Don't Assume a Can Opener: Confronting Patent Economic Theories with Licensing and Enforcement Reality

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I. INTRODUCTION

The types of entities who license and enforce patents divide into five general groups. They are:

- Individual inventors with a single patent (the "One Big Idea Inventors");
- Individual serial inventors (the "Thomas Edisons");
- Non-Practicing Entities (the "NPEs");
- Operating companies who practice inventions acquired from others (the "Not-Invented-Here's"); and
- Operating companies who practice inventions developed in-house (the "R&D Practicers").

Each of these can be further subdivided into subtypes. For example, individual inventors (the first two types) either do or do not use their own inventions. NPE's come in many varieties, and include businesses whose model involves solely licensing and enforcement, as well as universities and government agencies. R&D operating

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> A physicist, a chemist and an economist are stranded on an island, with nothing to eat. A can of soup washes ashore. The physicist says, "Let's smash the can open with a rock." The chemist says, "Let's build a fire and heat the can first." The economist says, "Let's assume that we have a can-opener . . . ."

companies come in all different sizes – say, small and large. So a more precise overview of patent enforcers might list the following:

One Big Idea Inventors

- Practices the Invention
- Does Not Practice the Invention

"Thomas Edison"

- Practices the Invention
- Does Not Practice the Invention

NPE's

- Licensing/enforcement Companies
- Universities
- Government Agencies

Not-Invented-Here's

R&D Practicers

- Smaller
- Larger

Certainly there are overlaps and evolutions. A single entity might arguably fit into multiple categories. For example, a larger operating company might be a non-practicing entity for a specific patent it seeks to enforce. But its operating company status will generally dominate its attitudes and approaches toward enforcement (*e.g.*, fear of countersuits). One type of entity might grow into another. "Thomas Edisons" might form operating companies around their inventions (for example, Mr. Edison himself did). In the other direction, former operating companies might become NPE's (Encyclopedia Britannica is one example). But aspirations or evolutions aside, who the entity is right now will dominate its thinking and planning.

Patent licensing and enforcement is a different experience for each type, and even for each subtype. An individual inventor might have strikingly different aims from the patent system than would an R&D entity (*e.g.*, personal wealth creation, rather than product line protection). Such an individual would likewise know different obstacles to achieving them (*e.g.*, lack of financial resources for enforcement, versus a risk of infringement countersuits). The same difference in perspective exists among any pair of subtypes. As one example, a small operating R&D company might see both the advantages and the disadvantages of patent enforcement quite differently from a large one.

The law and economics literature about patents seems to ignore this rich diversity. This body of scholarship analyzes the interplay between positive law and economic forces motivating market players. Law and economics supplies a powerful and widely accepted framework for evaluating policy, or suggesting policy changes. Yet it pays scant attention to the differing aims and means employed by different types of actors in the patent-economic system. The omission might undermine the legitimacy of law and economics as applied to the patent system.

This article begins to correct the omission. It injects the diversity of actors into discussions about patent system economics. The article proposes to test various theories and methods against real world facts about patent licensing and enforcement.

To begin, the article will discuss several predominant patent system theories. They are the "reward theory," the "prospect theory," and the "commercialization theory." These theories in different ways explain the justifications for, or social costs and benefits of, a patent system. Yet each of them barely acknowledges what goes on during actual

patent licensing or enforcement. Next, the article will survey some prior economic analyses of the patent system. This survey will expose the conventional assumptions going into such analyses, and demonstrate that while they can offer provocative insights and generalizations, they do not often take into account real world factors. Finally, the article will conclude with the ramifications of injecting the aims of real patent actors into contemporary patent economic theory, exposing the need for modifications to the prevailing modes of thinking on the patent system.

II. PATENT ECONOMIC THEORIES

Over time, three main patent system theories have emerged. These are the reward theory, the prospect theory and the commercialization theory.[2, 3] Each theory offers a perspective on motives and incentives behind the patenting decision and patenting effects (such as licensing and enforcement). As will be seen, certain aspects among them overlap. Yet they each provide a distinct point of view, and distinct understandings of what sorts of policy adjustments promote social welfare.

Underpinning each theory is a basic economic assumption – the primacy of rational choice. Economists posit that systems behave as if each actor in the system seeks to maximize his or her own private welfare. The words "as if" are significant. Economists are generally agnostic about whether specific actors ever make specific choices based on a conscious welfare calculation. Even so, the patent system theories discussed below each take as their starting point the premise that the individuals or entities who innovate and patent are wealth seeking rational actors.

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[2] Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J. L. & ECON. 265, 266 (1977).

[3] F. Scott Kieff, *On the Economics of Patent Law and Policy*, *in* PATENT LAW AND THEORY: A HANDBOOK OF CONTEMPORARY RESEARCH 3, 34-42 (Toshiko Takenaka ed., 2008).

A. Reward Theory

The reward theory is perhaps the most traditional of the three. Under this theory, innovation is a social good. Therefore, systems should be set up to reward innovation. Patents perform this function. They ostensibly provide an inventor with exclusive rights to an invention for a period of years.[4]

The reward is one pole of what has been called the incentive-access dilemma.[5] Incentives exist to spur innovation. But the incentive itself is the promise of reduced access to future prospective entrants. Policy discussion under the reward theory tends to focus on conceiving optimal incentive structures, while reducing the social costs of access restriction.

Regarding access restriction, reward theorists believe that monopoly rights, once granted, tend to diminish social welfare.[6] They make the assumption that exclusive rights over a technology lead to exclusive rights over a product market. Exercise of monopoly power (which exclusivity allows under these assumptions) leads to reduced output and increased prices of finished goods compared to a purely competitive market. This breeds the problem economists call "rent dissipation." Rent dissipation describes the total disappearance of a portion of social welfare based on pricing structure and output constraints. As a baseline, theory holds that competitive markets supply the maximum social welfare. This is seen in prototypical supply and demand curves as the area of the trapezoid determined by the price A appearing at the intersection of the supply – demand curve:

