property as Process: How Innovation Markets Select Innovation Regimes*, 119 YALE L.J. 384 (2009). Murray and Huang discuss the potential for policy experiments in funding innovation. See Kenneth G. Huang & Fiona E. Murray, *Entrepreneurial Experiments in Science Policy: Analyzing the Human Genome Project*, 39 RES. POL'Y 567 (2010).

188. Rai has been arguing for a coordinated innovation policy. Benjamin & Rai, *supra* note 25.

189. The absence of patents in national innovation strategies could be accounted for in political economy terms. Recognizing patents as critical tools of innovation would require a shift in authority and resources that many in the current government structure would be reluctant to make.

190. See OFFICE OF MGMT. & BUDGET, BUDGET OF THE U.S. GOVERNMENT: FISCAL YEAR 2011, at 28 (2010) (discussing clean energy economy); NAT'L

In addition to increased funding, the USPTO implemented a pilot program for green technologies that is designed to expedite the processing of patent applications relating to clean energies.¹⁹¹ A simple incentive-based approach to patent law would suggest that increased funding of private sector R&D and faster processing of patents would together increase the speed and volume of development and deployment of green technologies. Applying the organizational approach, however, shifts the starting point of analysis to alternative ways of organizing efforts to develop and deploy green technologies.¹⁹² Transactions, such as the agreements between private parties in a patent pool or contracting arrangements between research entities and industry partners, are the units of analysis; the effects of alternative patent laws on the cost and feasibility of different transactions are examined. Using this approach, the effectiveness of the USPTO program is evaluated in light of the most promising models of innovation, including attention to patent pools and patent commons.¹⁹³ When viewed from this perspective, increasing the speed and likelihood of patenting might hinder rather than enhance these relationships. In addition, the ways in which public funding is provided and the ownership of publicly funded inventions need to be considered. Existing NIE work points to the importance of examining incentives of public and private actors in light of default ownership

ECON. COUNCIL, *supra* note 2 (identifying clean energies as one of the sectors identified for intervention).

191. Green Technology Pilot Program, U.S. PAT. & TRADEMARK OFF., http://www.uspto.gov/patents/init_events/green_tech.jsp (last modified Oct. 5, 2011); *see, e.g.*, EWING MARION KAUFFMAN FOUND., WHITE HOUSE ENERGY INNOVATION CONFERENCE: SUMMARY REPORT 10 (2010), *available at* http://www.energyinnovationnetwork.org/en/~media/Files/WH_summary_report.ashx (This report discusses the White House energy innovation agenda, which includes the USPTO pilot program to expedite processing of patent applications covering clean energy technologies under the assumption that “[p]roviding innovators with more timely patent protection will help bring technologies to market more quickly.”).

192. *See* American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (calling for \$190 billion to develop clean energy technologies).

193. *See* alternative models for sharing innovation such as the Eco-Patent Commons established by IBM, Sony, Nokia, and Pitney Bowes. *See Eco-Patent Commons*, WORLD BUS. COUNCIL FOR SUSTAINABLE DEV., <http://www.wbcd.org/web/epc> (last visited Aug. 16, 2010). Alternative models also can be found at the GreenXchange hosted by Creative Commons. *See Patent Licenses*, SCI. COMMONS, <http://sciencecommons.org/projects/patent-licenses> (last visited Aug. 16, 2010).

rules.¹⁹⁴ It provides the tools to explore how a changing balance of public and private activity may alter innovation processes.¹⁹⁵ Getting the balance of public and private ownership right might be critical to supporting organizational innovation and preserving both private sector incentives and widespread access to fundamental discoveries.¹⁹⁶

Another key finding from national innovation studies is the need for public involvement in the formation of “clusters” or “networks” of innovation, including universities, private laboratories, and access to funding and other forms of support for new businesses.¹⁹⁷ If regional industry clustering is the goal, we examine whether stronger or weaker patent rights support this clustering. We know already that patents allow for more decentralized forms of production and may enhance certain kinds of information sharing.¹⁹⁸ Where there is a more pervasive role for public actors as not only funders but also consumers and users of innovation, we examine the costs and benefits of the existing

194. See generally Kevin Outterson, *The Legal Ecology of Resistance: The Role of Antibiotic Resistance in Pharmaceutical Innovation*, 31 CARDOZO L. REV. 101 (2010) (exemplifying various public incentives and economic theories at play in the antibiotic market, and the impact this has on pharmaceutical innovation and development).

195. See, e.g., Sean O'Connor, *Controlling the Means of Innovation: The Centrality of Private Ordering Arrangements for Innovators and Entrepreneurs*, in HANDBOOK ON LAW, INNOVATION AND GROWTH (Robert Litan ed., 2011).

196. Kevin Outterson offers an interesting example of the importance of the structure of the innovation process in his study of antibiotics. See Kevin Outterson, *The Legal Ecology of Resistance: The Role of Antibiotic Resistance in Pharmaceutical Innovation*, 31 CARDOZO L. REV. 101 (2010). He shows that strengthening patent rights in the market for antibiotics may lead to overuse of antibiotics, with significant consequences for antibiotic resistance and incentives to develop new antibiotics. *Id.*

197. See, e.g., Daniel Gervais, *Of Clusters and Assumptions: Innovation as Part of A Full TRIPS Implementation*, 77 FORDHAM L. REV. 2353, 2363 (2009); see also OFFICE OF MGMT. & BUDGET, *supra* note 190, at 22 (including a discussion of a shift towards cluster policies in innovation); NAT'L SCI. FOUND., NATIONAL SCIENCE FOUNDATION FY 2011 BUDGET REQUEST TO CONGRESS, at Overview-4 (2010), available at <http://www.nsf.gov/about/budget/fy2011/pdf/FY%202011%20Budget%20Request%20to%20Congress.pdf> (discussing the National Science Foundation's (NSF) plan to invest \$12 million to promote new “NSF Innovation Ecosystems” with support for regional innovation clusters around universities to increase the impact of innovation through commercialization, industry alliances, and start-up formation).

198. See generally Craig Allen Nard & John F. Duffy, *Rethinking Patent Law's Uniformity Principle*, 101 NW. U. L. REV. 1619, 1651–55 (explaining the benefits that a decentralized model will have for patent law).

allocation of ownership rights provided by patent laws such as the Bayh-Dole Act, with its allocation of ownership rights to private research institutions.¹⁹⁹ The one specific effort to address the increase in collaborative research and development in patent law may have created more problems than it solved because it failed to address the underlying structural challenges of different kinds of collaboration. This effort, the Cooperative Research and Technology Enhancement (CREATE) Act of 2004, sought to foster collaborations between public and private actors by allowing exchanges of information in a way that increased the ability of each party to patent the results.²⁰⁰ While seemingly a benefit to public-private partnerships, a failure to consider the transactional structures of university-private company negotiations and the scope for opportunistic behavior by private parties resulted in rules that could systematically disadvantage the university partners.²⁰¹

B. TAILORING THE CASE FOR TAILORING

The U.S. patent statute creates a set of rules of general applicability which are to be applied to provide technology-neutral protection to any inventions that satisfy the legal standards prescribed.²⁰² This fits well with traditional approaches to patents and invention, with their abstraction from the processes of innovation. The one-size-fits-all approach is increasingly at odds, however, with evidence that patents perform differently in different market and non-market contexts. Additionally, patent law has not yielded the hoped for flexibility in addressing

199. The Bayh-Dole Act of 1980 and the Stevenson-Wydler Technology Innovation Act of 1980 reflect U.S. patent law efforts to facilitate innovation in contexts of government-funded research, by non-government research entities. See 15 U.S.C. § 3701 (2006); 35 U.S.C. § 200 (2006). The effectiveness of these laws is still under debate. See F.M. Scherer, *The Political Economy of Patent Policy Reform in the United States* 18 (John F. Kennedy Sch. of Gov't, Working Paper No. RWP07-042, 2007) (suggesting alternatives to the current patent law regime).

