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The Patent Lottery: Exploiting Behavioral Economics for the Common Good

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INTRODUCTION

Incentives are critically important to patent law. The truth is, however, that our patent system is built primarily on assumptions about how incentives operate. The standard assumption is that today's enforcement of patents will promote tomorrow's innovation and disclosure. But researchers have not fully explored the incentive value of patent rights, especially in relation to the incentives felt by entrepreneurs and individual inventors. Some studies do suggest that relatively small-time operators are captured by an overly optimistic outlook on their chances for success and may be investing in a losing game.[1] This Article focuses on the bounded rationality of certain would-be innovators and examines policies that use those choices to increase the social benefit of patents.

While many applaud patents as tools for promoting innovation,[2] others deride them as supporting an artificial market structure ripe with potential monopolistic business activities and excessive litigation.[3] These potentially negative results of patent protection create a powerful counterbalance against policies that further increase patent protection. Policymakers' understanding of both the upside and downside of patent protection is impor-

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[1] U.S. Patent No. 6,556,992 (filed Sept. 14, 2000), *available at* http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=6556992.PN.&OS=PN/6556992&RS=PN/6556992 ("[T]he so-called 'lottery effect' may encourage some to over-invest in highly speculative technologies that have the seductive allure of potentially huge economic rewards but very little if any realistic probability of success.").

[2] *See* Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 266 (1977) ("The patent is a reward that enables the inventor to capture the returns from his investment in the invention, returns that would otherwise (absent secrecy) be subject to appropriation by others.").

[3] Gideon Parchomovsky & R. Polk Wagner, *Patent Portfolios*, 154 U. PA. L. REV. 1, 26 (2005); *see* Adam K. Cramer, *Giving Patents an Upgrade*, PC MAG., Aug. 1, 2008, at 20 ("From 2005 to 2007 only one of the 30 [patent infringement] lawsuits Cisco battled in court was brought by a company that made anything.").

tant so they can better calibrate the rights granted: making them strong enough to help induce innovation and development while limiting monopolistic problems. The patent laws include dozens of policy levers, such as the length of the patent term; level of nonobviousness required for patentability; and type of relief available against infringers. These policy levers calibrate the patent rights.

As with almost any novel enterprise, the potential payout of innovation and patenting is highly skewed. One example of the skew is patent valuation. The majority of issued patents are relatively worthless, as the holder never asserts, licenses, or even leverages the asset.[4] A sizable number are worth enough to repay the associated costs of research, but only a few are highly valuable (hereinafter "successful"). This low odds structure is comparable to a lottery where players have a low probability of winning a large jackpot. Although more empirical work is necessary, behavioral science provides some indications of how potential innovators make decisions involving low-probability, high-payout events.[5] Interestingly, entrepreneurs and individual inventors fall in line with lottery players whose lottery investments are quite sensitive to the size of the jackpot but are relatively insensitive to the probability of winning. In other words, for lottery players, a small increase in the size of a jackpot tends to induce a disproportionally large increase in lottery purchases, while a comparable increase in the probability of winning the jackpot would engender a lesser response. In a parallel fashion for potential innovators, a shift in the value of successful innovation tends to outweigh a proportional change in the likelihood of success. If these innovative entities do indeed overweigh their chances of success, then it also follows that a reduced and perhaps negative expected return on investment could still encourage their innovative activities. The state-run lottery system understands this "lottery effect," focusing its marketing efforts on the jackpot size while largely ignoring information about the odds of success.[6] The patent system, however, has not taken advantage of its own lottery effect. This Article develops a model of innovation incentives based on an understanding of the "patent lottery effect" and how the implementation of patent policy choices may alter innovative behavior.

In rough patent terms, we can think of policies that marginally increase the *potential size* of the patent reward as having more impact on innovative activity than do those that marginally increase the *probability* of obtaining value from a patent. The benefits of using intellectual property as an innovation incentive must be balanced with concerns of holdup costs and potential monopoly harms. The lottery effect provides a tool that may help

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[4] Parchomovsky & Wagner, *supra* note 3, at 5, 14.

[5] Cass R. Sunstein, *Probability Neglect: Emotions, Worst Cases, and Law*, 112 YALE L.J. 61, 64-67 (2002).

[6] Philip J. Cook & Charles T. Clotfelter, *The Peculiar Scale Economies of Lotto*, 83 AM. ECON. REV. 634, 637-38 (1993).

weaken the connection between these otherwise linked pros and cons. Specifically, the varying marginal impact of different policy levers means that certain levers may increase an incentive to innovate with only a small increase in the monopoly harm of patents while other levers may be used to decrease the monopoly harm of patents with only a limited impact on innovation incentives.

Of course, the lottery effect only explains a subset of innovation incentives. Thus, policymakers must take care to design policies that do not unduly disturb other innovation incentives that operate in parallel with the lottery incentive, such as innovation in response to customer demands. My proposed policy guidelines fit well with the Supreme Court's recent decision in *eBay, Inc. v. MercExchange, L.L.C.*[7] and *KSR International v. Teleflex, Inc.*,[8] which present helpful case studies.

This Article discusses evidence supporting a conclusion that the lottery effect explains some innovation behavior. Proof of such a concept, however, is well outside the scope of this examination. Rather, this Article presumes that the patent lottery effect is real and examines the resulting implications for patent law policy. Part I introduces the lottery effect and its development in behavioral economics. Part II applies the lottery effect to the patent system and discusses criticisms of applying the lottery analogy. Part III develops the model for exploiting the patent lottery effect by selectively applying policy levers. To conclude, Part IV discusses the case study of *eBay v. MercExchange*.

I. BETTING ON LONG ODDS

A. *Behavioral Theory and Long Odds*

Expected utility theory is based on an economic model of rational behavior that traditionally assumes that decisionmakers are risk-averse.[9] For instance, given the choice of taking a guaranteed $3,000 or an eighty-percent chance on $4,000, the rational actor may well choose the sure thing even though the expected $3,200 payout of the gamble is higher.[10] In their

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[7] 547 U.S. 388 (2006).

[8] 127 S. Ct. 1727 (2007).

[9] Risk aversion and its corollary of decreasing marginal utility can be explained with the intuitive example of a millionaire who would likely do less work for another ten dollars than would a pauper. *See* Milton Friedman & L.J. Savage, *The Utility Analysis of Choices Involving Risk*, 56 J. POL. ECON. 279, 279-80 (1948) (discussing economists' use of utility and marginal utility in analyzing occupational choices).

[10] Daniel Kahneman & Amos Tversky, *Prospect Theory: An Analysis of Decision Under Risk*, 47 ECONOMETRICA 263, 266 (1979).

groundbreaking work on prospect theory[11] and behavioral economics, Daniel Kahneman[12] and Amos Tversky report numerous experimental examples where real people making decisions did not exhibit the expected rational behavior.[13] In one area of study, they found that decisions concerning unlikely events typically appear to be based on an overweighting of the probabilities of the events' occurrences.[14] Academics have spilled much ink in the literature attempting to explain why we overvalue long odds, although no real consensus exists.[15]

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[11] Application of prospect theory in patent law is a bit confusing because of Edmund Kitch's entirely unrelated "prospect theory of patents." *See* Kitch, *supra* note 2, at 276 (arguing that granting patent rights to a single entity encourages further investment and development in that technological prospect by the patent owner); John F. Duffy, *Rethinking the Prospect Theory of Patents*, 71 U. CHI. L. REV. 439, 486-91 (2004) (extending Kitch's theory). Because of the confusion, I propose that, at least for the area of patent law, the term "prospect theory" be abandoned in favor of the broader term "behavioral economics."

[12] Kahneman was awarded the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel in 2002 "for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty." The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2002, http://nobelprize.org/nobel_prizes/economics/laureates/2002/ (last visited Aug. 27, 2008).

[13] Kahneman & Tversky, *supra* note 10, at 265-69; Daniel Kahneman & Amos Tversky, *Choices, Values, and Frames*, 39 AM. PSYCHOLOGIST 341, 343-46 (1984); Amos Tversky & Daniel Kahneman, *Rational Choice and the Framing of Decisions*, 59 J. BUS. S251, S262-70 (1986); Amos Tversky & Daniel Kahneman, *The Framing of Decisions and the Psychology of Choice*, 211 SCI. 453, 455-56 (1981). *See also* Christine Jolls, Cass R. Sunstein & Richard Thaler, *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471, 1476 (1998) (distinguishing between homo economicus and "real people").

[14] Kahneman & Tversky, *supra* note 10, at 263 ("Overweighting of low probabilities may contribute to the attractiveness of both insurance and gambling.").