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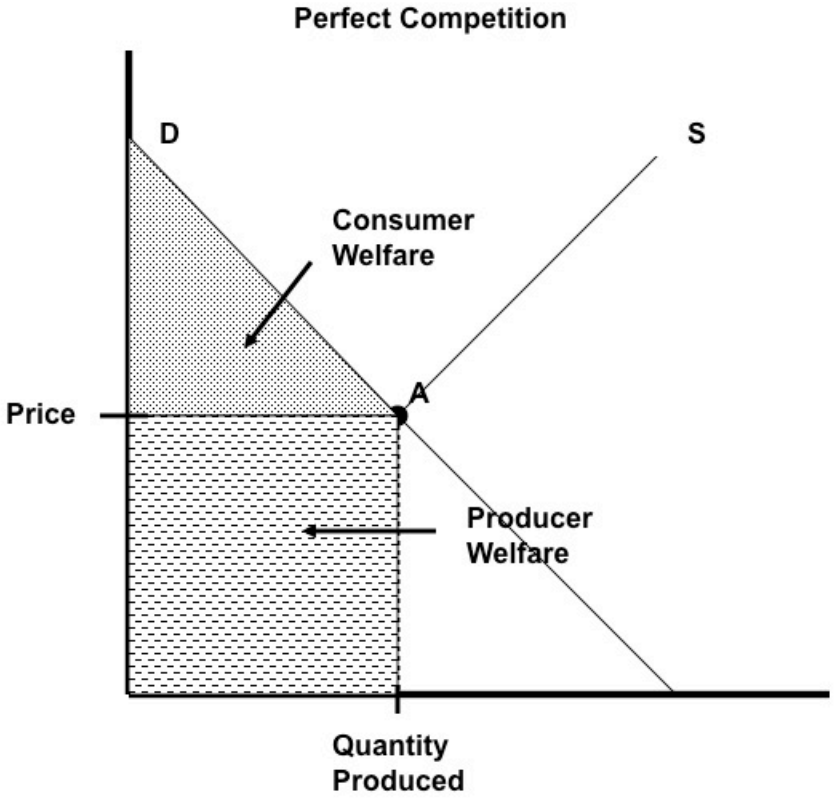
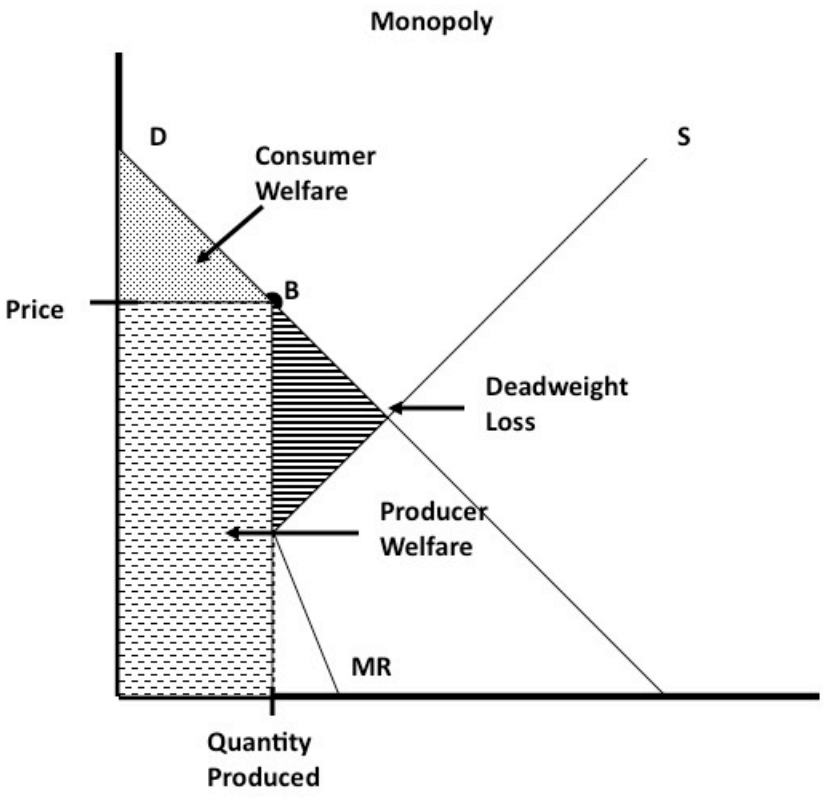
[4] Kitch, *supra* n.2 at 266.
[5] Glynn S. Lunney, Jr., *Reexamining Copyright's Incentive-Access Paradigm*, 49 VAND. L. REV. 483, 492 (1996).
[6] Kieff, *supra* n.3 at 35.



Total social welfare is the sum of consumer welfare and producer welfare. In perfect competition, marginal revenue equals marginal cost, and none of the area marked "Producer Welfare" represents a profit.

In contrast, a monopoly condition (in the absence of competition) moves the price along the curve to point B. Now what was part of the "Consumer Welfare" area falls into the "Producer Welfare" area. This differential is producer profit – in this case, monopoly rent. With a monopoly, there is now a different trapezoid whose area reflects social welfare:



Mathematically, the area of the second trapezoid is less than the area of the first. Thus, in this model, the grab of monopoly rent (and the fact of producer profit) causes social welfare to disappear – rent dissipation. Where did it go? Really, nowhere. The reduction did not go to consumers or to producers, but vanished from the sum of producer and consumer welfare, and appears as a region labeled "Deadweight Loss" in the graph. Thus, the fact a producer was able to draw monopoly rents because of its pricing power meant that overall rent dissipated.

In reward theory, society endures the reduction in social welfare, because the monopoly rents have paid the innovator. Society understands that such rewards are needed for innovations to exist at all. Then once the patent term expires, a competitive

marketplace can return without any further payments to the innovator. By the time of patent expiration, society deems the innovator to have been fully rewarded for any contribution.

Reward theory sets up a powerful narrative, filled with moral overtones.[7] Like a contemporary Prometheus, inventors bring light where before there was darkness. Innovators and innovating firms create new and useful ideas. Mousetraps catch mice better, electric lights chase away the darkness, and airplanes fulfill humankind's dream of flying like the birds.

But another narrative holds that rewards can be unjust, or misused. Those who barely innovate still reap the same reward as those who pioneered a field. Industries complain of barriers to entry set up by those who contributed little to nothing in a field. Firms who merely patented that which would have been created by ordinary technicians in the ordinary course build fences around essential technologies. Commentators evoke the metaphor of the bridge troll – the old fairy tale of the monster who lives under a bridge of someone else's making, and who collects a fee from all who pass.

Enlarging the perspective – where multiple trolls lie in wait under many bridges – commentators invoke a more sophisticated metaphor. They decry the "problem of the anti-commons,"[8] sometimes called the "patent thicket." The anti-commons idea posits that enterprises will tend not to produce a good or a service if there are too many rights holders who must be paid (*e.g.,* licensing royalties). Particularly in information technology industries, a single product might include hundreds of slight innovations, each

[7] Collen V. Chien*, Of Trolls, Davids, Goliaths, and Kings: Narratives and Evidence in the Litigation of High-Tech Patents*, 87 N.C. L. REV. 1571 (2009).
[8] Michael Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 HARV. L. REV. 621, 675 (1998).

potentially owned by a different party. If the producer had to seek out and pay all stakeholders, the producer would just as well not enter the marketplace. Thus commentators use the anti-commons idea to criticize the patent system, for its unintended effects of reducing competition in a marketplace, thus causing additional rent dissipation[9]

The metaphor itself grew out of the plight of shopkeepers in Eastern Europe after the fall of communism. In any given town, numerous agencies were in control of the government permits needed to open a business, and ownership of retail space was ill-defined and shared among various different agencies. In this environment, any number of actors had competing and overlapping claims to the property and the power to exclude the shopkeeper from opening.[10] Analogizing this to patents, anti-commons commentators believe the patent system has become too solicitous to rights holders. Such commentators are particularly concerned about the health of the information technology industry when confronted by rights holders with royalty demands.

The problem of the anti-commons is an ironic twist on the earlier metaphor usually invoked in support of property rights: the problem (sometimes called tragedy) of the commons. The problem of the commons is often used to justify property rights (such as patents). It seeks to explain how a common resource tends to be misused or inefficiently allocated.[11] For example, privately rational fishermen or livestock owners will tend to overfish or overgraze a common area. Overuse of the commons eventually reduces everyone's welfare. This is an example of an economic and legal condition where actions that are privately rational and wealth enhancing in the short run are indeed

[9] Kieff, *supra* n.3 at 15-17.
[10] Heller, *supra* n.8.
[11] Garrett Hardin, *The Tragedy of the Commons*, *in* SCIENCE 162, 1243 (1968).

irrational and impoverishing over the long run. As will be described later, property rights (*i.e.*, a private actor's right to exclude others) are seen as the antidote to this condition.