200. The Act expands the universe of information that will not be considered prior art when seeking patent protection for the fruits of the collaboration. See, e.g., Cooperative Research and Technology Enhancement (CREATE) Act of 2004, Pub. L. No. 108-453, 118 Stat. 3596 (amending 35 U.S.C. § 103(c)) (protects information shared as part of a collaboration from being considered prior art for patenting purposes); Bayh-Dole Act of 1980, 35 U.S.C. § 200 (2006) (providing for ownership over inventions developed using federal funding).

201. See Vertinsky, *supra* note 183, at 68.

202. See, e.g., Burk & Lemley, *supra* note 22, at 1576.

changing technological and business needs.²⁰³ Patents are seen as working well in the pharmaceutical and chemical industries, for example, and poorly in the software and other related high tech industries.²⁰⁴ They are seen as working well in privately funded, purely commercial projects and less well in areas of research receiving significant public support.²⁰⁵ Patents covering single products are less worrying than patents covering platform technologies used in producing multiple goods. Patents may serve functions early in the development process but fail to address the challenges of commercialization.²⁰⁶

Many commentators have advocated a tailored approach to patent law, through the policy levers available to courts, tools available to the USPTO, or through legislative efforts.²⁰⁷ Proposals that have been prominent in the patent literature include the recommendations made by Dan L. Burk and Mark A. Lemley in "The Patent Crisis and How Courts Can Solve It." Burk and Lemley make the argument that patent law should be, and in practice often is, tailored to specific industries and technologies, based on the argument that different industries innovate differently.²⁰⁸ To the extent that industry differences align with characteristics of different processes for innovation, and alternative forms of tailoring are not feasible, industry tailoring may be an appropriate guide for policymakers. Opportu-

203. See BESSEN & MEURER, *supra* note 22, at 106–09.

204. BESSEN & MEURER, *supra* note 22, at 106–09; Burk & Lemley, *Policy Levers in Patent Policy*, *supra* note 22, at 1675–95.

205. See, e.g., Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation?: The Anticommons in Biomedical Research*, 280 SCI. 698 (1998); Samuel E. Trosow, *Copyright Protection for Federally Funded Research: Necessary Incentive or Double Subsidy?* (forthcoming), available at http://publish.uwo.ca/~strosow/Sabo_Bill_Paper.pdf.

206. See, e.g., F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 707–08 (2001); Sichelman, *supra* note 19, at 5–6 (arguing that patent law as an inducement to invent does not sufficiently capture the incentives needed for further commercialization).

207. See, e.g., Burk & Lemley, *supra* note 22 (pointing to policy levers and the fact that patent law is applied in different ways in different industries, but not necessarily through a reasoned approach).

208. See, e.g., BURK & LEMLEY, *supra* note 25, at 109–65 (arguing that courts can use existing policy levers to achieve a tailored patent approach that is responsive to the needs of different industries and technologies); see also BESSEN & MEURER, *supra* note 22, at 106–09 (concluding that patents work well as property in some fields of technology and some industries some of the time).

nities for more refined strategies should be explored.²⁰⁹ These strategies need to encompass evolving innovation paradigms and the multi-faceted nature of innovative activity.²¹⁰ They need to respond to multiple innovative communities, including commercial firms, scientific researchers, user innovator communities, and open source proponents.²¹¹

I suggest that disagreement persists about the type and level of tailoring of patent law that should occur in part because explanations of how patents change innovation are inadequate. By targeting the organization of innovation as the focus of patent policy, the organizational approach offers a coherent framework for examining ways in which patent law should be tailored to fit different contexts.²¹² A central premise of the organizational approach is that patent law should be designed in light of and be tailored to the distinct needs of alternative innovation processes. Selection among alternative approaches should be informed by factors such as information asymmetries, the nature and specificity of investments required, the importance of informal rules in shaping relationships among participants, and the structure of the markets within which such activities take place. Moreover, patent law needs to be responsive and adaptable to emerging modes of innovation. In some cases, such as the evolution of standard setting organizations to address the coordination needs of related technologies, this may mean limiting regulation to provide greater opportunities for private ordering, but with some protection against

209. Carroll, for example, advocates a pragmatic, evidence-based economics approach to tailoring measures, which takes into account information costs relating to who can pick the winning technologies and the cost and political feasibility of tailoring measures. See Michael W. Carroll, *One Size Does Not Fit All: A Framework for Tailoring Intellectual Property Rights*, 70 OHIO ST. L.J. 1361, 1410–1414 (2009) (advocating for a pragmatic, evidence-based economics approach as basis for selecting among tailoring policies. Factors include questions of who has the best information, costs of administering the system, and considerations of political economy).

210. While innovation and economic growth are sometimes referred to almost interchangeably as desired outcomes of the patent system, for example, innovation is only one factor in economic growth and does not always result in what we might think of as economic growth. There may also be non-economic objectives or values to address, such as issues of equity and a transformational impact of certain kinds of property rights, which need to be captured in the analysis of patent policy.

211. Strandburg, *supra* note 44, at 867.

212. See, e.g., Burk & Lemley, *supra* note 22, at 1578.

opportunistic behavior.²¹³ In other cases, such as the search for vaccines in the face of a potential public health emergency, it may mean recognizing and accommodating a broad government role in the innovation process. Recent work documenting the prevalence and importance of alternative systems of innovation highlight the importance of unpacking the concept of innovation and recognizing the institutional context within which different forms of innovation take place and the resulting implications for patent policy.²¹⁴

The framework offered in Part III provides a useful starting point in exploring when and how patent laws might have differential effects that should be addressed through a change in patent law or how it is interpreted and applied. At the most basic level, there may be a cognitive, behavioral or psychological aspect to the choice of property right system that selects for or against certain modes of innovation.²¹⁵ The availability of private ownership rights may create a tipping point, transforming systems of open collaboration into systems of proprietary ownership and use, once assets become more valuable. Free rider problems may limit the ability to form open collaborative innovation communities without some ability to pre-commit to participation. Interesting questions include how the presence of patents changes the ways that innovators think about collaborating and how it alters the relationships between members of collaborations. Where the understanding and interpretation of patent law involves conceptions of fairness and empowerment,

213. See, e.g., Robert P. Merges, *From Medieval Guilds to Open Source Software: Informal Norms, Appropriability Institutions, and Innovation* (Conference on the Legal History of Intellectual Property, Working Paper, Nov. 13, 2004), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=661543 (to access article, select One-Click Download).