[15] Edward McCaffery succinctly combines these attempts into three short paragraphs. Edward J. McCaffery, *Why People Play Lotteries and Why It Matters*, 1994 WIS. L. REV. 71, 77-78. A more thorough approach is explored in Jolls, Sunstein & Thaler, *supra* note 13, at 1477-79 (noting in particular issues of bounded rationality, bounded willpower, and bounded self-interest). *See also* Cass R. Sunstein, *Behavioral Analysis of Law*, 64 U. CHI. L. REV. 1175, 1182-84 (1997) (discussing, inter alia, self-serving bias, unrealistic optimism, and overconfidence); Russell B. Korobkin & Thomas S. Ulen, *Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics*, 88 CAL. L. REV. 1051, 1060-66 (2000); Edi Karni & Zvi Safra, *Rank-Dependent Probabilities*, 100 ECON. J. 487, 487 (1990); Lloyd R. Cohen, *The Lure of the Lottery*, 36 WAKE FOREST L. REV. 705, 712-15 (2001) (reminding us of the utility of savoring the game); Stephen J. Choi & A.C. Pritchard, *Behavioral Economics and the SEC*, 56 STAN. L. REV. 1, 15 (2003) (explaining lottery-like investment behavior of many middle-class individuals as follows: "[a]t bottom, we suspect, is a utility function that favors a remote chance of striking it rich over the slow but steady gains from buying and holding a well-diversified portfolio"); Alok Kumar, Who Gambles in the Stock Market? 3 (Mar. 15, 2005) (unpublished working paper), *available at* http://www.nber.org/confer/2005/bfs05/kumar.pdf (arguing that gamblers may hope "to have a positive probability, albeit very small, of reaching their aspiration levels"); Colin F. Camerer & Howard Kunreuther, *Decision Processes for Low Probability Events: Policy Implications*, 8 J. POL'Y ANALYSIS & MGMT. 565, 566-67 (1989) (discussing overestimation of the likelihood of low frequency events in the context of technological hazards); *cf.* Derek E. Bambauer, *Shopping Badly: Cognitive Biases, Communications, and the Fallacy of the Marketplace of Ideas*, 77 U.

Behavioral economics has been briefly explored in one area of patent law—the area of hindsight bias and consideration of nonobviousness.[16] These hindsight examples, however, focus on *ex post* analysis of the patentability of a popularized invention and do not consider behavioral economic implications for the *ex ante* decision to invest in innovation—the topic of this paper.

B. *The Traditional State-Run Lottery*

Winning the lottery is the classic example of an unlikely event. State-run lotteries are extremely common and popular despite a house rake that often approaches fifty percent.[17] An attractive rational explanation for the popularity of lotteries despite the poor odds is that the potential thrill of winning a jackpot and instant riches has overwhelming appeal, especially when compared with the slow grind of a daily job.[18] This is not meant to

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COLO. L. REV. 649, 683 (2006) (noting that "question framing" easily alters risk-preferring behavior). A pre-Kahneman line of thinking in the same vein is provided by Friedman and Savage in their famous essay on risk-seeking behavior. Friedman & Savage, *supra* note 9, at 294-95 (proposing that the jump in socioeconomic class from a large payout may allow for risk-seeking behavior). Adam Smith provides an even older example focusing on overly optimistic lottery consumers. ADAM SMITH, AN INQUIRY INTO THE NATURE AND CAUSES OF THE WEALTH OF NATIONS *20 (Edwin Cannan ed., Methuen & Co., Ltd. 1904) (1776), *available at* http://www.econlib.org/library/Smith/smWNtoc.html ("That the chance of gain is naturally over-valued, we may learn from the universal success of lotteries . . . . The vain hope of gaining some of the great prizes is the sole cause of this demand.").

[16] For academic discussions, see Gregory N. Mandel, *Patently Non-Obvious: Empirical Demonstration that the Hindsight Bias Renders Patent Decisions Irrational*, 67 OHIO ST. L.J. 1391, 1397-1404 (2006); Gregory Mandel, *Patently Non-Obvious II: Experimental Study on the Hindsight Issue Before the Supreme Court in* KSR v. Teleflex, 9 YALE J.L. & TECH. 1, 3-9 (2007); Colleen M. Seifert, *Now Why Didn't I Think of That? The Cognitive Processes that Create the Obvious*, 12 LEWIS & CLARK L. REV. 489, 504-07 (2008); Jeffrey J. Rachlinski, *A Positive Psychological Theory of Judging in Hindsight*, *in* BEHAVIORAL LAW AND ECONOMICS 95, 106-07 (Cass R. Sunstein ed., 2000). For an implicit court discussion, see *Alza Corp. v. Mylan Labs., Inc.*, 464 F.3d 1286, 1290 (Fed. Cir. 2006) (explaining that a particular requirement for proof in the analysis of obviousness is designed to prevent "statutorily proscribed hindsight reasoning").

[17] In the United States, legal lotteries are generally run by the individual states and are quite popular. In Fiscal Year 2007, the Illinois lottery system, as an example, had sales totaling $2.2 billion. Of that revenue, only 57 percent was paid out to winners. IllinoisLottery.com, Where Your Lottery Dollar Goes, http://illinoislottery.com/subsections/News01Text.htm (last visited Aug. 27, 2008). *See also* McCaffery, *supra* note 15, at 72-73.

[18] This explanation is something of a combination of the theories proposed by Cohen and Choi & Pritchard. *See* Cohen, *supra* note 15, at 712-15 ("Rather than an input in wealth production, the lottery ticket is an input in creating a sense of open-ended possibility, specifically, the possibility of escaping one's current life by acquiring great wealth."); Choi & Pritchard, *supra* note 15, at 15 (explaining that middle-class individuals engage in lottery-like investment behavior in hopes that they "will become rich enough to leave their everyday jobs and lifestyles behind"). State lotteries usually fund popular programs such as education and youth programs. It is conceivable that some purchasers value the charity aspect of the purchase. This is almost certainly true for private charity lotteries and auctions. However,

imply that lottery consumers are not hard working people. In fact, lottery tickets are unreliable and impractical as a sole means of wealth generation. Rather, lottery consumers diversify their sources of income by continuing to work regular jobs and only allocate a portion of their income to the lottery.[19] The question of whether playing the lottery is rational behavior does not turn out to be critically relevant. Rather, as we discuss, it is the behavior that is important.

Most lottery tickets have several common features, including a low price, a low probability of winning, and a large payout award.[20] Using these numerical values, a person could calculate the mathematically expected payout of a ticket, or conversely, the house rake.[21]

Generally, a lottery ticket should be more desirable if it has a higher expected value based on its comparatively lower cost, higher probability of winning, or larger potential payout. At first glance, these inputs appear to be controlled by the lottery originator. The ticket-purchaser, however, actually has some control over both increasing the probability and reducing cost. For instance, the probability of winning can be adjusted by purchasing more tickets[22] while the cost can be lowered by forming partnerships with other buyers.[23] Likewise, the purchaser can alter the potential payout by

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we have no evidence that state-run lotteries engender any more donative goodwill than would a for-profit operation. Interestingly, lottery winners are not any happier than the rest of us. Philip Brickman, Dan Coates & Ronnie Janoff-Bulman, *Lottery Winners and Accident Victims: Is Happiness Relative?*, 36 J. PERSONALITY & SOC. PSYCHOL. 917, 920 (1978).

19 *See* John L. Mikesell, *State Lottery Sales and Economic Activity*, 47 NAT'L TAX J. 165, 170 (1994) (finding a positive correlation between income and lottery play).

20 Cohen, *supra* note 15, at 712; Charles T. Clotfelter & Philip J. Cook, *On the Economics of State Lotteries*, 4 J. ECON. PERSP. 105, 108-09 (1990).

21 Cohen, *supra* note 15, at 712 (providing a series of equations to represent the lottery ticket model). Although there is some variation among states, the expected payout for a lottery ticket is often about fifty cents on the dollar. Clotfelter & Cook, *supra* note 20, at 107.

22 Purchasing more tickets would also have the negative result of higher total costs.

23 In addition to obvious transaction costs, partnerships will reduce the potential payout because the money will be divided amongst several people. *See* Cohen, *supra* note 15, at 719 (explaining that by purchasing more tickets in a lottery or sharing in the purchase of tickets, a player increases the probability of winning but does not increase the value of winning the prize). Some of the potential problems of common informal lottery purchase partnerships are discussed in Stephen F. Thompson, Note, *Contracts to Split Lottery Prizes: What Happens When the Ticket is a Winner?*, 18 AM. J. TRIAL ADVOC. 201, 202-09 (1994) (discussing cases where parties holding winning tickets refused to acknowledge the existence of a preexisting partnership agreement). *See, e.g.*, *Man Gets Half of Lotto Winnings . . . for Now*, EDMONTON SUN, Nov. 30, 2006, at 46.

Lottery partnership appears to be used as a way to increase the odds of winning at the cost of a reduced jackpot payout. In practice, groups of friends or coworkers often pool funds together to purchase a set of tickets and then share any payout. In that situation, a pool manager typically receives a small portion as an administrative fee. U.S. laws prevent the formation of larger 'professional' syndicates that are quite popular in other countries such as the U.K. *E.g.*, eLottery, http://www.elottery.com (last visited Aug. 27, 2008). Interestingly, this phenomenon of preferring lower risk rather than higher potential returns follows the traditional notion of risk aversion but runs counter to other behavioral

choosing amongst various types of tickets, such as a scratch-off game, Powerball, Pick-Three, and so on.[24] Ticket type selection adjusts the payout because some tickets have a relatively low potential payoff value (such as $2,000, for example) while others have a much larger payoff (perhaps as high as $300 million).[25] The variety of tickets available for sale does, however, limit ticket type selection, and the upper limit of the most risky ticket type bounds the maximum potential payoff. The State determines the final variable—expected payout.[26] Since the consumer cannot usually influence the maximum potential payoff, State policy must ensure that the payoff is high enough to incentivize purchases. Likewise, although partnership is available to share the price of a single ticket, a very low ticket price generally avoids the need for that additional transaction.

Lotteries have a long history as vehicles for revenue generation.[27] Modern lotteries are no different, and their primary purpose is to raise funds for public spending.[28] Public finance presents two primary complaints against revenue generation via the lottery system. The first complaint is that high variation in lottery revenues makes it difficult to properly plan and

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economic evidence indicating that lottery players prefer higher jackpots over higher probabilities of winning. Speculatively, the group dynamic and diversification may play a role in the purchase decisions. This phenomenon also gives us pause to remember that individuals suffering under the "lottery effect" do not ignore the low probability of winning. Rather, the lottery effect simply results in individuals valuing a marginal increase in the jackpot greater than a marginal increase in the probability of winning.