Historically, anti-patent narratives such as the anti-commons gained greater popularity once a large number of entities who did not practice their own patented invention began enforcing their patents. Such NPE's included operating companies whose core operations no longer involved the patented area, research universities who had amassed portfolios invented by innovative faculty, individual inventors who never found a way to start a company around their ideas, and patent licensing entities formed to purchase patents from others for the sole purpose of deriving licensing revenue. In the morally charged narratives, NPE patent holders did not resemble the entities the reward theory suggests need to be rewarded – specifically, individuals and operating companies who create and nurture a consumer market in their own invention.

These are the powerful moral narratives under the reward theory. A patentee is either a Promethean savior on the one hand, or a bridge troll likened to a bloated post-socialist bureaucracy on the other. Reward theory implies a constant need to maintain a policy balance between these extremes. The role of government is to adjust the incentive-access rules to maximize welfare. Exclusive rights need either strengthening or weakening, depending on the proponent and the direction of contemporary public sentiment.[12] One or another of these narratives is in play any time courts or legislatures make important decisions affecting patent terms, exclusionary powers, or patentability or

[12] Kieff, *supra* n.3 at 35 ("[U]nder this view, the reward and its recipient must be regulated carefully to mitigate monopoly effects and transaction costs.").

infringement standards. Court decisions often cite the monopoly power of a patent, and its capacity to diminish social welfare.[13]

Reward theory does not incorporate any notion of how patents are actually used.[14] If a patent system exists to reward innovators, then it should be able to differentiate

[13] *E.g., Graham v. John Deere Co.*, 383 U.S. 1, 5-6 (1966) (citation omitted):

> At the outset it must be remembered that the federal patent power stems from a specific constitutional provision which authorizes the Congress "To promote the Progress of . . . useful Arts, by securing for limited Times to . . . Inventors the exclusive Right to their . . . Discoveries." Art. I, § 8, cl. 8. The clause is both a grant of power and a limitation. This qualified authority, unlike the power often exercised in the sixteenth and seventeenth centuries by the English Crown, is limited to the promotion of advances in the "useful arts." It was written against the backdrop of the practices -- eventually curtailed by the Statute of Monopolies -- of the Crown in granting monopolies to court favorites in goods or businesses which had long before been enjoyed by the public. See Meinhardt, Inventions, Patents and Monopoly, pp. 30-35 (London, 1946). The Congress in the exercise of the patent power may not overreach the restraints imposed by the stated constitutional purpose. Nor may it enlarge the patent monopoly without regard to the innovation, advancement or social benefit gained thereby. Moreover, Congress may not authorize the issuance of patents whose effects are to remove existent knowledge from the public domain, or to restrict free access to materials already available. Innovation, advancement, and things which add to the sum of useful knowledge are inherent requisites in a patent system which by constitutional command must "promote the Progress of . . . useful Arts." This is the standard expressed in the Constitution and it may not be ignored. And it is in this light that patent validity "requires reference to a standard written into the Constitution."

See also id. at 10-11 ("[T]he underlying policy of the patent system [is] that 'the things which are worth to the public the embarrassment of an exclusive patent,' . . . must outweigh the restrictive effect of the limited patent monopoly."); *Amgen, Inc. v. F. Hoffmann La Roche Ltd.*, 581 F. Supp. 2d 160, 173 (D. Mass. 2008):

> Since the inception of the Republic, our patent system "has been about the difficult business 'of drawing a line between the things which are worth to the public the embarrassment of an exclusive patent, and those which are not.'" *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 148, 109 S. Ct. 971, 103 L. Ed. 2d 118 (1989) (quoting 13 WRITINGS OF THOMAS JEFFERSON 335 (Memorial ed. 1904)). Codified at 35 U.S.C. §§ 102(a)-(b), the novelty requirement reflects Congress's determination that the public will not pay the dear price of a 17-year monopoly for information that is already available to the public. See *id.*

[14] Kieff, *supra* n.3 at 36 (calling reward incentives "very sloppy in their effect").

pioneering inventions from minute improvements, and grant the former stronger rights. But it does not. If reward theory explained firm behavior, firms would only seek patent protection that had a reasonable chance of either protecting a product line from competition, or generating royalty income. But that is not true either, given statistics showing that only about 1% of patents are ever litigated;[15] by implication, the vast majority of patents must claim innovations that no one is using. The "access" side of the incentive – access paradigm is also problematic. First, individual patents almost never claim exclusive rights over a product market.[16] Even when a product contains a patented invention, substitutes for that aspect of the product will almost always exist. Thus concerns over rent dissipation are overblown.[17] Second, the anticommons problem is a phantom problem. Owners want their rights to be used, and as long as there is an open registration system where patent owners can be identified, "permit granters" can be located for negotiation. In Eastern Europe this was not the case, where officials often engaged in corrupt under-the-table deals[18]

Nonetheless, reward theory still has its proponents. In a later section, this article will test reward theory and its power to explain behavior of the different types and subtypes of licensing and enforcement entities.

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[15] Jean O. Landjouw and Mark Schankerman, "Characteristics of Patent Litigation: A Window on Competition," 32 *RAND J. ECON.* 131 (2001).

[16] Kieff, *supra* n.3 at 38 n.124 (citing literature pointing out that reward theories "seem to view an intellectual property right as somehow having a one-to-one correlation with a good or service that is sold in a market.").

[17] *Id.* at 60 ("In the real world, the benefits of this type of market power for capital formation and dynamic competition must be weighed against its theoretical cost in the form of static deadweight loss. . . . [R]eward literature's concern over mitigating monopoly effects of patents can be seen as unduly exalting static efficiency over dynamic efficiency.").

[18] *Id.* at 16 ("Patent rights are different, because a U.S. patent owner has incentives to engage in, not avoid, open transactions.").

B. Prospect Theory

Prospect theory seeks to explain the complex interactions among multiple innovators, usually those competing against one another. Advocated by Edmund W. Kitch in his seminal 1977 article, *The Nature and Function of the Patent System*, prospect theory analogizes patent grants to nineteenth century mineral rights in the western United States. The government wanted to encourage prospecting and mining activity to advance the nation's industrial infrastructure. As a result, mineral rights presumptively went to the first discoverer of a potential deposit. The discoverer made a "claim." The claim was a public announcement of the first discovery, and informed others of its location. The claim served to communicate to other prospectors where not to go, because claims were validated in order of priority. The claim also had some particular restrictions to it; for example, the mineral claim system "restricts the area that can be claimed through rules that specify maximum boundaries in relation to the location of the mineralization," and also "has rules designed to eliminate claims that prove unpromising and return them to the public domain."[19]

Prospect theorists point to the similarities between mining claims and patents. The patent document serves as a public announcement of an innovation that has already occurred. The government grants the rights to the first innovator, so long as the requirements of patentability are observed. With the open nature of the patent document, an innovating firm in effect tells other firms what has already been invented. Thus they incentivize other firms, particularly competitors, to "prospect" in other areas. Not only does a single patent tell a competitor what innovation has already been made, but also entire portfolios reveal the direction in which an innovating firm is going. Lest they be

[19] Kitch, *supra* n.2 at 273-74.

ensnared as infringers, competitors know to direct their innovations elsewhere. Competitors continue prospecting for innovations across a range of ideas away from what has previously been done, and their efforts result in further prospecting and perpetuation of the system.[20]

Unlike the reward theory, prospect theory offers few moral overtones. The theory focuses on the use of patents to minimize duplication of effort among competing innovating firms. It highlights the coordination effect of the patent system among competing actors. Social welfare benefits from each firm going in its own direction without duplicating efforts society has already paid another firm to make. Each firm will seek to avoid the exclusive rights of its competitors, and devote its scarce resources to staking out its own. It does not seem to matter who eventually holds the property right under the prospect theory. Whether the right belongs to a garage inventor who does nothing with it, or a licensing entity who collects royalties without manufacturing anything, the patent has already served its function. It has already spurred other innovating firms to avoid duplicating its subject matter.