214. See, e.g., Dreyfuss, *supra* note 146; Rebecca S. Eisenberg, *Noncompliance, Nonenforcement, Nonproblem? Rethinking the Anticommons in Biomedical Research*, 45 Hous. L. Rev. 1059 (2008); Michael J. Madison, Brett M. Frischmann & Katherine J. Strandburg, *Constructing Commons in the Cultural Environment*, 95 CORNELL L. Rev. 657 (2010); Strandburg, *supra* note 44, at 904–05.

215. See, e.g., Jeanne C. Fromer, *A Psychology of Intellectual Property*, 104 NW. U. L. Rev. 1441, 1484–92 (2010) (looking at the difference in standards for protectibility in patent and copyright law from the perspective of the psychology of creativity and creation, and emphasizing the aspects of problem solving and the ability to embrace newness in scientific and engineering inventions). Fromer also suggests that the law needs to address how to treat protected forms of creativity that do not fit the archetype of creativity for the relevant IP regimes. *Id.*

for example, and where norms for flexible use of and respect for patent rights emerge, the formal institution of patent law may become more effective as a tool for innovation. Similarly, where the system is regarded as exploitative or inefficient, or norms develop which involve ignoring intellectual property rights, the effectiveness of the patent system may decline. Examples of patent law research beginning to take place at this level include the study of how norms of information production and information sharing develop and interact with formal rules, such as the allocations of property rights.²¹⁶ Studies of creativity and processes of scientific discovery can suggest characteristics that may usefully inform the construction of patent laws.²¹⁷

Informal rules—level two of the framework—play an important role in the development and dissemination of knowledge, and in the interaction of norms of “free” or “semi-free” information sharing with patent law; this is a subject of growing concern, particularly in the context of academic science.²¹⁸ Alternative modes of innovation emerge that are constructed around norms of open access. Consider, for example, user innovators—or lead users—who develop technology for their own use, and are involved in free innovation transfers. These “lead users” innovate in order to solve their own ahead of market needs, providing new and improved products, often without any intent or action to patent their contributions.²¹⁹

216. This has been the subject of much discussion in the context of patent rights obtained over the fruits of basic research. See Robert P. Merges, *A New Dynamism in the Public Domain*, 71 U. CHI. L. REV. 183, 197 (2004) (discussing concerns about the “proprertization” of the public domain); see also Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, *supra* note 35.

217. See, e.g., Fromer, *supra* note 215.

218. See, e.g., Rebecca S. Eisenberg, *Proprietary Rights and the Norms of Science in Biotechnology Research*, 97 YALE L.J. 177, 217–26 (1987) (discussing the conflict between exclusive rights in research discoveries and academic norms); Heller & Eisenberg, *supra* note 205, at 698; Robert P. Merges, *Property Rights Theory and the Commons: The Case of Scientific Research*, 13 SOCIAL PHILOSOPHY & POLICY 145 (1996).

219. See Fred Gault & Eric von Hippel, *The Prevalence of User Innovation and Free Innovation Transfers: Implications for Statistical Indicators and Innovation Policy* at 3 (MIT Sloan Sch. Mgmt., Working Paper No. 4722-09, 2009), available at <http://ssrn.com/abstract=1337232> (to access article, select One-Click Download) (arguing that statistical indicators of innovation activities should be modified to reflect the importance of user-innovators in producing product and process innovations and that given the significance of this “free” innovation we should be more skeptical about the need for strong patent rights).

User innovator communities are often characterized by a “free revealing” of their innovations with others in response to private benefits that they can obtain as a result, such as recognition, adoption of certain generally available technologies, or the exchange of contributions from others.²²⁰ The informal rules which sustain free revealing may override, or come into conflict with, formal rules of ownership over the information. In “open source” software development projects, contributors commit to make their contributions available for duplication and use without charge.²²¹ Patents may serve to undermine certain types of innovation structures by interfering with norms of information sharing. Alternatively, they may strengthen the systems by creating mechanisms for enforcing the sharing of information, like through open source licensing. As an example, the open source model of software has managed to co-exist with proprietary software ownership and, indeed, has utilized intellectual property rights to formalize and perpetuate the open source model through license agreements such as the General Public License.

Focusing on levels three and four of the framework, the existing literature suggests that the connection between patents and market structure is critical.²²² Industry-specific studies, and applications of industrial organization to the study of patents and innovation—in particular market structures—move in the right direction. Examples include the study of industries where standard setting is important and where technological progress is characterized by incremental, cumulative innovation.²²³ The organizational approach to innovation connects in-

220. See Eric von Hippel, *Innovation by User Communities: Learning from Open-Source Software*, MIT SLOAN MGMT. REV. 84, 85 (2001).

221. See, e.g., James Bessen, *What Good is Free Software?*, in GOVERNMENT POLICY TOWARD OPEN SOURCE SOFTWARE 14–18 (Robert W. Hahn ed., 2002).

222. Attention is increasingly directed towards theories of patents and market structure, spurred by the work of Lemley, Merges, Barnett, and others. Overall patent scholars have been much slower than anti-trust scholars to turn their attention to issues of market structure and the organization of innovation.

223. E.g., Bronwyn H. Hall & Rosemary Ham Ziedonis, *The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995*, 32 RAND J. ECON. 101, 102 (2001) (conducting interviews of industry representatives and analyzing the industries patenting behavior); Burk & Lemley, *Policy Levers in Patent Policy*, *supra* note 22, at 1619–24 (citing examples from different industries).

dustry-specific and technology-specific studies and models to inform proposals for a more tailored approach to patent policy.²²⁴ The effectiveness of patents in furthering desirable forms of economic behavior depends on a variety of factors. Examples offered by the existing patent literature, particularly NIE-based work, include differences in the levels of investment needed to develop technologies and the risks of appropriation, differences in licensing costs in different markets,²²⁵ relative costs of increased incentives to pioneer inventors versus the costs of impeding incremental improvers,²²⁶ and industry-specific factors that allow for patents to perform better or worse as property rights.²²⁷ Norms can also play a role in influencing what types of collaborative practices are considered.²²⁸

The organizational approach offers a way of incorporating these different factors into patent policy design because it looks at the organization of innovation with the recognition that efficient organizational form will be context dependent. In moving away from a uniform patent law, however, we need to consider whether selection between paths of innovation is an appropriate domain for patent lawmakers. As North reminds us, institutions are inherently imperfect. They are subject to the ideas, ideologies, and interests of those who govern. How much government intervention do we want in selecting for or against alternative forms of innovation? Decisions about the nature of the tailoring must also be made in light of the costs of administering such detailed rules and the limitations of both decision-makers and implementers of the rules. A slightly different but equally important policy implication is that the government is, whether directly or indirectly, selecting for or against certain kinds of innovation through patent policy.²²⁹ In certain coun-

224. See, e.g., Hall & Ziedonis, *supra* note 222, at 101; Peter Lee, *Towards a Distributive Commons in Patent Law*, 2009 WIS. L. REV. 917, 924–25; Fiona Murray, *The Stem Cell Market: Patents and the Pursuit of Scientific Progress*, 356 NEW ENG. J. MED. 2341, 2343 (2007).