24 Various game names change rapidly based on marketing concerns. A glossary of lottery terms is provided by the online gambling advice web site "*il dado*." Lotto Lottery Glossary, http://www.ildado.com/lottery_glossary.html (last visited Aug. 27, 2008).

25 Emily Oster, *Are All Lotteries Regressive? Evidence from the Powerball*, 57 NAT'L TAX J. 179, 180 (2004). Powerball drawings are progressive so that if no winner is picked for a given drawing, the current jackpot "rolls over," potentially resulting in a very large jackpot. *Id.* ("[J]ackpots have reached as high as $300 million.").

26 In Missouri, 63 percent of state lottery income is distributed to winners. Missouri Lottery: Where the Money Goes, http://www.molottery.com/where_the_money_goes/where_the_money_goes.shtm (last visited Aug. 27, 2008). The remaining 37 percent is used to fund education, compensate lottery retailers, and fund the lottery administration. *Id.* In Fiscal Year 2006, 57 percent of state lottery income was distributed to winners of New Jersey state lotteries. N.J. STATE LOTTERY COMM'N, NEW JERSEY LOTTERY ANNUAL REPORT 13 (2006), *available at* http://www.state.nj.us/lottery/general/audit_reports/FY%202006%20Financial%20Statements.pdf. During Fiscal Year 2007, 57 percent of state lottery income was distributed to the winners of Illinois state lotteries. IllinoisLottery.com, *supra* note 17.

27 Anisha S. Dasgupta, *Public Finance and the Fortunes of the Early American Lottery*, 24 QUINNIPIAC L. REV. 227, 235-50 (2006) (providing a close study of six eighteenth century New Haven lotteries); Zeng Zhonglu & Zhang Dongmei, *A Profile of Lottery Players in Guangzhou, China*, 7 INT'L. GAMBLING STUD. 265, 265 (2007) (tracing lotto purchases to the Han dynasty); Frances Stokes Berry & William D. Berry, *State Lottery Adoptions as Policy Innovations: An Event History Analysis*, 84 AM. POL. SCI. REV. 395, 401-02 (June 1990).

28 Dasgupta, *supra* note 27, at 227-28.

budget for public spending.[29] The second complaint is that, although more than half of all Americans buy lottery tickets,[30] poor and uneducated consumers are more likely to play than are other socioeconomic groups.[31] (Interestingly, at least one study shows that more wealthy and educated individuals are more likely to purchase lottery tickets as the jackpot size increases.[32]) Part IV will revisit these critiques to suggest how the patent lottery may be better managed.

C. *The Lottery Effect in Other Realms*

Unsurprisingly, people do not limit their practice of betting on long odds to lottery play or gambling. Several studies chronicle overweighting of long odds in a variety of settings, such as stock market investing,[33] entrepreneurship,[34] acting,[35] frivolous litigation,[36] purchase of insurance,[37] and others.[38] Here, our focus is on patenting and innovation.

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29 *See* Mikesell, *supra* note 19, at 166 (discussing various economic factors that may ultimately influence lottery ticket sales).

30 Clotfelter & Cook, *supra* note 20, at 105.

31 The lottery thus operates regressively. Ross Rubenstein & Benjamin Scafidi, *Who Pays and Who Benefits? Examining the Distributional Consequences of the Georgia Lottery for Education*, 55 NAT'L TAX J. 223, 226 (2002); John W. Welte et al., *Gambling Participation in the U.S.—Results from a National Survey*, 18 J. GAMBLING STUD. 313, 334, 336 (2002); CHARLES T. CLOTFELTER & PHILIP J. COOK, SELLING HOPE: STATE LOTTERIES IN AMERICA 100-01, 226-27 (1989); MARY O. BORG ET AL., THE ECONOMIC CONSEQUENCES OF STATE LOTTERIES 10-11 (1991); John L. Mikesell & C. Kurt Zorn, *State Lotteries as Fiscal Savior or Fiscal Fraud: A Look at the Evidence*, 46 PUB. ADMIN. REV. 311, 315-16 (1986). These fiscal complaints are in addition to the traditional complaints that the lottery is immoral, a sin, and that lottery play creates a set of negative externalities. *See, e.g.*, Martin McKee & Franco Sassi, *Editorial: Gambling with the Nation's Health?*, 311 BRIT. MED. J. 521, 521 (1995).

32 Emily Oster, *supra* note 25, at 180 (finding results that suggest that regressivity is partially alleviated by increasing the jackpots of lotto games).

33 Lynn A. Stout, *Are Stock Markets Costly Casinos? Disagreement, Market Failure, and Securities Regulation*, 81 VA. L. REV. 611, 665-67 (1995) (contending that trading volume often represents speculative trades on the part of investors with heterogeneous expectations on the value of companies).

34 Hugo A. Hopenhayn & Galina Vereshchagina, *Risk Taking by Entrepreneurs* 1, 15-16 (Rochester Ctr. for Econ. Research, Working Paper No. 500, 2003), *available at* http://rcer.econ.rochester.edu/RCERPAPERS/rcer_500.pdf; Thomas Åstebro, *The Return to Independent Invention: Evidence of Unrealistic Optimism, Risk Seeking or Skewness Loving?*, 113 ECON. J. 226, 236 (2003).

35 Melvin Aron Eisenberg, *The Emergence of Dynamic Contract Law*, 2 THEORETICAL INQUIRIES L. 1, 42-45 (2001).

36 Chris Guthrie, *Framing Frivolous Litigation: A Psychological Theory*, 67 U. CHI. L. REV. 163, 163 (2000) ("[T]he decision frame in frivolous litigation induces risk-seeking behavior in plaintiffs and risk-averse behavior in defendants.").

37 *See infra* note 53 (discussing insurance).

38 Jolls et al., *supra* note 13, at 1524-25, 1541-42; Sunstein, *supra* note 15, at 1183.

II. THE PATENT LOTTERY

A. *Describing the Long Tail*

The patent system has its own lottery.[39] Numerous studies have shown

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[39] The underlying concept of the lottery example in intellectual property is discussed in Professor F.M. Scherer's chapter on the innovation lottery. F.M. Scherer, *The Innovation Lottery: The Empirical Case for Copyright and Patents*, *in* EXPANDING THE BOUNDARIES OF INTELLECTUAL PROPERTY: INNOVATION POLICY FOR THE KNOWLEDGE SOCIETY 3-21 (Rochelle Cooper Dreyfuss et al. eds., 2001). A number of writers have recognized that the patent system operates as a lottery. Jonathan A. Barney, *A Study of Patent Mortality Rates: Using Statistical Survival Analysis to Rate and Value Patent Assets*, 30 AIPLA Q.J. 317, 326, 328 n.30 (2002) ("A patent is not unlike an expensive lottery ticket; you pay your money up front and hope for the big payoff."; "[T]he so-called 'lottery effect' may encourage some to over-invest in highly speculative technologies that have the seductive allure of potentially huge economic rewards, but very little, if any, realistic probability of success."); JOHN JEWKES ET AL., THE SOURCES OF INVENTION 188 (2d ed. 1969) (noting that critics have described the patent system as "a lottery in which it is hardly worth while taking out a ticket"); A. Samuel Oddi, *The Tragicomedy of the Public Domain in Intellectual Property Law*, 25 HASTINGS COMM. & ENT. L.J. 1, 39 (2002) (analogizing the race to patent to a lottery); Mark A. Lemley & Carl Shapiro, *Probabilistic Patents*, 19 J. ECON. PERSP. 75, 79-83 (2005) (comparing patents to lottery tickets and noting that only one tenth of one percent of patents are ever litigated at trial); Posting of Dennis Crouch to Patent Law Blog (Patently-O), http://www.patentlyo.com/patent/2006/09/patent_lotterie.html (Sept. 11, 2006); Jeremy Phillips, Editorial, *The Patent Lottery*, 2 J. INTELL. PROP. L. & PRAC. 567, 567 (2007) ("The value of the patent is in some respects comparable with that of the lottery ticket."). *Cf.* Allan N. Littman, *Restoring the Balance of Our Patent System*, 37 IDEA 545, 564-65 (1997) (analogizing patent litigation to a lottery system); Kimberly A. Moore, *Worthless Patents*, 20 BERKELEY TECH. L.J. 1521, 1530, 1547-48 (2005) (pointing to particular factors that help predetermine likely losers in the patent lottery but noting that the long lag-time in biotech and pharmaceutical innovation processes indicates that the patenting incentives covering those types of inventions are "more like a lottery"); Parchomovsky & Wagner, *supra* note 3, at 25-26 (criticizing the innovation lottery theory); Kristen Osenga, *Entrance Ramps, Tolls, and Express Lanes—Proposals for Decreasing Traffic Congestion in the Patent Office*, 33 FLA. ST. U. L. REV. 119, 147-48 (2005) (noting that a reduced cost of a lesser patent in a two-tier system would be favorable to patent lottery players looking for the "cheapest ticket"); Shubha Ghosh, *Patents and the Regulatory State: Rethinking the Patent Bargain Metaphor after* Eldred, 19 BERKELEY TECH. L.J. 1315, 1355 (2004) (agreeing that empirical evidence supports a conclusion of "risk loving behavior among inventors"); Sabrina Safrin, *Chain Reaction: How Property Begets Property*, 82 NOTRE DAME L. REV. 1917, 1943 n.124 (2007) ("Individuals and corporations obtain patents in the hope that one of them will turn into a winning lottery ticket. Because they cannot know in advance which of their patents will ultimately prove the winner, they patent everything."); Sean T. Carnathan, *Patent Priority Disputes—A Proposed Re-Definition of "First-to-Invent"*, 49 ALA. L. REV. 755, 808 n.257 (1998) (noting that the litigation lottery structure of the patent system is illustrative of inventors' risk-loving propensities).