Prospect theory has another leg up on reward theory – a recognition that patent systems create dynamic outcomes. Analyzing rent dissipation in a static market might have its uses. But sometimes markets themselves come into existence as a result of innovating activities. Imperfectly allocated social welfare is still more than zero social welfare – the condition that inheres before any market-creating innovation. Prospect theory is less concerned about access restrictions because of its assumption that competing firms will try to innovate around them. However, as shown in the next section, prospect theory is incomplete to the extent it deals only with the conduct of

[20] *Id.* at 271-80.

competing actors. Commercialization theory explains the interactions of complementary actors as well (*e.g.*, players in a vertical marketplace).

Like with reward theory, a later section of this article will test prospect theory against the distinct types and subtypes of licensing and enforcement entities.

C. Commercialization Theory

Commercialization theory focuses neither on compensating for new ideas, nor on efficiency among competing firms in allocating resources. Instead, it looks at the pragmatic effects of patent ownership and transfer.[21] This theory does invoke its own metaphors, though. It posits that each patent serves as a beacon. The beacon alerts the commercial world to the collection of technologies and rights embodied by the patent document. And since a patent and its rights can be transferred, the system promotes bargaining. These two features – beaconing and bargaining – allow patents to serve a coordination function. The coordination function enables multiple complementary actors to communicate with each other and work together within a product market. By enabling reasonable predictability of outcomes, patents thereby support investment in product markets. All of these combined traits and effects incentivize investment, communication and coordination in a marketplace.[22]

The important characteristic of patents here is that each one can be bartered. Each patent is a unit of exclusive rights in the hands of whoever wants to use it that way. Ultimately those exclusive rights maximize social welfare in the hands of a firm in the business of exploiting them in the consumer marketplace. However, a patent might pass through several hands before it gets there. In effect, patents themselves are units of

[21] Kieff, *supra* n.3 at 42.
[22] *Id*. at 42-43.

currency in a patent marketplace. They are assets and by statute have the attributes of personal property.[23] But for their transferability, some inventors would not have entered the field.

Like with reward theory and prospect theory, a later section of this article will test commercialization theory against the distinct types and subtypes of licensing and enforcement entities.

III. ECONOMIC LITERATURE IN TERMS OF REWARD, PROSPECT AND COMMERCIALIZATION THEORY

This section surveys the economic literature to discuss a variety of economic research in the context of the various patent system economic theories. The survey is not exhaustive, but instead is illustrative. The survey underscores how common it is for economists to conduct their analysis without regard to distinctions among the various types of rights holders.

A. Reward Theory

What can pure economic literature (as distinct from the law and economics variety) add to the understanding of each of these theories? The backbone of all economic theory is a rational decision maker. In terms of patenting, the rational choice would be to patent only when the benefits of the patent outweigh the costs of trying to obtain one. Reward theory is consistent with treating innovators as private calculators of cost-benefit outcomes. Reward theory argues that patents serve as a motivator for innovation by increasing the benefits associated with obtaining a patent.

Consistent with reward theory, some economists have tried to model the social welfare effects of patenting. Deardorff[24] concludes that the monopoly markets created by

[23] 35 U.S.C. § 261.

a patent provide less social welfare than would a competitive market in which the invention exists, but not the patent. The conclusion that patents hurt social welfare (because they create a monopoly market) is, of course, incorrect because of its unduly narrow *ex-post* perspective. If one assumes that an invention will certainly be created with or without a patent, then yes, a monopoly market is less optimal than a competitive market. But the question that needs to be considered is the dynamic one: whether the invention would have been made without the possibility of the patent protection. Would the inventor's benefits of patenting have been greater than the costs if he could not obtain monopoly profits for his invention? And would society be better off with the invention and a monopoly market than without the invention at all?

Take the following thought experiment: before Selden filed his patent for a gas-powered automobile in 1879, the main form of transportation was horse and buggy. While an individual during the 19th century might benefit from the transportation opportunities brought by the horse and buggy, it had its limitations. An economist might assign the horse and buggy a particular economic measurement of happiness or, "utility level." After the invention and patenting of the gas-powered automobile, a presumptive monopoly market arose.[25] Any individual who chose to purchase one of these vehicles was required to pay the monopoly price, and theoretically some were unable or unwilling to purchase these vehicles because of this high price.[26] The consumer utility levels of these less wealthy people remained the same, as they had to continue their use of the

[24] Alan V. Deardorff, *Welfare Effects of Global Patent Protection*, 59 ECONOMICA 35, 38 (1992).
[25] Or at least an oligopoly. Until Henry Ford "broke" the exclusive rights reflected in the Selden patent, the Association of Licensed Automobile Manufacturers was able over a ten-year span to demand high royalties and to exclude new entrants who did not pay.
[26] As shown in the supply-demand models in the earlier section, the price of a good in a monopoly market is higher than the price of a good in a competitive market.

horse and buggy. But those who could afford the new form of transportation experienced a higher level of utility. As a result, social welfare (as defined by total utility levels across society) increased. Thus, assuming the Selden innovation helped spur the American automotive industry, the patent benefited society.

An economist viewing this scenario from an *ex-post* perspective might point out that social welfare had the potential to increase by a larger value if a competitive model had been practiced in which more consumers could purchase the automobile and have the higher associated utility level. But would this invention have been created without the incentive of monopoly profits? Assuming no, some increase in welfare is better than none at all, and so allowing the inventor and his successors to claim the monopoly market through a patent was the optimal economic choice for society. By viewing the act of patenting *ex-ante,* a patent and monopoly market appears more beneficial than no innovation at all.

A concern remains, of course, that some inventions would come about without a patent system. Patenting in those cases might diminish social welfare. The legal regime is designed to cull these out, with patent invalidity doctrines that deprive an inventor of a patenting right for inventions that only require ordinary skill. In the United States, it is now settled that inventions that are "obvious to try" do not deserve patent protection.[27] The larger reward theory question then becomes, does the overall increase in social welfare from inventing "spurred" by the patent system outweigh the decrease in social welfare from patenting of inventions that would have been made anyway?

[27] *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 402 (2007).