225. See, e.g., Gallini & Scotchmer, *supra* note 120, at 62–65 (arguing that the ideal design of an intellectual property system depends on the ease with which rights holders can enter into licensing and other contractual arrangements involving these rights).

226. See *id.* at 68.

227. See BESSEN & MEURER, *supra* note 22, at 91–94.

228. See, e.g., Jay P. Kesan, *Transferring Innovation*, 77 FORDHAM L. REV. 2169, 2169 (2009) (discussing the focus of universities on narrow licensing practices and the need to explore broader forms of collaboration in their technology transfer practices).

229. See, e.g., Bessen, *supra* note 221, at 26–32. See also Rebecca S. Eisen-

tries, such as China, there have been considerations of whether government users should be required to use open source technologies.²³⁰ The selection can be implicit in patent policies that do not take into account the selective effect of the rules on different types of innovation. While recognizing the dangers of a government-driven system of innovation and the advantages of a decentralized innovation policy, we need some way of evaluating whether regulatory approaches are effectively targeting the most beneficial activities and addressing the multiple goals that the institutions are designed to serve.²³¹ Focusing on the intersection of rules and organization provides the framework within which such a discussion can take place.²³²

C. THE NEED FOR ROBUSTNESS AND THE SECOND BEST RULE

A key implication of the organizational approach and its underlying assumptions about economic behavior is that patent laws should be designed with the expectation of opportunistic behavior and should be robust to the consequences of such behavior. This means that patent laws should be designed in light of propensities for over-patenting, the abuse of continuations, and patent trolling, taking into account the positive and negative effects of such behavior on the cost and feasibility of different modes of innovation.

Opportunistic behavior can arise when contracts are neces-

berg & Arti K. Rai, *Harnessing and Sharing the Benefits of State-Sponsored Research: Intellectual Property Rights and Data Sharing in California's Stem Cell Initiative*, 21 BERKELEY TECH. L.J. 21 1187 (2006) (illustrating the importance of the intersection of public funding and patent policy regarding publicly funded inventions in shaping innovation outcomes).

230. See Josh Lerner & Jean Tirole, *The Economics of Technology Sharing: Open Source and Beyond*, 19 J. ECON. PERSP. 99, 111 (2005).

231. See, e.g., Madison et al., *supra* note 214, at 659 (examining the intersection of IP and its interactions with other legal and social mechanisms of governing creativity and innovation through the study of intellectual sharing/pooling arrangements and the construction of cultural commons arrangements); see also Timothy R. Holbrook, *The Expressive Impact of Patents*, 84 WASH. U. L. REV. 573, 579–81 (2006).

232. Key questions to inform this analysis include: What is the relative importance of different types of innovation and how, if at all, should patent law respond? To what extent do patent laws select for or against different types of organizations, such as joint ventures, collaborations, and small versus large firms, and does this matter for innovation outcomes? When will private actors adapt their modes of innovation to neutralize the effects of patent law?

sarily incomplete or information is imperfect.²³³ The potential for costly opportunism is particularly severe where asset-specific or relationship-specific investments are required in the face of imperfect information and high transaction costs. Patent laws should therefore be designed to reduce situations of incomplete, particularly asymmetric, information, and to reduce the cost and uncertainty of establishing the boundaries of patent rights. A number of patent reform proposals that have received attention by commentators and policy-makers can be explained and justified in light of this approach.

For example, the organizational approach provides a justification for Lemley's and Kimberly A. Moore's proposal to restrict the ability to file continuation patent applications, which allow patent applicants to abandon and re-file applications or to keep applications on file while pursuing related applications on the same invention.²³⁴ Continuations can create problems such as introducing delay and uncertainty for competitors because they must guess about pending claims, obtaining broader patents due to persistence rather than merit, and using of strategic practices of drafting claims that cover competitor products or surprising established producers who are unaware of the pending application.

The organizational approach similarly supports James Bessen's and Michael J. Meurer's call for improving the notice function of patents by increasing the transparency of the patent process and the predictability and visibility of patent boundaries.²³⁵ These efforts help to increase the information that economic actors have before they make project-specific or relationship-specific investments and improve the ability of patents to perform effectively as property.

The organizational approach is of particular assistance in guiding responses to patent trolling, since the practice involves

233. See Williamson, *Transaction Cost Economics*, *supra* note 144, at 30–31.

234. Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuations*, 84 B.U. L. REV. 63, 64–66 (2004) (describing the harm caused by abuse of continuations practice and proposing restricting, or even abolishing, continuation practice).

235. BESSEN & MEURER, *supra* note 22, at 7 (“The economic effectiveness of any property system depends not just on what it sets out to do, but also on the laws, regulations, institutions, and norms that implement the system.”). Bessen and Meurer also argue that an effective property system must improve the implementation of patent laws in a way that satisfies the notice requirement of property rights. *Id.* at 235–36.

an analysis of the transactional structures of patent owners and patent users and the transaction costs of asserting patents against producers of existing goods. Level three and four of the framework encompass many of the tools for unpacking this type of strategic behavior and its implications for organizational and market structure. Patent trolling is often used to describe the opportunistic enforcement of patents against infringers—generally with no intention to manufacture or market the patented invention—with the hope of extracting licensing fees that exceed the contribution of the invention to the user. Concerns about patent trolls have fueled some of the most significant proposed changes to the patent statute and have elicited strong reactions from the courts.²³⁶ Rather than viewing such behavior as abhorrent, the organizational approach suggests that such behavior is to be expected and may even serve the function of enabling secondary markets and increasing asset liquidity.²³⁷ Attention then focuses on if, when, and how such behavior impacts transaction costs and transactional structures in the areas where opportunities for trolling arise, and how to reduce those costs through rule change. The organizational approach supports measures that increase the visibility and transparency of patent rights, reducing the asymmetries in information that patent “trolls” capitalize on. Similarly, the organizational approach supports proposals to include considerations of “contribution” of a patent to a product seeking to address the patent hold-up problem. Although concerns do arise over whether these “contributions” can be measured in an accurate, or at least predictable, way. More careful analysis of the use of injunctions in cases of patent infringement is also an appropriate response, although the absence of a general consideration for market-wide effects of an injunction limit its effectiveness, making it a blunt instrument. As Robert Merges argues, use of injunctions can provide the type of institutional adjustment that is needed to adapt patent rights to shifting

236. See Robert P. Merges, *The Trouble with Trolls: Innovation, Rent-Seeking and Patent Law Reform*, 24 BERKELEY TECH. L.J. 1583, 1585–87 (2009).