News reports have also picked up on the lottery schema. *See, e.g.*, Edmund L. Andrews, *A 'White Knight' Draws Cries of 'Patent Blackmail'*, N.Y. TIMES, Jan. 14, 1990, § 3, at 5 (noting that patent jury trials are "a 'judicial lottery,' an often unpredictable system that can yield huge rewards for those who are sufficiently aggressive"); Richard B. Schmitt, *Juries' Role in Patent Cases Reconsidered*, WALL ST. J., Feb. 18, 1994, at B6 (quoting Wayne State University Law School professor Martin Adelman as saying that jury confusion results in "a system of justice that is basically a lottery"). While the patent lottery metaphor is usually associated with an innovator hoping for success, at least one court

that patent values are highly skewed,[40] or, in popular parlance, they have a "long-tail."[41] The majority of patents are relatively worthless while only a few are highly valuable with multimillion dollar payoffs.[42] This skew in valuation has been recognized as speculation for over 120 years.[43] In the 1883 *Fire Extinguisher* case, for instance, the U.S. Court of Appeals based

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took the lottery example in an alternative direction. In *Hartford National Bank & Trust Co. v. E.F. Drew & Co.*, 188 F. Supp. 353, 357 (D. Del. 1960), the district court noted that intentional patent infringers are participating in a lottery by betting that the patent will be found invalid or not infringed.

> If an infringer may take unto himself the invention of another without any bona fide or reasonable basis for so doing and run the risk only of having to pay at some future time a reasonable royalty for his use of invention, a premium would be placed upon the act of a wrongdoer, the rights of the inventor under his patent would become illusory, and responsible people dealing in the patent field would be encouraged to disregard lawful property rights and participate in a lottery with the winning ticket stamped 'invalid.'

Id. at 357. The *Hartford* example could appropriately be termed the anti-patent lottery. *See also* Carole Kitti, *Patent Invalidity Studies: A Survey*, 20 IDEA 55, 55-56 (1979) ("[T]he possibility of a court invalidity judgment can make a newly issued patent a 'lottery ticket' . . . .").

40 Scherer, *supra* note 39, at 4; Jean O. Lanjouw et al., *How to Count Patents and Value Intellectual Property: The Uses of Patent Renewal and Application Data*, 46 J. INDUS. ECON. 405, 410-11 (1998); Barney, *supra* note 39, at 327-28 (using a cohort of 70,000 patents that all issued in 1986 and a lognormal extrapolation to explain patent valuation based on patent maintenance fee payments, Barney calculated a median value of $6,930 and a mean value of $73,340). In a more recent study, James Bessen studied a cohort of patents issued in 1991 and calculated results that are strikingly similar to those of Barney. James E. Bessen, *The Value of U.S. Patents by Owner and Patent Characteristics* 10 (Boston Univ. Sch. of Law, Working Paper No. 06-46, 2006) (calculating a median value of $7,175 and a mean value of $78,168). Both of these studies show an order of magnitude difference between the calculated median and mean value and provide an indication that the patent valuation distribution includes a large number of lower-value patents and a small number of much more highly valued patents. These values are perhaps shocking because they show that the median patent value does not even reach the direct attorney fees associated with obtaining patent protection. *See* LAW PRACTICE MGMT. COMM., AM. INTELL. PROP. LAW ASS'N, REPORT OF THE ECONOMIC SURVEY 21 (2007) (reporting patent prosecution survey results).

41 *See* CHRIS ANDERSON, THE LONG TAIL: WHY THE FUTURE OF BUSINESS IS SELLING LESS OF MORE 10 (2006) (explaining that "long tail" is a term used to describe statistical curves where "the tail of the curve is very long relative to the head"). Here, we turn Anderson's use of the highly-skewed distribution ninety degrees. Where he focuses on the large variety of low-value products, we are focusing on the few very-high-value items. Although the term long-tail has been used by statisticians, physicists, and economists for many years, Anderson's popular book and blog may have now co-opted the meaning.

42 At root, a patent provides a legal right to exclude others from practicing the invention covered by the patent claims. *See* Moore, *supra* note 39, at 1546 n.70 ("[L]itigated patents are a subset of all valuable patents."). Three primary ways to profit from a patent right are: (1) licensing; (2) litigation damages; and (3) enforcement of market exclusivity to support supracompetitive pricing. *See id.* at 1522-23.

43 In the *Fire Extinguisher* case, the U.S. Court of Appeals discussed Congress's preference for protecting the rights of persons engaged in the practical use of machines over "speculators in patents." Fire Extinguisher Mfg. Co. v. Graham, 16 F. 543, 550-51 (C.C.W.D. Va. 1883). In an earlier 1846 case, the Supreme Court interpreted the Patent Act of 1836 to give an estate administrator the right to renew a patent's term, as well as to extend the benefit of such renewal to users of the patented invention. Wilson v. Rousseau, 45 U.S. 646, 681, 687 (1846).

its policy conclusions on a preference for persons engaged in practical use of machines over "speculators in patents."[44] Likewise, in an earlier 1846 case, the Supreme Court strained the meaning of the Patent Act of 1836 to avoid giving any benefit to those who "dealt with the patent rights as a matter of business and speculation."[45] The *Fire Extinguisher* preference is also common amongst policymakers who disfavor non-practicing entities that generate income purely through licensing of patent rights.[46]

In the patent lottery, a potential innovator decides whether to risk an attempt at innovation in the hopes that a resulting patent will be among the winners.[47] This speculative process involves many uncertainties including, inter alia, the uncertainty of whether the attempt will result in a technically functioning innovation; the uncertainty of whether the innovation will succeed in the marketplace; and the uncertainty of whether the innovator can protect the innovation through intellectual property or other means.[48] In the hotly disputed "spring-tooth harrow" cases of the nineteenth century, Judge A.C. Coxe[49] explained:

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44 *Fire Extinguisher*, 16 F. at 551.

45 *Wilson*, 45 U.S. at 678, 687.

46 *See* Viet D. Dinh, *Yes to the Patent Reform Act*, THE AMERICAN SPECTATOR (Dec. 3, 2007), *available at* http://www.spectator.org/dsp_article.asp?art_id=12378 (last visited Oct. 6, 2008) (discussing how the Patent Reform Act of 2007 helps cure the problem of "patent trolls").

47 The patent lottery should also be distinguished from patents on lottery technology. *See, e.g.*, Int'l Gamco, Inc. v. Multimedia Games, Inc., 215 F. App'x 991 (Fed. Cir. 2007) (litigation over patent covering aspects of New York State Lottery); Lottotron, Inc. v. GTech Corp., No. 05-4562, 2007 U.S. Dist. LEXIS 82579 (D.N.J. Nov. 7, 2007) (litigation over patented computerized lottery waging system); Scientific Games Int'l, Inc. v. Oberthur Gaming Techs., No. 1-02-CV-3224-TWT, 2003 U.S. Dist. LEXIS 25938 (D. Ga. July 17, 2003) (litigation over patented scratch-off tickets).

48 Thurston v. Reed, 229 F. 737, 747 (D. Mass. 1915) (recognizing "the [notorious] uncertainty and highly speculative nature of patent values"); E. Bement & Sons v. La Dow, 66 F. 185, 190 (C.C.N.D.N.Y. 1895) ("[N]o property is so uncertain as 'patent rights'; no property more speculative in character or held by a more precarious tenure."); Milberg v. Comm'r, 52 T.C. 315, 317-18 (1969) (treating a patent as having speculative value); Rawson v. Harger, 48 Iowa 269, 275 (1878) ("The value of a patent is purely speculative. It may be worth much or little. He who buys takes his chances . . . ."). *See also* Carnathan, *supra* note 39, at 808 ("Admittedly, invention is by nature a speculative enterprise. Whatever the doctrinal regime, inventors must work without knowing whether their work will ever pay off by yielding a patentable idea, and further must work without knowing whether some other inventor may complete the conception of the idea first. An overly risk-averse person is not likely to choose to become an inventor. In fact, inventors are likely among the least risk-averse people on the planet.").

49 The *Harrow* case was decided rather early in Judge Coxe's judicial career. Judge Coxe went on to serve on the Second Circuit from 1902 to 1917. Fed. Judicial Ctr., Biography of Alfred Conkling Coxe, Sr., http://www.fjc.gov/servlet/tGetInfo?jid=527 (last visited Aug. 27, 2008). During the Taft administration, Judge Coxe was considered a potential Supreme Court nominee. Albert H. Walker, Letter to the Editor, *His Vote as a Sacrifice: Judge Coxe's Qualifications*, N.Y. TIMES, Nov. 15, 1909, at 8.