Reward theory can provide useful tools for analyzing these spurring effects. Analyzing patent markets with a reward theorist perspective, Schmidt[28] illustrates how incentives to innovate in the context of standards-essential patents differ in different business models. He concludes counter-intuitively that patent pools (and similarly horizontal integration[29]) maximize innovation incentives as compared to vertical integration[30] and non-integration. One reason this occurs is because a patent holder in a vertically integrated company has an incentive to increase the royalty it charges to competitors outside of itself to gain a competitive advantage. With this power it can raise the royalty rate so high that the profit potential of entering the standards-controlled industry is zero, and thus deter any new innovator (who needs to license the patent to innovate) from entering the industry. Alternately, horizontal integration tends to reduce royalty rates to innovators (an effect understood by Schmidt as reducing the cost of entry for new innovators). By pooling a group of essential patents together, Schmidt posits that new innovators can purchase the pool of patents at a cheaper rate than they would trying to license each patent individually. This allows them greater profit potential in the downstream product market, and increases the rate of participation, thus increasing the amount of innovation. Is Schmidt focusing too much on the "access" side of the incentive – access continuum?

But Schmidt's conclusions assume that all patents in the patent pool are perfect complements, and thus all essential to the standard that the pool represents. In practice, this is not always the case. In many instances these patent pools shield weaker patents

[28] Klaus M. Schmidt, *Complementary Patents and Market Structure*, Discussion Papers 274, SFB/TR 15 Governance and the Efficiency of Economic Systems 1, 22 (2009).
[29] E.g., integration of all steel producers who then sell their goods to manufacturers.
[30] E.g., integration of a steel producer and a manufacturer who uses steel as an input.

from challenge of invalidity (either by explicit agreement or because pooling erodes incentives to challenge patents).[31] The addition of weak patents in the pool has the same effect on innovation as a combination of substitute patents: to directly prevent competition that should have occurred. Because of the additional protection of the pool, a weak patent is granted enforcement rights that it may not have secured standing alone. Instead of paying to license the patent, an infringer could claim invalidity in court and win. After doing this the innovation, if non-pooled and now invalidated, can be used in a competitive market rather than a monopolistic one since it is no longer covered by a patent. Innovators who would have had to pay a licensing fee to use the technology covered by the weak patent when pooled, no longer have to when unpooled. Thus the rate of innovation using this prior technology increases because the reward for innovation is higher.[32] So Schmidt is not on firm ground when using reward theory principles to argue that pooling increases innovation.

As well, Schmidt claims a patent pool's superiority over vertical integration as a tool to mitigate "patent thickets." The patent thicket supposedly creates a "complementary effect" (i.e., hold-out power by each rights holder), which results in social inefficiency from excessive royalty rates for an outside-the-pool innovator trying to in-license a group of patents.[33] But what happens when no pool of essential patents is present, and a new entrant licenses individual patents through several discrete market-rate negotiations? By individually licensing these patents, a new entrant can avoid purchasing

[31] Richard J. Gilbert, *Antitrust for Patent Pools: A Century of Policy Evolution*, 2004 STAN. TECH. L. REV. 3 ¶¶ 90-117 (2004).
[32] Schmidt also assumes that new innovators need the patent pool to perform basic research leading to a further pool-worthy patent, but this is not necessarily so. One does not have to commit any infringing acts – make, use or sell someone else's patented invention – in order to conceive of a new patentable idea and put it in writing in the form of a patent application.
[33] *See* Schmidt, *supra* n. 28 at 11.

weak or substitute patents that could be found in a patent pool. As a result, the initial investment for licensing is actually lower. In such a case, vertical integration would be optimal for innovation and entry of new market players, when compared to horizontal integration or a patent pool. Lower initial investments lead to greater rewards for innovation, and thus increase the rate of innovation and the quantity of competition.

As shown, Schmidt assumed a black-and-white situation where a pool contains "essential" patents – innovations that are already patented where the patents are unquestionably infringed by any new entrant. What happens when those easy assumptions are gone? Economic proponents of reward theory should find that their conclusions stand on a weaker footing after considering the uncertainty that exists in the patenting process. Rather than model incentives to innovate from an *ex-post* perspective, the *ex-ante* analyst must recognize that there are delays and uncertainties in the patenting process. As of early 2010, 750,000 patent applications were currently waiting to be approved.[34] The uncertainty associated with patent delay imposes significant costs on patent applicants and reduces their likelihood to innovate.

That the reward a patent provides an innovator spurs at least some extent of creation or market entry is undeniable. In his empirical research about how firms make use of the patent system, Mansfield[35] obtained an estimate of the proportion of inventions developed in 1981-1983 that would not have been developed without the possibility of obtaining patent protection. His results concluded that 60% of inventions in the pharmaceutical industry would not have been developed without patent protection and

[34] Arti Rai, Stuart Graham, & Mark Doms, *Patent Reform: A White Paper from the U.S. Department of Commerce,* A White Paper from the U.S. Department of Commerce (April 13, 2010).
[35] Edwin Mansfield, *Patents and Innovation: An Empirical Study*, 32 MGMT. SCI. 173, 175 (1986).

38% would not have been developed in the chemical industry. In four other industries (petroleum, machinery, fabricated metal products, and electrical equipment) patents incentivized creation of over 10% of their products. Thus patents seem to be successful in their goal to provide innovation incentives to potential innovators. In this way, empirical evidence supports the basic assumption under reward theory that incentives spur innovation and can supply an *ex ante* boost to social welfare.

Such statistics also have a negative implication under a reward theory framework. Are we sure that society benefits when – perhaps – 40% of pharmaceutical, 62% of chemical and 90% of other industries' innovations might have come about anyway without the reward of a patent? If one believes the patent system serves no societal functions beyond spurring, such statistics can in fact be alarming. As will be shown, other theories hold there are indeed additional societal functions.

B. Prospect Theory

Prospect theorists advocate a patent's use as a property right, acting as a claim to an inventive territory. By creating and publicizing such a property right, new entrants become informed of areas of research that have already been "claimed." Thus they can continue a forward progression of innovation rather than repeat research that has already been performed.

In his analysis of optimal incentives for innovation, Wright[36] suggests that the range of situations in which a practical patent system dominates other feasible alternatives may be narrower than is commonly believed. He determines that in many situations research contracts and prizes might provide the socially optimal incentive for

[36] Brian D. Wright, *The Economics of Invention Incentives: Patents, Prizes and Research Contracts*, 73 AM. ECON. REV. 691, 704 (1983).

innovation rather than patents.[37] But a prospect theorist would differ with these conclusions, arguing that a research contract and prize do not give the inventor the property rights that are granted by patents, or cause the forward progression that arises from publication of competitor achievements. With a patent comes a territorial claim and an announcement that an innovation has already occurred. Patenting also communicates a threshold level of seriousness and commitment in seeing the innovation come to market. This makes other firms who might be interested (or currently are working on) research in the same space aware of their success and their intentions. The firm can then transfer its investment to research that has not already been completed. Reducing duplicative research allows investments to be put toward new endeavors and increases the rate of innovation. Contracts and prizes cannot produce this result on such a massive scale. As a result patents might be optimal in more situations that Wright concludes.