237. See, e.g., *id.* at 1584–86 (examining how property rights systems can lose traction with the underlying economic situations they govern and examining the challenges of rent seeking and the pressures it can put on innovation and advocating institutional adjustments such as the eBay revision of standards for injunctive relief).

economic conditions and their underlying transactional structures.²³⁸ Patent policy-makers must also be proactive in anticipating the behaviors of private actors who are seeking to maximize profits from their patent rights in evolving systems of technology and business.

D. INTERNATIONAL PATENT LAW: NORMS & COMPLIANCE

*IP is essentially becoming the world's currency of innovation. In this new environment, the global legal, economic, and innovation communities bear the challenge and responsibility of creating a market-based, stable exchange rate for the currency of innovation by fostering greater understanding and respect for IP.*²³⁹

If intellectual property is the world's currency of innovation, then an understanding of how international patent law works, and how it connects with domestic patent law is critical to effective patent policy. The emergence of the international intellectual property framework complicates domestic U.S. patent policy. The two systems diverge in terms of how rules are developed, applied, and enforced; the policies and policy-makers shaping U.S. patent law have historically been different from those driving international patent laws and patent policy. While domestic law relies on statutes and formal rules, international law relies heavily on custom. Yet the two systems increasingly intersect. They intersect on an administrative level through legal cases that have extra-territorial aspects and through concerns about compliance of domestic laws with an international framework. They intersect on a broader policy level in light of the globalization of markets and innovation processes. Traditional approaches to patent law, with their abstraction from the institutional environment in which rules are generated and enforced, and their primary focus on market-based incentive theories, do not readily generalize to international law settings. Nor do they help us to explore the effects of globalization on domestic patent law. As a result, domestic patent policy remains largely disconnected from international patent policy and the study of international patent law and policy

238. *Id.* at 1586.

239. David J. Kappos, Under Secretary, Speech to the National Bureau of Economic Research at the National Press Club (Apr. 20, 2010) *available at* http://www.uspto.gov/news/speeches/2010/Remarks_Kappos_Economic_Research.jsp.

remains under-theorized.²⁴⁰ The organizational approach can provide a broader understanding of how international patent law operates and how international rules might intersect with domestic rules. Applying the approach suggests that international patent policy should include a broader role for international norm building; it should be informed by broad principles of compliance that are sensitive to local norms and legal system capacity. The approach supports recent proposals for organizational innovation in the form of administrative solutions to some of the challenges of international patent lawmaking and enforcement, as discussed below.²⁴¹

The traditional starting point for thinking about international patent law is the Agreement on Trade Related Aspects of Intellectual Property (TRIPS), which provides the dominant formal legal framework for international patent law.²⁴² TRIPS is housed within the World Trade Organization (WTO), a rules-based international environment which has the stated objective of promoting international trade.²⁴³ TRIPS provides minimum levels of protection that each member state needs to provide to the intellectual property of other members. It also includes certain broad principles, including national treatment, most-favored nation treatment, and the principle that intellectual

240. However, important contributions have been made. See generally Margaret Chon, *Substantive Equality in International Intellectual Property Norm-Setting*, in INTELLECTUAL PROPERTY, TRADE AND DEVELOPMENT (Daniel Gervais ed., 2007); Graeme Dinwoodie & Rochelle Dreyfuss, *Designing a Global Intellectual Property System Responsive to Change: The WTO, WIPO and Beyond*, 46 HOUS. L. REV. 1187 (2009); Graeme B. Dinwoodie & Rochelle C. Dreyfuss, *TRIPS and the Dynamics of Intellectual Property Lawmaking*, 36 CASE W. RES. J. INT'L L. 95 (2004); Rochelle Dreyfuss, *Fostering Dynamic Innovation, Development and Trade: Intellectual Property as a Case Study in Global Administrative Law* (Inst. Int'l L. & Just., Working Paper No. 08-66, 2008), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1316925 (to access article, select One-Click Download); Strandburg, *supra* note 44.

241. See Merges, *supra* note 216; see also Eisenberg, *supra* note 35.

242. Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, 33 I.L.M. 1197 [hereinafter TRIPS Agreement] (establishing a multilateral agreement creating minimum protection standards for various forms of intellectual property among Member States).

243. See *Managing the Challenges of WTO Participation: 45 Case Studies*, WORLD TRADE ORG., http://www.wto.org/english/res_e/booksp_e/casestudies_e/casestudies_e.htm (last visited Aug. 16, 2010) (“[T]he WTO creates a framework within which sovereign decision-making can unleash important opportunities or undermine the potential benefits flowing from a rules-based international environment that promotes open trade.”).

property protection should “contribute to the promotion of technological innovation and to the transfer and dissemination of technology.”²⁴⁴ This third principle in particular reflects the fact that the TRIPS framework must accommodate countries with very different needs and interests, and that its implementation should reflect normative concerns such as access to health. Many of the proposals for international patent policy change take the form of proposed changes to the TRIPS framework, such as efforts to build in expanded or restricted abilities to use compulsory licensing and expanded or restricted definitions of patentable subject matter.²⁴⁵ The mechanisms for effecting change in the rules and their enforcement are complex and go beyond simple law-making processes. Moreover, a change in the rules doesn’t go very far in changing behavior, as demonstrated by the relative lack of utilization of the compulsory licensing provisions fought for as part of the Doha Declaration.²⁴⁶ Finally, it is difficult to connect the changes proposed at the international level with implications for domestic patent law and domestic innovation.

The organizational approach moves us beyond the view of international patent law as simply a system of formal rules and towards a view of the system as a set of both formal and informal rules that are the product of the diverse relationships and arrangements that shape the system’s development, adoption, and economic impact. The organizational approach suggests that a first step in more effective reform of international patent law is to recognize the relative importance of informal rules in international law-making, implementation, and enforcement. Informal rules play a significant role in shaping international law, and in determining how agreed upon rules are interpreted, implemented, and enforced.²⁴⁷ A variety of actors, both public

244. TRIPS Agreement, *supra* note 242, at 1200.

245. See generally Gervais, *supra* note 197 (analyzing the TRIPS agreement, with particular emphasis on the impact intellectual property has on economic activity).

246. See Amir Attaran, *Assessing and Answering Paragraph 6 of the Doha Declaration on the TRIPS Agreement and Public Health: The Case for Greater Flexibility and a Non-Justiciability Solution*, 17 EMORY INT’L L. REV. 743, 746–751 (2003).