> It should also be borne in mind that no property is so uncertain as "patent rights"; no property more speculative in character or held by a more precarious tenure. An applicant who goes into the patent office with claims expanded to correspond with his unbounded faith in the invention, may emerge therefrom with a shriveled parchment which protects only that which any ingenious infringer can evade. Even this may be taken from him by the courts. Indeed, it is only after a patentee has passed successfully the ordeal of judicial interpretation that he can speak with any real certainty as to the scope and character of his invention. Especially is this true of patents on spring-tooth harrows . . . .[50]

To some extent, the popular press and blogosphere mask the challenges, impediments, and improbable success faced by a hopeful innovator by heavily focusing on the small minority of patent cases that result in substantial returns.[51] In behavioral economics, an "availabilty heuristic" has been defined to explain how, inter alia, news reports of an event's occurrence increases a person's prediction of the frequency of the event. Here, reports of successful innovations may well increase the perception of the likelihood of future success.[52]

B. *Defining the Patent Lottery*

There are clear parallels between this simple speculation-oriented patent scenario and the lottery system described in Part I.B.[53] Like a lottery

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[50] *E. Bement & Sons*, 66 F. at 190.

[51] The 2006 $612.5 million settlement of the *NTP v. Research-in-Motion* litigation represents a case-in-point. A LexisNexis news search conducted for articles published between September 7, 2005 and September 7, 2006 resulted in 2,521 news articles discussing the lawsuit and settlement size. Similarly, a search of Technorati, a blog search engine, reveals thousands of articles discussing the settlement. Technorati, http://www.technorati.com (last visited Aug. 27, 2008).

[52] Jolls et al., *supra* note 13, at 1477-78; Cass R. Sunstein, *Precautions Against What? The Availability Heuristic and Cross-Cultural Risk Perception*, 57 ALA. L. REV. 75, 87 (2005).

[53] Another analogy—that of insurance—can also be drawn with respect to patents. At first glance, insurance premiums appear to be almost the exact opposite of lottery purchases. Insurance involves paying a premium to avoid risk while lottery players are thought to pay a premium to achieve risk. In an insurance analogy, patents play the role of an insurance policy against a combined risk that (1) an innovation is a practical and market success *and* (2) non-patent protections insufficiently protect the innovators. In the patent world, this situation often plays out in scenarios when an innovative company fails to achieve market success but the newly created technology is successfully marketed by another company.

Professor Shubha Ghosh criticizes this insurance model as empirically incorrect, "given the evidence of risk loving behavior among inventors." Ghosh, *supra* note 39, at 1355. However, Professor Ghosh too quickly concludes that the insurance model is incompatible with that of "risk loving" inventors. Rather than opposites, insurance is more aptly described as a mirror image of the lottery. As in the lottery, insurance purchasers tend to pay a premium against the odds of a long-shot. This mirror-image analysis was recognized early on by Kahneman and Tversky. Kahneman & Tversky, *supra* note 10, at 263.

Again with terminology: Patents as insurance should not be confused with patent defense insurance or patent enforcement insurance, both of which can be purchased from a handful of carriers. *See* Melvin Simensky & Eric C. Osterberg, *The Insurance and Management of Intellectual Property Risks*,

ticket, an attempted innovation has an expected price, a potential large payout, and a low probability of winning.[54] The expected private value of the innovation is a function of the price, payout, and probability. Unlike the state lottery system, however, the house rake is not defined by these variables. Part III further develops the concept of the house rake.

An apt criticism here is that the lottery analogizes poorly to patents and innovation where the variables are, in fact, all theoretical. None of the inputs to the metaphorical patent ticket price are known to a potential innovator: the ticket price—consisting of the money, time, and opportunity costs of innovating and then monetizing the innovation—is unknown; the potential value and timing of a payout is not defined; and the probability of achieving success is uncertain. On the other hand, in the state-run lottery, the inputs are all pre-defined: the ticket price is a particular dollar figure; the jackpot payout is displayed in flashing lights and a payout schedule is available; the probability of winning and house rake are also known—although found only in fine print.

The preceding critique, although important to consider, only shows that the analogy eventually breaks down. Of course, all analogies eventually break down—otherwise we would be speaking in identities.[55] The lottery performs the function of a convenient conceptual aide.[56] However, what matters here is not whether the analogy is close enough. Rather, the important issue here is whether potential innovators are acting in a way that is better explained by behavioral economics.

C. *Scherer's Patent Lottery and the "Small" Innovator*

Although a number of commentators have drawn parallels between our patent system and lotteries,[57] Harvard Economist F.M. Scherer demonstrates the parallels most forcefully by providing data showing the skewed distribution of patent values and illustrating that the expected median return

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17 CARDOZO ARTS & ENT. L.J. 321, 329, 377 (1999) (discussing various intellectual property insurance policies).

54 This is a simplified approach in a number of respects. More generally, a patent payout would have a probability distribution function of potential payouts. Researchers have found that the distribution of invention values fits well to a lognormal distribution. Bessen, *supra* note 40, at 6; James E. Bessen, *Estimates of Firms' Patent Rents from Firm Market Value* 20 (Boston Univ. Sch. of Law, Working Paper No. 06-14, 2006); *see also* Lanjouw et al., *supra* note 40, at 410.

55 *See* David McGowan, *The Trespass Trouble and the Metaphor Muddle*, 1 J.L. ECON. & POL'Y 109, 109-10 (2005) (criticizing the over-extension of metaphors in the internet-property context).

56 No matter how close the parallel between the state lottery system and the patent system, we could never make the proof-like claim that the lottery effect exists in patents because it exists in the state lottery.

57 *See* sources cited *supra* note 39.

is far less than the expected mean return for innovative activities.[58] From his analysis, Scherer finds "that there are striking regularities in the distribution of rewards to technological innovation. A minority of 'spectacular winners' appropriate the lion's share of total rewards."[59]

For several reasons, innovative activity by individual inventors and small entrepreneurs is generally a much riskier activity as compared with larger corporate initiatives. Small businesses are more likely to fail, have less ability to recover from poor investments, have fewer resources for research and development, and generally have an inadequate understanding of the marketplace.[60] Scherer suggests that there is an exceptional affinity for risk taking in these small-time operators, something not found as strongly in corporate culture.[61] And, that risk-taking affinity may help explain why many of the "boldest technological innovations" originate outside of large corporations.[62] More recently, an empirical study bolstered this conclusion by finding that "valuable patents"—or at least patents that have been litigated—tend to be "issued to individuals or small companies, not large companies."[63]

D. *Criticisms of Applying the Lottery Analogy*

1. Only a Partial Answer

The lottery analogy only provides a partial answer to the question of why people innovate and protect those innovations through patents. As Federal Circuit Judge Kimberly Moore argues, in addition to licensing fees and litigation-related damages, patents are also sought to deter litigation by a competitor, to deter competitors from entering a field of research, to establish a patent thicket, and to signal investment value.[64] There is also a real distinction between patents and innovation. Many non-patent factors drive innovation and can in some instances make patents irrelevant.[65] These in-

58 Scherer, *supra* note 39, at 11-12.

59 *Id.* at 11.

60 *Cf. id.* at 20-21 (noting that risk aversion and greater financial resources of large, well-established organizations support the belief that the enforcement of intellectual property rights is biased in their favor).

61 *Id.* at 20.

62 *Id. See also* JEWKES ET AL., *supra* note 39, at 186.

63 John R. Allison et al., *Valuable Patents*, 92 GEO. L.J. 435, 438 (2004) (using litigation as a proxy for value). Their study found that larger companies may also tend to purchase those potential plaintiffs. However, their use of litigation as a proxy value has been rightly criticized as incomplete and subject to sample bias.

64 Moore, *supra* note 39, at 1522-23.

65 Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, 3 BROOKINGS PAPERS ON ECON. ACTIVITY 783, 803 (1987).

clude the desire for a first-mover advantage, insurance against potential market opportunities, and to meet customer demands. Inventors will still seek patents on inventions that were not developed as a result of these non-patent incentives. In those cases, the patent rights are simply a bonus for the inventor.[66] Thus, at best, the lottery analogy only explains a part of the incentive felt by potential innovators.[67]

This concern does not disprove the lottery effect. It should, however, raise a cautionary flag against loose implementation of policies based on the effect, as there is a potential for undesired interactions of these policies with the other innovation incentives. As discussed *infra*, one approach to avoid interactions is to direct policies toward entities and individuals most likely operating under lottery assumptions.

2. Problems of Uncertainty

Perfect foreknowledge would destroy the lottery effect because potential innovators would already know which innovative attempts would result in high-value patents. Thus, a second concern with the lottery analogy involves its assumption that the future value of a potential innovation is merely speculative and offers nothing more than a small positive probability of achieving a large payout. As it turns out, many common traits of a subset of valuable patents—those that are litigated—can be identified prior to issuance of a patent.[68] This finding prompted a group of prominent patent scholars led by John Allison to argue that the lottery analogy cannot be a full explanation of reasons for patentability.[69] Allison's study on valuable patents uses litigation as a proxy for value, presuming that valuable patents are more likely to be litigated than those that are worthless.[70] According to the study, compared to ordinary patents, litigated patents tend to be owned by domestic companies, be issued to small entities or individuals, cite more prior art, and contain more claims.[71] Mechanical, computer, and medical device patents are also "significantly more likely to be litigated" than those related to chemical and semiconductor innovations.[72] Most of the variables

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66 The patent does guarantee some level of public disclosure of the invention, but in many cases, public disclosure cannot be avoided once the invention is sold. Similarly, the patent right may provide some incentive for the inventor to pursue further development. However, once granted, patent rights can also serve to chill the innovation of others.

67 It is entirely plausible that some potential innovators are not swayed in the least by a potential for a large reward.

68 Allison et al., *supra* note 63, at 438.

69 *Id.* at 462.

70 *Id.*

71 *Id.* at 438.

72 *Id. But see* James E. Bessen & Michael J. Meurer, *Patent Litigation with Endogenous Disputes*, 96 AM. ECON. REV. 77, 79-80 (2006) (disagreeing with those results).

identified by Allison are under the control of the patentee, indicating that the patentee can get a sense of the value of a potential patent during prosecution of the patent, if not earlier.