The dissemination of information by a patent holder adds social value to the act of patenting. But such communication would not occur unless the patentee was likely to maintain exclusivity over his invention.[38] A patent grants this assurance in ways a prize or contract cannot. Kitch in his seminal paper on prospect theory outlines these additional benefits of patents derived from their use as a property right:

a) A patent increases the efficiency with which investment in innovation can be managed. No one is likely to make significant investments searching for ways to increase the commercial value of a patent without working with the patent holder. With the security of their property right, patent holders will facilitate this communication.

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[37] *Id.* at 703.

[38] The Arrow Information Paradox implicates this quandary. *See* Kenneth J. Arrow, ESSAYS IN THE THEORY OF RISK-BEARING 152 (1971).

b) The patent owner has an incentive to make investments to maximize the value of the patent without fear that the fruits of his investment will produce unpatentable information appropriable by competitors that he cannot commercialize.

c) Absent a patent on the product, the incentives to provide information to purchasers about their need for a product are limited. Competitors could ride on the demand for the product created by the first seller without incurring the expenses necessary to inform buyers of the advantages of the product. A patent holder will be able to acquire all of the reward resulting from his demand creation himself and is thus more likely to extensively market the good to consumers and educate them about a product.

d) A patent reduces the amount of duplicative investment in innovation: once a patent has been issued other firms can learn of the innovative work of the patent holder and redirect their work so as not to duplicate the work already done.[39]

While Wright does not analyze the benefits of patents in comparison to trade secrecy, Kitch argues that the above reasons also serve as an argument in favor of a patent system[40] over a system having exclusively trade secrecy. Thus, a patent's unique ability to encourage the exchange of information is essential to consider when determining the value of a patent system. Because of the communication of information, patents encourage an increase in output that trade secrecy cannot. The protection of an invention brought by a patent encourages the patentee to license and share the innovation, while an invention kept secret cannot be shared or licensed without restriction for fear of imitation and loss of rights. Recognizing this fact weakens the assumption that a patent

[39] Kitch, *supra* n.2 at 276-78.
[40] Kitch assumes a system of patent rights where individuals may practice trade secrecy, since it is difficult to imagine a system that would willingly choose to forgo the practice of secrecy. *See* Kitch, *supra* n.2 at 288.

invariably reduces the output of the technology it subjects to exclusive control. Output-enhancing confidence of market actors might trump output-reducing effects of above-competitive pricing.

Rare within economic literature, Reinganum[41] accounts for the uncertainty inventors face in realizing the feasibility and profitability of their particular innovation. Aware of the competitor-informing function of patents under the prospect theory, she accounts for uncertainty resulting from the possibility of a protracted development period, the possibility that a rival may innovate first, and the possibility that a rival firm may imitate the innovation and appropriate some of the profits in the new market. As a result of this uncertainty, firms must determine the amounts they are willing to invest in research and development knowing that some of their investment might be wasted. Her model concludes that firms will generate knowledge at a higher rate when patent protection is perfect than when it is imperfect, and that the possibility for exclusive control of their invention can compensate for the uncertainty they face in the inventing process. Thus the practice of patents as a property right (granting an exclusive claim to the innovator) is essential to spurring innovation in the face of uncertainty. It is not optimal for firms to wait for their rivals to innovate in the face of uncertainty. There remains a positive probability that no rival will succeed in creating the invention. If the firm wants any payoff, its optimal strategy is to pursue the payoff actively rather than wait for a rival to succeed and try to attain the rewards of imitation.

[41] Jennifer F. Reinganum, *A Dynamic Game of R and D: Patent Protection and Competitive Behavior*, 50 ECONOMETRICA 671, 671 (1982).

C. Commercialization Theory

Commercialization theory illustrates the value of patents as a means of currency that can be used to further goals unrelated to market creation or entry.[42] Such goals can be to improve a firm's competitive position when trying to acquire start-up funds, to improve negotiating terms when licensing other patents, and to reduce the chance of paying excessive royalties to external patent owners. In their study of patenting in the U.S. semiconductor industry from 1979 to 1995, Hall and Ziedonis[43] found empirical evidence that large firms use patents as bargaining chips rather than embodying discrete potential rewards for innovation. During the time period they studied, the U.S. legal environment became friendlier to patent rights. Rather than serving to increase the monetary incentive coupled with patenting, these stronger rights motivated firms to participate in "patent portfolio races."[44] The incentive to patent came from their use as bargaining chips when negotiating access to external technologies with large owners of intellectual property or to assist them in winning favorable terms in cross-licensing negotiations with other firms in the industry. As well, the strengthening of patent rights increased the risk that a holder of the right could exclude or block another innovator from using the technology covered by the patent. Amassing large patent portfolios reduced the concerns of a firm about being excluded by external patent holders.

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[42] Kieff, *supra* n.3 at 42.
[43] Bronwyn H. Hall & Rosemarie Ham Ziedonis, *The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995*, 32 RAND J. ECON. 101, 125 (2001).
[44] *Id.* at 103.

Graham et. al.[45] found similar results in the 2008 Berkeley Patent Survey. In their survey of 1,332 early-stage technology companies, they found that motivations to patent were mainly to seek a competitive advantage by preventing technology copying (a core patent function to be sure), but also to securing financing, and enhancing their firm's reputation. Their research found that firms that sought venture funding patented more actively prior to a funding event for the purpose of securing funding. Venture capital investors appeared much less willing to invest in companies that held no patents. The patent acted as a signal of quality in an uncertain investment environment, and dispelled some of the information asymmetries between the investor and the start-up. Thus the patent served as a beacon to venture capital investors and increased a start-up's likelihood of receiving funds. As well patents served as a beacon that increased the odds and quality of a liquidity event (such as an acquisition or IPO), and served as a crucial bargaining chip in negotiating and defending against patent infringement suits.

IV. TESTING PATENT ECONOMIC THEORIES AGAINST REALITY

The survey above suggests that the literature on patent economics sometimes does but often does not take into account the important distinctions among types of rights holders. The literature largely assumes that a patent will inevitably supply its owner with exclusive rights. When infringed, it will invariably be enforced, and infringement invariably will be abated. When invalid or not infringed, its owner will reap no rewards. Much of the literature also makes the dubious assumption that a product market exists corresponding to each patent. Product market monopoly power, in turn, sets the stage for arguments about rent dissipation and diminution in social welfare.

[45] Stuart J.H. Graham, Robert P. Merges, Pam Samuelson, & Ted Sichelman, *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 BERKELEY TECH. L. J. 1255, 1299 (2009).

Few commentators seem to appreciate the following considerations about patent enforcement (or at least have not found a way to incorporate them into theory):

- High transaction costs for bringing an enforcement action prevents it from ever being brought;[46]
- For those that are brought, transaction costs and size asymmetries distort the settlement value;
- Unpredictability in court outcomes – cases that should have been won are lost, and cases that should have been lost are won;
- *De minimus* infringement makes enforcement irrational by any measure;
- Courts treat patents under liability rules, rather than property rules, leading to compulsory licensing situations instead of injunctions;[47] and
- Non-litigation or pre-litigation licensing discussions happen in the shadow of all of the above, and actors use tactics to advantage themselves with non-merits factors.

Each player braces for these costs, uncertainties and other non-merits factors of licensing and litigation in a different way. These differences inform a more nuanced view of patent system theories.

The following sections focus on considerations apparently overlooked by the existing literature that each type of rights holder gives to licensing and enforcement. These considerations, in turn, impact how true to reality the various patent system economic theories are.