247. See, e.g., Pitman B. Potter, *Globalization and Business Regulation in Local Context*, in A GUIDE TO BUSINESS LAW IN ASIA 13–16 (Pitman B. Potter & Ljiljana Biuković eds., 2008) (proposing a selective adaption paradigm which addresses the implementation of international legal norms in the context of local culture and legal traditions).

and private, participate in this process.²⁴⁸ As Dinwoodie notes, the “shape of international intellectual property law is being determined by the interaction of numerous components of the system.”²⁴⁹ There are multiple participants in norm creation: both domestic and international, public, and private. In some cases the norms may conflict with each other or with the established rules. Tensions also exist between uniform international norms and national autonomy.²⁵⁰ A second step is to recognize the importance of limited institutional capacity in responding to formal and even informal rule changes.²⁵¹ Local practices, regulatory infrastructure, and local cultural norms are important factors in determining compliance with both formal and informal rules. The approach advocates concepts which take into account the limited institutional capacity of different countries and the different cultural and social norms through which formal rules are filtered. Notions of compliance, which capture both adoption of rules and the constraints on their implementation and enforcement, provide a useful conceptual framework for analysis.²⁵²

Third, the organizational approach supports proposals for innovation in the organization of law making and enforcement. Current work in the interface of domestic and international patent law explores the need for mechanisms to accommodate national courts and national interests in international patent law making.²⁵³ The administrative structure of international patent

248. Graeme B. Dinwoodie, *The International Intellectual Property Law System: New Actors, New Institutions, New Sources*, 10 MARQ. INTELL. PROP. L. REV. 205, 206 (2006).

249. *Id.* at 10.

250. Dinwoodie & Dreyfuss, *TRIPS and the Dynamics of Intellectual Property Lawmaking*, *supra* note 240, at 95–96.

251. *See, e.g.*, SAMUEL WANGWE ET AL., CASE STUDY FOR STUDY 9: INSTITUTIONAL ISSUES FOR DEVELOPING COUNTRIES IN IP POLICY-MAKING, ADMINISTRATION AND ENFORCEMENT, UGANDA 12–14 (2002). (looking at the challenges of developing and implementing an IP system in Uganda in light of the obligations of the TRIPS framework).

252. *See, e.g.*, Potter, *supra* note 247, at 12–13 (arguing that international law can acquire a variety of local meanings that require an understanding of the local history and culture in addition to knowledge of the domestic economy and laws).

253. *See, e.g.*, Graeme B. Dinwoodie, *The Architecture of the International Intellectual Property System*, 77 CHI.-KENT L. REV. 993, 1010–13 (2002) (examining how the system of international IP lawmaking is changing and discussing the need for mechanisms to enhance the role of national courts that were historically largely excluded from lawmaking process); Graeme B.

law becomes a central part of international patent policy under this approach. Dreyfuss and Dinwoodie argue that the process of international intellectual property law should be the primary focus of attention, and that new administrative structures are needed to guide the development of international intellectual property law. Internationalization of intellectual property law is seen as occurring quickly through the activities of multiple participants and the impact of global trade and digital technologies. Dreyfuss and Dinwoodie call for the recalibration of the balance between national and international norms through careful choice of institutional structures and gathering of information needed to make choices about international patent law fairly and consciously.²⁵⁴ “Organizations such as the WTO and World Intellectual Property Organization (WIPO) evolve in response to the needs and interests of different stakeholders, with implications for both rule development and rule enforcement.”²⁵⁵

E. PATENTS AND ENTREPRENEURSHIP

The study of entrepreneurship and its determinants has been largely confined to disciplines other than law. A large and growing business literature supports the importance of entrepreneurship as a vehicle of economic progress and growth and explores the determinants of entrepreneurship and the variables that contribute to the success and failure of new ventures. But despite the importance of intangible assets in new business ventures and the role of ideas and control over these ideas in fueling entrepreneurship, the relationship between patents and entrepreneurship has received little attention from patent scholars.²⁵⁶ If we agree that entrepreneurs play an important

Dinwoodie, *The Integration of International and Domestic Intellectual Property Lawmaking*, 23 COLUM.-VLA J.L. & ARTS 307, 307–08 (2000).

254. See Dinwoodie & Dreyfuss, *TRIPS and the Dynamics of Intellectual Property Lawmaking*, *supra* note 240, at 95–97 (examining the extent to which TRIPs dispute resolution adequately accommodates the operation of each member’s political economy as it relates to intellectual property lawmaking). See generally Graeme B. Dinwoodie & Rochelle C. Dreyfuss, *International Intellectual Property Law and the Public Domain of Science*, 7 J. INT’L ECON. L. 431 (2004) (examining the scope for domestic responses to public domain in the face of international legal frameworks governing patent law).

255. See, e.g., Dinwoodie, *supra* note 248, at 207–10 (examining international norm creation by a wide range of institutions, both public and private, and the implications for the future development of the international IP system).

256. See Stuart J.H. Graham & Ted M. Sichelman, *Why Do Start-Ups Pa-*

role in driving innovation, then how patents influence entrepreneurial activities, the performance of start-up ventures, and the structure and nature of entrepreneurial markets should be an area of focus for patent policy-makers.²⁵⁷ The Berkeley Patent Survey is one of the few attempts to uncover the broader relationships between patents and entrepreneurship, exploring patenting behavior of a large selection of high technology entrepreneurs. The results suggest that the patterns and drivers of patent-holding are industry and context-specific, with venture capital financing as an important variable in differentiating behavior.²⁵⁸ Evidence supports the assertion that patents are used for strategic reasons such as improving bargaining positions in cross-licensing, as well as signaling reasons such as securing early stage investment.²⁵⁹ The cost of obtaining and enforcing patent rights appears to be a significant variable. Overall, the results suggest the importance of context in determining use.²⁶⁰ The organizational approach provides a way of integrating the context and connecting empirical findings such as these to determine how to encourage entrepreneurship through patent law change.

By starting with the human arrangements that drive alternative processes of innovation, the organizational approach acknowledges the importance of human agency in the process of innovation. It allows for distinctions between different types of economic behavior at the level of the individual, the organization, and the market. Where there are actors that seem to play a particularly important role in driving innovation, the characteristics of these actors and factors that facilitate or impede their actions become an important area of policy focus. Fo-

tent?, 23 BERKELEY TECH. L.J. 1063, 1070 (2008); Ted M. Sichelman & Stuart J.H. Graham, *Patenting by Entrepreneurs: An Empirical Study*, 17 MICH. TELECOMM. & TECH. L. REV. 111, 113 (2010).

257. For the importance of entrepreneurs as agents of change, see Douglass C. North, *The Contribution of the New Institutional Economics to an Understanding of the Transition Problems*, in WIDER ANNUAL LECTURES 1, 7 (Mar. 1997), available at http://www.wider.unu.edu/publications/annual-lectures/en_GB/AL1.

258. See Stuart J.H. Graham, Robert P. Merges, Pamela Samuelson & Ted M. Sichelman, *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 BERKELEY TECH. L.J. 1255, 1326–27 (2009).

259. See Sichelman & Graham, *supra* note 256, at 112–13 (presenting evidence as to why innovators patent their new technologies).