In attempting to provide their own explanation for patenting rates, Gideon Parchomovsky and Polk Wagner similarly argue that because the inventive process is knowledge based, it cannot be completely random.[73] Parchomovsky and Wagner contend that "[u]nlike lotteries, which are completely random, the inventive process is knowledge based: *ex ante* information (such as technological know-how and industrial expertise) plays a key role, and to a large extent determines a company's likelihood of success."[74]

Even assuming their empirical soundness, these objections are useful and compelling only in a limited sense and should not cause us to reject the patent lottery analogy altogether. In particular, the authors of those studies will undoubtedly recognize that even if a patent exhibits all of the identified traits of a commonly litigated patent, it is still quite unlikely to be litigated.[75] Thus, even if a patentee uses all of this *ex ante* knowledge, the odds are still low that a resulting patent will be valuable. Furthermore, even when the potential value of a particular innovation is known in advance, innovation and patenting is still a high-risk activity. There is no guarantee that a firm's innovation will be successful or that the patent office will agree with that success and grant the patent application. *Ex ante* knowledge of the value of a potential innovation would also fuel patent races, which creates an additional layer of uncertainty as to who would receive the prize. At the baseline, even with presumed industry knowledge, "the inventive process involves a significant degree of uncertainty and some degree of luck."[76]

3. Problem of Irrationality

A third concern with the lottery analogy involves a pushback against the assumption that buyers are "so risk-seeking that they are willing to engage in an activity with a negative expected value."[77] In state-run lotteries, the players may indeed be making "irrational" choices that violate two primary assumptions of expected utility theory—that of maximizing private

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73 Parchomovsky & Wagner, *supra* note 3, at 25.

74 *Id.*

75 *See, e.g.*, Allison et al., *supra* note 63, at 437 (of the 2,925,537 patents in their study, only 6,861, or 0.23%, had been litigated).

76 Parchomovsky & Wagner, *supra* note 3, at 25; Jonathan Douglas Putnam, The Value of International Patent Rights 131-33 (May 1996) (unpublished Ph.D dissertation, Yale University) (on file with Sterling Memorial Library, Yale University) (finding a low correlation between renewal rates and the number of countries filed for protection—indicating that early-on decision makers have little idea about the eventual value).

77 Parchomovsky & Wagner, *supra* note 3, at 25.

utility and that of avoiding risk.[78] The patent lottery, however, does not require that those two assumptions be violated. An important point here is that rational behavior allows for risk-taking but requires a premium in return. It is possible that for many potential innovators, the expected payout from the patent lottery surpasses the costs of the portion of innovative behavior associated with the lottery incentive. Furthermore, although the evidence is still inconclusive, data available at least suggests that inventors may be overconfident and overweight the low probability of reaping a large reward as predicted by the model.[79] At this point, the data on patent return overvaluation is admittedly only suggestive, and this is an area where more research is necessary to determine the motivation of innovators in their decisions. As we will discuss in Part IV, this further research is important because only a correct understanding of innovative behavior can lead us to policies that are more socially optimal.[80]

4. Lotteries and Patent Races

A fourth concern mistakenly raised by commentators is that the lottery analogy assumes that all inventors compete for the same prize.[81] It is true that in state-run lottery games players are all going after the same prize. Even in state-run games, however, the winnings are disaggregated. Winners share the prize when multiple winning tickets are purchased, and multiple lotteries can run simultaneously. In the patent lottery context, disaggregating is likewise conceptually simple. Each innovation has its own prize found in its potential market value. That formulation of the model would thus avoid any problem associated with a single available prize.

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78 Richard O. Zerbe, Jr., *The Legal Foundation of Cost-Benefit Analysis*, 2 CHARLESTON L. REV. 93, 129 (2007). It is important to note that a large number of behavioral economic studies have shown that people do indeed make decisions to engage in activities with negative expected values. *See generally* DAN ARIELY, PREDICTABLY IRRATIONAL: THE HIDDEN FORCES THAT SHAPE OUR DECISIONS (2008) (discussing how irrational behavior is neither random nor senseless, but systematic and predictable); ROBERT J. SHILLER, IRRATIONAL EXUBERANCE (Doubleday 2006) (2000) (studying factors behind the stock market boom leading up to the year 2000).

79 Åstebro, *supra* note 34, at 226. Åstebro observed that the median return for Canadian individual inventors was negative, but that the average internal rate of return was positive but did not include a high risk premium. *Id.* at 231, 235. The positive rate of return was substantially based on the 0.55% of the sample that realized returns of over 1,400%. *Id.* at 235.

80 *See* Lanjouw et al., *supra* note 40, at 424-28 (discussing the incentives created in particular foreign patent systems based on variations in patent term and application and renewal fees).

81 Parchomovsky & Wagner, *supra* note 3, at 25.

5. One Dimensional

Finally, Parchomovsky and Wagner criticized Scherer's lottery analogy as overly one-dimensional because it ignores effects of the patent portfolio.[82] By forming a portfolio of patents, the holder is thought to have a much stronger strategic position.[83] Portfolio-based valuation is a more difficult process, but there is no reason why the patent lottery cannot account for sets of patents, especially if those groupings of patents make a payout either larger or more probable. For the purposes of this paper, however, many of the complicating issues associated with patent portfolios can be largely ignored since the portfolio effect is primarily associated with large, well-established firms, while this notion of the lottery effect is primarily thought to be associated with smaller entities and new entrants.

An additional concern against the lottery analogy is that it leads to a distorted world view by too casually discarding "losing tickets."[84] This complaint has some validity, as unlike most losing tickets in the state-run lottery, patents can still hold value even when the value is much less than the hoped-for value. However, this criticism of the lottery analogy creates no problem since there is no requirement that all benefits of innovation be tied to the patent lottery. Rather, the patent lottery should complement other forms of incentives for innovation.[85]

The majority of criticism directed at analogizing the innovation and patenting process to the lottery system focuses on the fact that the lottery does not explain all innovative activity. But those criticisms do nothing, in fact, to diminish the argument that the lottery analogy explains *some* of the innovative incentive felt by *some* potential innovators.

Although these logic-based criticisms of the lottery effect create interesting straw men, the larger question remains: is it empirically true that a substantial portion of innovative activity is moved forward by inventors who have unrealistic or overvalued estimations of the success of their project? The strongest evidence indicates that small entrepreneurial companies and individuals are the ones most likely to take this type of gamble.[86] Legal

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82 *Id.* at 58 (noting that "unlike lottery tickets, patents can exhibit superadditivity").

83 *Id.* at 27.

84 *Id.* at 26.

85 *Id.* at 57-58.

86 *See* Hopenhayn & Vereshchagina, *supra* note 34, at 1 (explaining how an option to jump to another opportunity explains why self-financed entrepreneurs may find it optimal to invest in risky projects that do not offer any risk premium). For a discussion of entrepreneurial gambling behavior, see Robert A. Lowe & Arvids A. Ziedonis, *Overoptimism and the Performance of Entrepreneurial Firms*, 52 MGMT. SCI. 173, 174 (2006) (finding no entrepreneur overconfidence in the decision to establish a new firm, but finding significant overconfidence in the decision to continue with thus-far unsuccessful opportunities); Åstebro, *supra* note 34, at 236-37 (noting the behavior of independent inventors to move forward in the face of discouragement from authorities). *See also* David L. Hull et al., *Renewing the Hunt for the Heffalump: Identifying Potential Entrepreneurs by Personality Characteristics*, 18 J.

structures such as the availability of bankruptcy and limited liability also promote risk-taking behavior by eliminating the potential for the most negative returns on investment.[87]

III. THE HOUSE RAKE

A. *Private Law v. Public Law*

We have been discussing the patent lottery analogy in relation to private actors such as innovators. The policy decision to hold a lottery, however, would rarely be based on the private benefit to participants.[88] Rather, lotteries are held for the benefit of the lottery organizers. In a government or non-profit scenario, the lotteries are thus held for the benefit of the public. The private benefit is necessary to induce participation. Thus, odds and payouts and other inducements are tweaked to ensure that the game is played. However, the underlying reason for holding the lottery is what we might term the "house rake."

B. *House Rake in the Patent Lottery*

In state-run lotteries, the purpose is to collect money to finance public spending.[89] By contrast, although the United States Patent and Trademark Office (PTO) collects fees,[90] those fees are not its reason for existence. Instead, the patent system is built on the constitutional justification of promoting the progress of the useful arts.[91]

In legal terms, the patent system operates to reward innovation and disclosure by granting exclusive rights to patented inventions. The exclusive rights, while generating a potentially large private benefit for the patent holder, can have a variety of positive and negative social impacts—namely increased incentives to innovate and disclose (both with presumptively positive results) at the cost of potential monopoly rents, dampened competi-

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SMALL BUS. MGMT. 11, 15-18 (1980) (finding that a questionnaire of risk-taking propensity differentiated potential entrepreneurs from non-potential entrepreneurs).

87 *See* Robert H. Brockhaus, Sr., *Risk Taking Propensity of Entrepreneurs*, 23 ACAD. MGMT. J. 509, 510-11 (1980) (noting entrepreneur's tendency to prefer high risk situations in order to easily explain failure without assuming personal responsibility); Susan Rose-Ackerman, *Risk Taking and Ruin: Bankruptcy and Investment Choice*, 20 J. LEGAL STUD. 277, 279 (1991) (discussing some authors' views that bankruptcy has lost its sting and is a used mechanism for dealing with costly legal situations).