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[46] Robert P. Greenspoon, *Is the United States Finally Ready for a Patent Small Claims Court?*, MINN. J. L. SCI. TECH. 549, 552 (2009).
[47] For a discussion of property versus liability rules, *see* Kieff, *supra* n.3 at 5-6.

A. "One Big Idea" Inventors

Thousands of individuals, if not tens or hundreds of thousands, file for and obtain patents each year. Of these, many inventors have only one patent. This is their "One Big Idea." It might represent the culmination of a life's work, or it might be a quickly-conceived improvement in a commonplace field.

Individuals seeking representation either seek prospectively to license their rights, or they have already located a possible infringer and seek enforcement advice. Run-of-the-mill invention-submission is a perilous gauntlet for individuals to run. The obstacles individuals face in getting third-party companies to incorporate their ideas while paying for them are legendary.

When there is already infringement, individuals almost never have the financial resources to engage full-scale hourly billing representation by patent law firms. If traditional representation models were the only option, most individuals would have to suffer all infringement without recourse. In economic terms, this category of rights holder would effectively have to supply royalty-free compulsory licenses to all comers. Mitigating this, contingency fee representation is sometimes an option. In the contingency fee model, the lawyers typically look for cases that have such merit, and potential damages, that there is a good chance the enforcement outcome (whether by settlement or via judgment) will supply a multiple of the amount that would otherwise be billed on an hourly basis. The chance for a multiple fee equivalent compensates for the lawyers' risk of no fees at all, and the corresponding opportunity costs. Successful

contingency fee practices operate with a pipeline of cases, similar to a diversified investment portfolio.[48]

Under this structure, individuals stand at a clear disadvantage against infringers. They are highly sensitive to enforcement transaction costs. Their challenge is not just to get the infringer to stop or pay something. Their challenge is to get any help at all, and then try to get the infringer to stop or pay. They will find representation only for the most valuable cases, where the merits look very good and a potential damages award will be large enough to entice a contingency fee lawyer.

How does this all relate to the reward theory framework? Recall that reward theory urges policies for optimal stationing along the incentive–access continuum. There should be incentives for bringing inventions into existence, yet caution about rent dissipation arising from monopoly power. In the vast majority of cases, the "One Big Idea" inventors neither experience the rewards and incentives of the patent system, nor prevent meaningful third party access. In situations of small- or medium-scale infringement, the system is biased against them. They are relatively powerless actors whose situation forces them to endure infringement without recourse. This is ironic. The morality tale the reward theory advances ostensibly supports individual inventors.[49]

Meanwhile, those same actors would be viewed as having some beneficial effect under the prospect theory. While prospect theory describes the way patents allow competitors to allocate resources amongst themselves, nothing prevents the same competitors from monitoring the creative output of individuals in their fields. One might

[48] Rights holders can also contract for the services of administration / licensing / enforcement companies, who themselves often employ contingency fee counsel.

[49] Chien, *supra* n.7 at 1574 ("[M]any believe that protection of the small inventor provides the best yardstick of how well the patent system is working.").

expect the same spurring effect when a competing patentee is a mere individual. Firms will still observe the area already staked out by the individual's patent, and move on to invent elsewhere.

The commercialization theory might be the most descriptive of the three for "One Big Idea" inventors. With the emergence of patent auction marketplaces, and proliferation of NPE's (discussed below), individuals no longer have to be alone in the search for representation or resources. The beacon effect and the bargaining effect are agnostic about the power of the rights holder. These effects posit that parties will come together for a negotiation, but assert no *ex ante* bias in how the negotiation should proceed or who between the rights holder and its negotiating counterparts should assert the greatest negotiation power.[50] In the end, the marketability of the patent right to complementary players becomes the mechanism for bringing incentives and rewards to the individual. Commercialization theory thus overlaps with reward theory. This fact arises because patent rights of an individual are equally able to coordinate behaviors among complementary actors as are patent rights of any large entity. That is, a patent rights marketplace allows transfer of rights to larger entities. Once the rights are owned by an entity who does not suffer the same power asymmetries that the individual does, the rights are just as good as those of any other patent.

B. "Thomas Edisons"

What distinguishes "Thomas Edisons" from "One Big Idea" inventors is sophistication about patents. A serial inventor is more likely to know the ins and outs of the patent system, and is likely better able to locate representation for licensing or

[50] Kieff, *supra* n.3 at 55 ("While the commercialization theory is focused on who will have both the incentive and the ability to negotiate with whom, it is agnostic as to who will end up controlling those negotiations.").

enforcement. When and if negotiations with a third party get started, such individuals might have more to offer – a greater skill at drafting valuable patent claims, multiple portfolios, continuation applications in which claims can still be amended to cover existing infringements, etc.

That said, such an individual faces the same headwinds as any other. The reward theory, prospect theory and commercialization theory considerations discussed above for the case of "One Big Idea" inventors would apply as well to "Thomas Edisons." While serial inventors might end up with more negotiating power than one-off inventors, the difference is degree, not kind. They still face massive asymmetries that deter enforcement.

C. NPE's

NPE's are the most diverse group of licensing and enforcement entities. They include companies who just license or enforce patents, as well as universities and government agencies. Newer breeds include portfolio aggregators, as well as defensive aggregators who acquire patents to protect "subscribers" against infringement charges. As with individuals, the reward theory does not characterize NPE behavior particularly well. NPE's other than universities and government agencies do not typically carry out research and development themselves (with Intellectual Ventures being a prominent exception). Instead, they tend to purchase patent rights from other owners – for instance, individuals or corporations. As such, NPE's permit the existence of a secondary market in patent properties. NPE's therefore do not seem to need incentives or rewards to innovate. If anything, they depend on prior incentive and reward systems having prodded their transaction partners to innovate.

Proponents of reward theory usually show only antipathy toward NPE's (hence the popularity of the "patent troll" *ad hominem*). Since they do not typically invent, and they are not in any product markets, any success they achieve in licensing or enforcement appears to outsiders as a windfall to the "wrong" party. This happens even though many NPE's structure their purchase transactions to guarantee future revenue to the original innovator.

Nor on the access side of the continuum do NPE's seem in danger of creating product market monopolies. Their usual motives are to monetize intellectual property, not restrict output or raise prices above the competitive level in a product market. Even where their success in patent enforcement might lead a licensee to raise prices, it can easily be said that the pre-license price was sub-competitive, since it did not incorporate the true costs of inputs before the license fee was paid. In short, neither the incentive nor the access side of the reward theory continuum seems aptly to describe NPE's.

Likewise, prospect theory would find it hard to account for NPE's. As rights acquirers, rather than rights generators, NPE's do not themselves advance any prospecting function of the patent system. None of their actions serve to communicate efficient areas of research to any competitors, at least not directly. As discussed next, their existence itself creates a ripple effect that can encourage innovation activities at the source.

NPE's find their greatest justification in the commercialization theory (and vice versa). The existence of NPE's negates some of the power asymmetries felt by individual inventors. Not only does NPE's funding tend to allow individual-generated rights to be evaluated on their own merits within a license negotiation or enforcement

campaign. The willingness itself to purchase the patent rights also embodies the introduction of liquidity into technology markets. In other words, when acquiring rights to an individual's or a company's patent or portfolio, the NPE is realizing the function of coordinating complementary actors by becoming the first gateway of patent rights into a liquid technology marketplace.