260. *Id.*

cusing on cognition provides a useful context for exploring the characteristics, motivations, and decision-making of the entrepreneur, with implications for how patents might influence behavior.²⁶¹ There is at least anecdotal evidence that patents could have an empowerment function.²⁶² The notion that one can “own” their own ideas and create valuable assets out of their own intellectual efforts can encourage individuals to pursue their initiatives in a business world that they might otherwise feel was inaccessible. There is both a psychological component and a practical business component to the notion of intellectual property as property that can be self-created, with limited external resources. At the broader social level, cultural and social understanding about patents and intellectual property ownership more generally could create a climate conducive to entrepreneurship, just as the bankruptcy laws and the acceptability of failure has been thought to contribute to the willingness to engage in risky new ventures.²⁶³ General norms about risk taking and historical practices of investment might be influenced by patent policies, influencing at least the financing of entrepreneurial activities. The different psychologies of creativity and scientific or technical invention may also justify differences in formal rules.²⁶⁴ Recognizing the interaction between informal rules and formal rules, the organizational approach captures the potential of entrepreneurial acts and beliefs to shape the direction of innovation and influence the roles that patents may play in innovation processes.²⁶⁵

261. See, e.g., Shyamkrishna Balganesh, *Foreseeability and Copyright Incentives*, 122 HARV. L. REV. 1569 (2009); Jonathan Remy Nash & Staphanie M. Stern, *Property Frames*, 87 WASH. U. L. REV. 449 (2010); Jennifer W. Scangos, Comment, *Instinct and Rationality: An Evolutionary Approach to Intellectual Property Law*, 15 INTELL. PROP. L. BULL. 65 (2010).

262. For anecdotal evidence, see the life and work of National Foundation for Teaching Entrepreneurship founder Steve Mariotti. *But see* Torrance & Tomlinson, *supra* note 143, at 135.

263. See generally Mike W. Peng, Yasuhiro Yamakawa, & Seung-Hyun Lee, *Bankruptcy Laws and Entrepreneur-Friendliness*, 34 ENTREPRENEURSHIP THEORY AND PRACTICE 517 (2009).

264. See Jeanne C. Fromer, *A Psychology of Intellectual Property*, 104 NW. U. L. REV. 1441, 1443 (2010) (examining patent laws and copyright laws in light of psychology literature on creativity and different aspects of the creative processes for different works and inventions).

265. See, e.g., Sarah Kaplan & Fiona Murray, *Entrepreneurship and the Construction of Value in Biotechnology*, 29 RES. IN THE SOCIOLOGY OF ORG. 107, 107–8 (2010) (“[T]he burgeoning literature on institutional entrepreneurship . . . argues precisely that neither the technology nor the institutional environment is fixed and that multiple actors with multiple goals . . . act to

Most of the existing research connecting patents to entrepreneurship has focused on the roles patents might play in obtaining financing for new ventures. The relationships between entrepreneurs, their employees, their financiers, their suppliers, and their customers can be usefully explored by looking at the intersection of formal rules and governance structures. At the pre-financing level, patents can serve an information function, signaling the value of intangible assets and human capital to potential funders in a way that facilitates the financial transaction.²⁶⁶ Patents can also facilitate financing of early stage ventures by providing investors with property rights over intangible assets.²⁶⁷ Post-financing, venture capital backed firms tend to have higher patenting. This can be explained in terms of the higher innovation levels of venture-backed companies (a plus) or in terms of the short-term nature of venture capital strategies, with their interest in creating signals of market value to allow for early exit.²⁶⁸

The organizational approach also provides opportunities to tie in relevant research from other disciplines in order to refine patent strategies to promote entrepreneurship. At the level of the firm, the management, operations research, and organizational design literature offer interesting insights into the connection between organizational structure, information systems, and knowledge generation and transfer, with under-explored implications for patent law.²⁶⁹ Exploring firm structures that

shape the institutional setup that would govern activities in a particular field.”).

266. Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 627–28 (2002) (discussing patents as mechanisms for firms to signal their R&D capacity and the value of their intellectual assets to attract financing and licensing opportunities).

267. See Eisenberg, *supra* note 36, at 1024–28.

268. See, e.g., Simona Fabrizi, Steffen Lippert, Pehr-Johan Norbäck & Lars Persson, *Venture Capital Financing of Innovation, Patenting, and Long-Run Performance of Private Acquisitions* (Massey U. C. of Bus. Res., Working Paper No. 13, 2010), available at <http://ssrn.com/abstract=1629226> (to access article, select One-Click Download) (examining the relationship between venture capital financing, patent intensity, and firm performance in light of facts such as the higher patent count of VC intensive industries, and also studying the incentive effects such as role of patents in signaling company value prior to exit).

269. The study of how firm structure influences knowledge management offers an alternative entry point for studying characteristics of firms that are successful innovators. See Richard Baskerville & Alina Dulipovici, *The Theoretical Foundations of Knowledge Management*, 4 KNOWLEDGE MGMT. RES. & PRAC. 83, 90–92 (2006).

are particularly effective, or ineffective, at producing and utilizing new technologies and investigating what role, if any, patents play in sustaining those structures may offer new insights into the impact of patent law on innovation. Theories of knowledge management and spillover can be used to study the interaction between incumbent firms and entrepreneurs in the presence and absence of intellectual property rights.²⁷⁰ A particularly fruitful avenue for exploring the intersection of intellectual property and entrepreneurship lies in the study of organizational responses to opportunities and obstacles in cumulative innovation. Examples include the study of how the conditions surrounding the access and use of an innovation impact the ability of others to innovate cumulatively.²⁷¹ Industrial organization and game theory can help in exploring the effects of changing market structures on entrepreneurship. The expansion of markets for technology may, for example, either enhance the development of new ventures by providing greater access to new technologies with commercial potential, or reduce it by pushing innovators to sell early to large purchasers rather than accept the risk of self-development. Comparisons can be drawn between the ability of big and small firms to innovate and the potential costs of hierarchy and size in limiting entrepreneurial activity, and this can be tied to the roles that patents may play in allowing or impeding efforts to spin off ideas and create new ventures or, conversely, to block the development of competing technologies.²⁷² This type of research can be used to provide the contextual framework within which to reexamine the implications of existing studies within the pa-

270. See, e.g., Zoltan J. Acs, Pontus Braunerhjelm, David B. Audretsch & Bo Carlsson, *The Knowledge Spillover Theory of Entrepreneurship*, 32 SMALL BUS. ECON. 15, 15–19 (2009) (looking at the source of entrepreneurial opportunities and tying it to knowledge and ideas created in incumbent organizations, and suggesting that entrepreneurial opportunities are not exogenous but instead systematically created by investments in knowledge); Zoltan J. Acs & Mark Sanders, *Intellectual Property Rights and the Knowledge Spillover Theory of Entrepreneurship* § I (Jena Econ. Res. Papers, Paper No. 2008–069, 2008), available at <http://edoc.mpg.de/get.epl?fid=52283&did=399807&ver=0> (arguing that, up to a point, stronger IP rights may facilitate entrepreneurship, but at some point, expanding IP rights may dampen the incentives of entrepreneurs).