88 Dasgupta, *supra* note 27, at 260.

89 *Id.*

90 U.S. PATENT & TRADEMARK OFFICE, FY 2008 FEE SCHEDULE (2008), *available at* http://www.uspto.gov/web/offices/ac/qs/ope/fee2007september30_2008august01.htm.

91 U.S. CONST. art. 1, § 8, cl. 8.

tion, and interference with follow-on research (all generally considered negative).[92] It is the balance of those social impacts that "finance" the patent system and serve as the house rake of the patent lottery.

As noted above, this paper presumes that innovation and disclosure have a net positive social impact while patent exclusivity has a net negative social impact. That result is somewhat debatable. For instance, "*ex post* justifications" of intellectual property rights continue to receive some attention and push toward the idea that enforcement of intellectual property has some additional social benefits.[93] These *ex post* justifications generally rely on benefits of private ownership creating incentives for coordinated control and investment in further development. For patent rights in particular, this justification often fails to make even intuitive sense because overlapping patent rights allow for multiple points of control without any right to use. Yet, to the extent that *ex post* justifications are real, those additional costs and benefits would need to be incorporated into the model.

C. *Re-Aligned Interests in Patent Lottery House Rake*

In the state lottery, public interests are at odds with private interests. The state's returns will only be positive if the players' returns are negative. The patent lottery works a bit differently. Positive social impacts in the patent lottery do not require a negative expected return for potential innovators. Instead, it is quite possible that both public and private interests benefit from incentives placed on innovation. In the simplest model, the public interest must balance any harms associated with exclusivity rents collected by patentees against the social benefits of innovation.[94]

Sitting alone, exclusivity is thought to result in a direct drain on social welfare because of the potential monopoly-like behavior. Economists have, therefore, encouraged policymakers to grant patent rights "only to the extent that[] they are necessary to encourage invention."[95] In other words, in

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92 *See* Louis Kaplow, *The Patent-Antitrust Intersection: A Reappraisal*, 97 HARV. L. REV. 1813, 1816-17 (1984) (discussing the conflict between awarding innovation with patent rights and creating monopolies); Mark A. Lemley, *Ex Ante Versus Ex Post Justifications for Intellectual Property*, 71 U. CHI. L. REV. 129, 129-30 (2004) (discussing effects of patent rights on innovation, disclosure, and investment).

93 Lemley, *supra* note 92, at 129.

94 *See* Kaplow, *supra* note 92, at 1823-26 (arguing that optimal patent life is where the length of time that the marginal social cost of lengthening or shortening the patent life equals the marginal social benefit); Brett M. Frischmann & Mark A. Lemley, *Spillovers*, 107 COLUM. L. REV. 257, 257-58 (2007) (discussing spillovers as a social benefit of innovation).

95 Mark A. Lemley, *Property, Intellectual Property, and Free Riding*, 83 TEX. L. REV. 1031, 1031 (2005); Kaplow, *supra* note 92, at 1823-26. The last increment of monopoly pricing is especially problematic because it results in a large deadweight loss but only minimal increased private profits for the patentee. Ian Ayres & Paul Klemperer, *Limiting Patentees' Market Power Without Reducing Innovation*

an economist's idealized world, patent rights would only be offered when those rights are necessary to incentivize the innovation effort. For many reasons, the "just enough" formula is difficult to implement. There is no known method for effectively discriminating to provide only the necessary amount of incentive.[96] However, information on systematic tendencies can be useful. Thus, if innovators exhibit some systematic bias in their decisions to innovate, that information could be used to modify the patent policies which create innovation incentives.

D. *Correcting the Skewed Preferences of the Patent Lottery*

The lottery effect shows that individuals faced with a low probability of winning a large payout tend to be swayed more by changes in the size of the jackpot than by actuarially parallel changes in the probability of winning. This Article assumes that potential innovators actually feel the lottery effect causing them to exhibit the skewed preferences of the patent lottery and thus be willing to invest against the actuarial norm. The skewed preferences in the patent lottery involve probability neglect and overweighting the value of success, typically by ignoring the low probability of success. Thus, for a potential innovator captured by the patent lottery effect, a change in the probability of achieving a successful innovation would have little impact on the innovation incentive. By contrast, a change in the potential payout of successful innovation would be more likely to produce a response in the potential innovator. As discussed *supra*, these assumptions about innovator behavior have only been suggested by peripheral studies and have not been conclusively proven. However, the effect appears more often among individual inventors and start-up operators.[97]

A usual response to such bounded rationality is to suggest corrective measures to help overcome the associated losses. In other words, a policymaker may see a market information failure that needs correction and suggest a congenial form of education-based paternalism to help innovators realize their mistaken calculations. More direct forms of paternalism are also available to ensure that innovators only innovate when their expected return on innovation is positive. This Article takes a different approach.

Incentives: The Perverse Benefits of Uncertainty and Non-Injunctive Remedies, 97 MICH. L. REV. 985, 987 (1999).

96 I suggest that the issue of incentive discrimination can be thought of as akin to the inability of a producer to price discriminate according to individual consumer willingness to pay. Here, however, society would prefer to discriminate by changing the innovation incentive according to the amount needed to induce the innovative activity. Although addressing a different point, this analysis is implicitly suggested by Doug Lichtman in his article suggesting the use of government subsidies to ensure pharmaceutical innovation. Douglas Gary Lichtman, *Pricing Prozac: Why the Government Should Subsidize the Purchase of Patented Pharmaceuticals*, 11 HARV. J.L. & TECH. 123, 123-25 (1997).

97 *See* Part II.C.

Instead of trying to change and correct the behavior of individual innovators, I suggest that policymakers can leverage the potential innovator's bounded rationality to further society's innovation policy goals.

E. *Exploiting the Patent Lottery Effect*

To the extent that it exists, the patent lottery effect should not be ignored or extinguished—instead, it should be understood and used to benefit society. This section proposes a method of applying our knowledge of the patent lottery and behavioral economics to promote the policy goals of increased innovation and disclosure. In lottery lingo, we exploit the lottery effect to increase the house rake.[98]

If we are right that a low probability chance of winning a large patent payout does induce a skewed incentive effect on potential innovators, then there are policy options available that can increase the patent lottery's positive social impact while continuing to encourage the equivalent innovation. This first step does not require that the patent lottery players make decisions with negative expected returns. The policy options can be extended further, however, if the bounded rationality theories of behavioral economics are indeed applicable to potential innovators in a way that leads to such negative-return decisions.

Although the expansive language of behavioral economics encompasses most of the ways that a patentee may overweigh their chances of winning a large payout, a simplified formula may be more explanatory to some. Given a risk-neutral player having an incentive to innovate and patent (i) based on the chances of achieving a large payout (J) at probability (P); at first order, $i = J*P$ where the incentive (i) is directly proportional to the product of the payout (J) and probability (P).[99] Under the lottery effect, however, an incremental increase in the payout (J) results in an even greater increase in the incentive (i). Thus, in equation form, $\delta i + i > (\delta J + J)*P$, where $\delta J > 0$. Conversely, under the lottery effect, an incremental decrease in the probability (P) results in only a small decrease in incentive (i) as shown by the equation, $i - \delta i > J*(P - \delta P)$, where $\delta P > 0$.

In our simple model, there are only two levers that alter the incentive to innovate: (1) the potential value of successful innovation; and (2) the probability of achieving success. Any number of underlying policy levers can be identified to influence both the payout and the probability. These generally may include modification of patentability or litigation rules and limitations on damages or injunctive relief. A third lever—the up-front cost of innovation—is the patent lottery equivalent of a ticket price. Raising or lowering patent office fees or other tax or small business incentives are

98 *See* Part I.B; Part II.B.

policy examples that would impact that third lever.[100] A 1976 patent office appeal recognized some of these potential levers while noting that a poorly operating patent office has the negative effect of "encouraging fraudulent speculators in patent rights, deluging the country with worthless monopolies, and laying the foundation for endless litigation."[101] Although that parade of horrible outcomes may be overly dramatic,[102] the underlying message is clear—policy levers in the patent system do have an impact on the activity of patentees.

This model begins with the goal of maximizing positive innovative activity while minimizing negative rents associated with strong patent rights. Attempts to use these innovation levers to take advantage of the lottery incentive should follow certain guidelines.

First, to increase innovative activity, regulators should focus on levers that have a proportionately larger marginal impact on the potential value of successful innovation—the size of the jackpot. The payout size is the most important lever for influencing the desire of innovators to innovate. Thus, an increase in payout size is associated with a large marginal impact on inventor incentives to innovate but a smaller marginal increase in monopoly rents. Because the lottery effect indicates that innovators are relatively insensitive to increases in the probability of winning the jackpot, it would be comparatively fruitless to make changes increasing that probability in the hopes of increasing innovative activities.

Conversely, if enforcement of patent rights (and consequently rents) is to be reduced, that reduction will be most effective if applied using levers that have only a small marginal effect on inventor incentives but a large marginal impact on monopoly rents. Because the patent lottery effect predicts insensitivity to changes in the probability of successful innovation, policies that primarily reduce that lever will have only a small negative effect on innovative activity accompanied by a larger reduction on the innovator's ability to eventually seek monopoly rents.

1. Ramsey, Kaplow, and Ayres

In some ways, this approach can be thought of as building from Louis Kaplow's famous ratio test for deriving the optimal patent life[103] and the

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100 Lanjouw et al., *supra* note 40, at 425-28 (finding that although Patent Office fees consist of only a small part of the costs of protecting innovation, applicants are quite sensitive to those fees).