NPE activities also make funding available to start-up companies and their backers. Venture capital will nearly always obtain security interests in intellectual property of the backed company. Years later, if a financing company must attach the collateral and sell it, an NPE might end up being the very purchaser who lets the financing entity get its return on investment. While purchases of patent rights out of bankruptcy have attracted scorn, they undeniably help keep financing markets healthy. By enhancing liquidity in technology markets, NPE's create the very conditions that enable venture capital to support start-up companies. In turn, this enhances competition by nurturing new entrants into preexisting product markets.

In short, a patent's marketability is the foundation of its use to secure business financing, and commercialization theory would look favorably on a thriving NPE environment. The investment community needs clear rules for both transferability and enforceability. NPE's and commercialization theorists each share a common interest in such clear rules.

Under commercialization theory, diminution of exclusive rights undermines the value of a patent.[51] By extension, it reduces the usability of patents for raising investment capital. Reducing the power of patents to exclude infringers directly impacts

[51] A recent example is the Supreme Court's decision in *eBay v. MercExchange*, 547 U.S. 388 (2006) (discussed below, withdrawing the presumption in favor of a permanent injunction upon a judgment of infringement).

the small business community in two ways. First, it reduces the capacity for the patent to act as a beacon to attract capital (such as in NPE-backed financial markets). And second, if infringement does occur and the firm needs to enforce its rights, it reduces the firm's chances of keeping or obtaining its market share.

While reward theory stigmatizes NPE's, and prospect theory is disinterested in them, commercialization theory needs them. In one sense, all start-up firms are NPE's until they get a toehold in a consumer marketplace. Thus the theory best explains firm behavior in precisely an NPE context. In addition, for patents to serve their strongest role in protecting investment-backed expectations, they must be maximally marketable. Thus, a patent as a unit of currency ought to be equally enforceable in the hands of all owners. This is true even for middlemen and licensing entities. Thus, decisions like *eBay v. MercExchange*[52] (which held district courts have discretion to decide whether adjudged infringers should be enjoined, and hence is seen as diminishing property rights in patents) will have unintended consequences going forward. Reducing the right of injunction, and varying its applicability depending on who the rights owner happens to be, hurts the marketability of patent rights.[53] In turn, hurting the marketability curtails their use to facilitate start-up financing, which in turn raises barriers to entry. Commercialization theory permits the conclusion that rule changes that hurt NPE's strengthen the market power of larger entrenched firms.

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[52] *Id.*

[53] Andrew Beckerman-Rodau*, Patents are Property: A Fundamental But Important Concept*, 4 J. BUS. & TECH. L. 87, 93 (2006) (criticizing *eBay v. MercExchange*) ("Absent the ability to assert patent property rights, fewer inventions will be patented and the public storehouse of knowledge will decrease without the public disclosure from those patents.").

D. "Not Invented Here's"

Sometimes an operating company acquires patent rights from others in order to incorporate the innovations into a new product. Every once in a while, a garage inventor achieves that elusive goal of selling the invention to a big company. This category also includes larger firms who might merge with a smaller firm to acquire its intellectual property. And finally, on occasion companies sued for infringement resolve the litigation by acquiring the patent and enforcing it against its own competitors.

The "Not Invented Here's," when acquiring, licensing or enforcing their rights, share some features of NPE's, and some features of operating companies who develop in-house ("R&D Practicers"). They are like NPE's in the sense that they facilitate a liquid marketplace in innovation. Indeed, they can be the ultimate destination of marketed patent rights. In that sense they embody and justify commercialization theory, as discussed above in connection with NPE's. On the other hand, they are like R&D Practicers in the sense that they participate in a product market that uses the patent rights. In that sense they embody and justify reward theory, since they fit the narrative of an entity who participates in a product market with patent-protected products.

But the situation of the "Not Invented Here's" demonstrates that no single type of patent owner can embody every patent system theory. Of the three theories discussed in this article, the "Not Invented Here's" do not particularly fit into the prospect theory paradigm, for all the reasons stated above for NPE's. They acquire rights that others had already made, and thus those rights already served the prospecting function (*e.g.,* coordination among competitors in the relevant product space).

E. "R&D Practicers"

"R&D Practicers" are the paradigmatic rights holder upon which the pure economics literature builds its theories. Members of this category research and develop new products, and acquire patent protection for them as part of the overall product commercialization effort. When the literature expresses calculations and theories that investigate patenting effects in related product marketplaces, it is almost necessarily referring to "R&D Practicers." Intellectual myopia apparently leads economists to ignore the diversity discussed here.

Yet even such paradigmatic patentees do not completely fit into any of the conventional patent system economic theories. Reward theory holds that the availability of the patent right incentivized a given research and development company to create a new product covered by an ultimate patent. They ought to embody the "incentive" pole of the incentive–access continuum. Yet the data discussed above, section III.C., suggests at best a loose connection between patent availability and the decision to enter or create a product market. Likewise, the widespread use of patents as defensive negotiating chips (indeed, this is the exclusive use of patents at some companies) does not fit conventional notions of the far-sighted inventor reaping his just rewards. In the rare cases[54] when titans do clash (e.g., the recent battle between Apple and Nokia where each side throws a massive portfolio against the other), the tale to be told is distinctly amoral. Unless unique facts emerge, neither side in such a fight claims a sympathetic moral narrative. No one is a long-suffering garage inventor, and no one is a troll.

[54] The threat of a countersuit deters operating companies from suing infringers who are also portfolio owners. "Peace treaties" (e.g., mutual term licenses) are common, leading to the ironic fact that the very entities most financially capable of stopping a third party from using its patent rights are also the least likely to try.

Even prospect theory – the one theory that self-consciously analyzes competitor interactions enabled by patents – falls short under scrutiny. For example, some operating companies certainly monitor filings and issuances in the Patent Office by their competitors. But not all do. And of those who do, it is far more likely to be the legal department who monitors competitor patents, not the relevant engineering manager. As well, monitoring is more likely for purposes of minimizing infringement risk for products already in the pipeline than for creating strategic maps of where future pipelines should be laid.

Lastly, commercialization theory might well describe patenting benefits for early-stage operating companies. Those are the ones who need venture capital the most, and will use patent rights to secure financing. But entrenched companies have no particular need to set up a beacon showing that they are patenting ideas, because they have no particular need to bargain for any technology transfer to sustain operations. In these ways, "R&D Practicers" fail to justify any particular patent system economic theory.

V. CONCLUSION

Before now, debate over the role of the patent system, and its usefulness to society, has been incomplete. Patent system economic theories have all but ignored the large diversity of actors in the patent acquisition, licensing and enforcement community, to say nothing of their respective idiosyncratic traits. For example, this article highlights the little-recognized contribution to social welfare of non-practicing entities under well-grounded aspects of commercialization theory. This article also questions the assumptions of zero risk and unambiguous property right treatment of patents assumed by most authors in a survey of pure economics literature. Meanwhile, people form

prejudices and make policy based on modes of thinking that have no demonstrable connection to the real world. This article seeks recognition of the nuances and inconsistencies that emerge when testing patent economic systems against its real world actors and their motives.