271. See, e.g., Fiona Murray & Siobhán O'Mahony, *Exploring the Foundations of Cumulative Innovation: Implications for Organization Science*, 18 ORG. SCI. 1006, 1006–07 (2007); J. H. Reichman, *Of Green Tulips and Legal Kudzu: Repackaging Rights in Subpatentable Innovation*, 53 VAND. L. REV. 1743, 1744–45 (2000).

272. See generally Sichelman & Graham, *supra* note 256.

tent literature.

Studies of the academic-firm interface offer important insights into roles that patents might play in science-based entrepreneurship. The role of academic scientists in the process of creating and growing new ventures is particularly significant in the life sciences, where much of the basic research underlying drug discovery and development is conducted in universities and other non-profit research labs. They participate in venture creation and development through consulting, sponsored research, and other forms of collaboration that can involve transfer of both human and social capital.²⁷³ Patents offer mechanisms for structuring collaborations that might otherwise be unavailable, but in allocating ownership and control over the fruits of collaboration they might also foreclose certain types of research and collaborative activity. Despite the importance of these activities, the effects of science-based entrepreneurship and, in particular, the roles of patents in promoting it, on the conduct of academic science have yet to be fully understood.²⁷⁴ Policy implications uncovered by an organizational approach include tailoring of patent policy to include broader research use exemptions to distinguish between applied and basic research.²⁷⁵

CONCLUSION

*Truly among man's innovations, the use of organization to accomplish his ends is among both his greatest and his earliest.*²⁷⁶

In 2009 President Obama announced a new "Strategy for Innovation" designed to "lay the foundation for the innovation

273. See, e.g., Fiona Murray, *The Role of Academic Inventors in Entrepreneurial Firms: Sharing the Laboratory Life*, 33 RES. POL. 643, 644 (2004) (examining the extent and mechanisms through which academic scientists contribute not only human capital but also social capital to entrepreneurial firms).

274. Cf. Mark Edwards, Fiona Murray & Robert Yu, *Gold in the Ivory Tower: Equity Rewards of Outlicensing*, 24 NATURE BIOTECH. 509, 515 (2006) ("[T]he impact of startup involvement on scientific competition, the behavior of academic scientists and the diffusion of publicly funded science to a wide audience has yet to be fully unraveled.")

275. See generally Merges, *supra* note 41 (proposing broader research use exemption).

276. KENNETH J. ARROW, *ESSAYS IN THE THEORY OF RISK-BEARING* 224 (1971).

economy of the future,” and updated it in February 2011 to build on key aspects of the strategy.²⁷⁷ The policy calls for strengthening competitive markets through regulatory reform and a rethinking of the relationship between public and private sectors, for government intervention in key sectors where “markets may fail on their own,” and for increased investment in the basic infrastructure underlying systems of innovation.²⁷⁸ A key theme in the national innovation policy is the importance of collaboration and the need to foster new and improved regional and local systems of innovation.²⁷⁹ The America COMPETES Act, passed in 2007 and reauthorized in 2011, emphasizes the use of organizational strategies to support innovation. These strategies include fostering new kinds of collaboration, particularly public-private collaborations such as those between universities, government labs, and firms, and supporting new forms of economic organization, such as the creation of regional innovation clusters.²⁸⁰ Although the patent system was created for the purpose of encouraging innovation, patent policy is marginalized in current national innovation strategies. This paper provides a way of answering this puzzle and, more importantly, a way of making patent policy more relevant to innovation policy. I have argued that the neglect of patents as important tools in furthering the goals of national innovation strategies can be explained at least in part by the focus of traditional approaches to patent policy on incentives to invent rather than efforts to support innovation systems.

277. NAT'L ECON. COUNCIL, *supra* note 3, at i; *see also A Strategy for American Innovation: Securing Our Growth and Prosperity*, WHITE HOUSE (Feb. 2011), <http://www.whitehouse.gov/innovation/strategy>.

278. NAT'L ECON. COUNCIL, *supra* note 2, at ii (introducing a national innovation strategy built around government investment in key areas of innovation and in the infrastructure and other “inputs” of innovation and promotion of competitive markets to produce the innovations needed, and advocating for government intervention to support market production).

279. *Id.* at 19.

280. America COMPETES Reauthorization Act of 2010, H.R. 5116, 111th Cong. (2010) (investing in innovation through R&D and improving American competitiveness); *see, e.g.* Robert D. Atkinson, *Eight Ideas for Improving the America COMPETES Act*, INFO. TECH. & INNOVATION FOUND., March 2010, at 1, available at <http://www.itif.org/files/2010-america-competes.pdf>; Fred Block & Matthew R. Keller, *Where Do Innovations come From? Transformations in the U.S. National Innovation System, 1970-2006*, INFO. TECH. & INNOVATION FOUND., July 2008, at 1, available at http://www.itif.org/files/Where_do_innovations_come_from.pdf (documenting the importance of collaborations between universities, federal labs, small firms, and large firms as drivers of innovation).

This Article has made the case for a reorientation of patent policy to focus on the mechanisms through which patents alter the nature and cost of transactions supporting systems of innovation. The organizational approach that I have proposed promotes the design of patent laws that are more narrowly tailored to the particular needs of alternative innovation processes, focused on reducing the propensity for behaviors which are most costly to the organization of economic activities, robust to constraints on rule design and implementation, and sensitive to alternative mechanisms for regulating behavior. By adopting such an approach, policymakers can produce more effective strategies for patent policy design in real world settings characterized by bounded rationality, market imperfections, and constraints on efficient rule change. Existing applications of New Institutional Economics to patent law have offered important insights into how patents impact the organization of economic activities. But such efforts have thus far remained on the sidelines in policy discussions, operating largely in isolation from other theories and at a level that is either too abstract or too descriptive to map readily into practical policy prescriptions. Recognizing that some level of abstraction from reality is essential in policy design, the organizational approach provides a way of capturing critical features of real world innovation processes without losing analytical rigor and empirical testability. It offers an opportunity for integrating existing patent theories and empirical work in a way that can test the theories' robustness and give them greater explanatory power, and it offers new avenues for exploring different functions of patents that may have been neglected or overlooked by mainstream approaches. Most importantly, it provides a way of demonstrating the relevance of patents to key objectives of modern national innovation strategies.

Significant challenges remain in this form of analysis. Questions arise, for example, about how to apply an analysis of transaction costs to dynamic systems of innovation in a way that can be both modeled and measured, and about how to identify the types of transactions and modes of organization that will be most favorable to evolving systems of innovation. Given the dynamic nature of innovation, institutions must constantly adjust if they are to keep pace in a rapidly changing society, but the ways of making institutions such as the patent

system adaptively efficient remain the subject of continuing inquiry.²⁸¹ Clearly the challenges facing effective patent policy design are significant, and the value of the organizational approach that I propose remains to be proven by the effectiveness of future concrete applications. I conclude, however, that the organizational approach seems to be the most promising platform on which to pursue this challenging regulatory agenda. Moreover, without such a shift in approach, critical opportunities to turn patents into effective tools of innovation will be missed.

281. See North, *supra* note 60, at part VII (“It is adaptive rather than allocative efficiency which is the key to long run growth.”).