101 *In re* McKellin, 529 F.2d 1324, 1337 (C.C.P.A. 1976) (Miller, J., dissenting).

102 *Cf.* Gerard N. Magliocca, *Blackberries and Barnyards: Patent Trolls and the Perils of Innovation*, 82 NOTRE DAME L. REV. 1809, 1819-22 (2007) (discussing the flood of low quality patents associated with a patent registration system that lacked any substantive examination that was available during the nineteenth century).

103 Kaplow, *supra* note 92, at 1823-29.

concept of Ramsey pricing.[104] In his article, Kaplow created a ratio that compared social benefit of a patent to the monopoly cost to determine the optimal patent life.[105] Ian Ayres and others have extended that analysis by looking at patent features other than the term—noting in particular that "[i]f one margin of protection produces lower patentee profits per dollar of social loss than another margin, it makes sense to reduce the patentee's entitlement where the ratio is low and to expand the patent entitlement where the ratio is high"—thus extending Ramsey's ideas fully into the world of patenting.[106]

In the patent lottery, we abstract out from the concept of "patent profits" to consider the incentive effect more generally. Of course, in traditional economic literature, those two elements may be identical, but the behavioral economic aspect of the patent lottery requires that we consider the actual incentive effect rather than actuarial profit.[107] With that abstraction, but still using the concepts of Ramsey, Kaplow, and Ayres, we can construct the policy choices in the lottery effect as two ratios based on (1) the marginal effect of modifying the potential payout on the innovation incentive as compared to the monopoly cost; and (2) the marginal effect of modifying the probability of success as compared to the monopoly cost. A large ratio indicates that the lever in question should be increased while a small or negative ratio indicates that the lever in question should be decreased.

Our assumptions about the patent lottery indicate that the first ratio will be high because those captured by the patent lottery tend to overvalue a change in payout size. Conversely, the second ratio will be high for patent lottery players because they tend to undervalue a change in probability of success. The ratios, in slightly modified form, also indicate how far the policy levers can or should be pushed in either direction. Assume for a moment that the potential payout is increased by allowing an innovator to obtain exclusive rights for a broader swath of potential follow-on products. As the payout lever is ratcheted-up, at some point, the negative effect of monopoly cost will overtake the benefits of additional innovation. When that ratio flips,[108] we know that additional incentives are unlikely to result in societal gain. Likewise, the probability of success could be altered to best fulfill the goal of maximizing the benefits of innovation while minimizing the monopoly costs. The next section discusses one hard limit on the probability value: it must be above zero.

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104 F.P. Ramsey, *A Contribution to the Theory of Taxation*, 37 ECON. J. 47, 54 (1927); Robert Cooter, *Optimal Tax Schedules and Rates: Mirrlees and Ramsey*, 68 AM. ECON. REV. 756, 764 (1978).

105 Kaplow, *supra* note 92, at 1825-26.

106 Ayres & Klemperer, *supra* note 95, at 993.

107 Parchomovsky & Wagner, *supra* note 3, at 24.

108 In this scenario, a ratio flips when it drops below one.

2. Limitations on Uncertainty

As discussed above, even under the lottery effect, there must be some limits on how far a policymaker can ratchet-down the probability of success before the ratios begin to normalize.[109] At an absolute limit, the probability of success must remain non-zero and positive.

The lottery system works using a low but positive probability of winning a large payout. Rules that provide *ex ante* certainty significantly reduce the lottery incentives, as a person with the winning ticket bets with a certainty of success. Conversely, a certain loser would not be expected to take the bet at all. This suggests that the uncertainty of success must be maintained at some positive level in order to have a lottery effect. The history of innovation and business development suggests that uncertainty can never be eliminated from that process.[110] While understanding the inherent unpredictability of innovation and business, the thought of encouraging uncertainty may displease some commentators.

To this point, there is no denying that uncertainty in property rights creates problems. Unclear property rights may be underdeveloped and also create noisy information problems leading to exhaustive clearance searches by risk-averse competitors, for instance. Here, however, we are not talking about the difference between the stark contrast of certain and uncertain rights, but rather shades of risk associated with the potential of obtaining rights and the value of those rights. Decreasing the likelihood of success for the patent lottery player gives competitors more freedom to ignore the lottery player's probabilistic rights.[111] That freedom consequently works to ensure competitive development and avoid monopoly pricing.[112]

F. *Returning to State Lottery Complaints*

We now briefly return to the two common complaints made against the state lottery system—the volatility of revenue for the state and regressivity—and consider them in the patent context.

In the state lottery, the state's ability to pay a large jackpot is never in question because lottery boards adjust the jackpot size to ensure that it is always smaller than the revenue from ticket sales. In the patent system, however, there is the possibility that a jackpot patent could have a destabilizing economic effect because companies, unlike the state lottery, do not

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109 *See supra* Part III.E.1.

110 *See* Lemley & Shapiro, *supra* note 39, at 76 (discussing how virtually all property rights contain some element of uncertainty).

111 *Id.* at 75-76 (discussing how patents may be considered as probabilistic entities).

112 Regarding uncertainty and delay, see Ayres & Klemperer, *supra* note 95, at 1028-30 (proposing delayed adjudication of patent rights as a method of sustaining uncertainty).

have complete control over the size of the pot. Concerns over jackpot volatility rise as policymakers ratchet-up the potential payout. This volatility potential played out in 2004 to 2006 as the public feared an injunction against Research-in-Motion's wireless e-mail service.[113]

Despite the potential problems created by volatility of revenue, the concern for regressivity is of more practical importance in the patent context because preliminary evidence suggests a demographic skew in patent lottery players toward individual inventors and small companies.[114] The patent lottery may disproportionately encourage patenting by smaller entities.[115] In fact, a 2003 study completed for the U.S. Small Business Administration suggests this very phenomenon.[116] This study found that small innovative firms "produce 13-14 times more patents per employee as large patenting firms."[117] Likewise, as shown by Allison, Lemley, Moore, and Trunkey ("ALMT"), small entities are more likely to litigate their patents,[118] perhaps creating some competitive chilling effect. Small entities may also be less likely to fully develop their innovations because of a lack of resources and market channels. This situation leads to rights that are protected from use but left underdeveloped or wasted.[119]

IV. *EBAY v. MERCEXCHANGE* AS A PATENT LOTTERY CASE STUDY

A. *The Supreme Court Decision*

It is common lore that "a right implies a remedy."[120] However, this is a partial misstatement, as the two are not inseparable. A patent provides an exclusive right—a statutory "right to exclude."[121] The statute provides that

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113 *See* Donald S. Chisum, *Reforming Patent Law Reform*, 4 J. MARSHALL REV. INTELL. PROP. L. 336 (2005).

114 *See* Allison et al., *supra* note 63, at 465 (stating that patents originally issued to individuals and small businesses are far more likely to be litigated).

115 *Id.* at 468-69.

116 CHI RESEARCH, INC., SMALL SERIAL INNOVATORS: THE SMALL FIRM CONTRIBUTION TO TECHNICAL CHANGE 3 (2003), *available at* http://www.sba.gov/advo/research/rs225tot.pdf.

117 *Id.*

118 Allison et al., *supra* note 63, at 462, 465 (using litigation as a proxy for value).

119 *See* Michael Abramowicz, The Problem of Patent Underdevelopment (Dec. 2005) (unpublished manuscript), *available at* http://ssrn.com/abstract=873473 (last visited Oct. 7, 2008).

120 THE FEDERALIST NO. 43, at 225 (James Madison) (George W. Carey & James McClellan eds., Liberty Fund 2001).

121 35 U.S.C.S. § 154(a)(1) (LexisNexis 2008) ("Every patent shall contain . . . a grant to the patentee, his heirs or assigns, of the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States . . . ."). Furthermore, 35 U.S.C.S. § 261 (LexisNexis 2008) indicates that, subject to the provisions of the Patent Act, "patents shall have the attributes of personal property."

in a civil action, the remedy for violation of that right "may" be injunctive, with a court order to stop infringing activities.[122] Without a time machine, however, past infringement cannot be enjoined[123] and thus the usual compensation for past infringement is monetary damages.[124] Patent cases up to now have not used standard compensation for forward-looking infringement because injunctions to stop the infringement relief have been virtually automatic in the modern era.[125]

The 2006 Supreme Court decision in *eBay, Inc. v. MercExchange, L.L.C.* set the stage for a dramatic shift in patent infringement remedies. At the district court, the jury in this case found that eBay infringed MercExchange's patent and that the patent was not invalid.[126] After the jury verdict, however, the district court denied MercExchange's motion for permanent injunctive relief. The district court reasoned that MercExchange's own actions showed that it, the patentee, would not be irreparably harmed in the absence of an injunction. In its ruling, the district court cited a number of factors that led to denial of the injunction. These factors included: MercExchange's failure to commercially practice its patented invention,[127] MercExchange's willingness to nonexclusively license to would-be infringers,[128] a failure to request a preliminary injunction,[129] the current political

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122 35 U.S.C.S. § 283 (LexisNexis 2008) ("[C]ourts . . . may grant injunctions in accordance with the principles of equity to prevent the violation of any right secured by patent, on such terms as the court deems reasonable."); eBay, Inc. v. MercExchange, L.L.C., 547 U.S. 388, 391-92 (2006).

123 Time travel may become more widely available if and when the Worlesly-Twist warp drive becomes operational. *See* U.S. Patent Application. No. 20030114313, *available at* http://appft1.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PG01&s1=%22warp+drive%22.TTL.&OS=TTL/. If the patent examiner is correct, the world will never see this warp drive in action because the invention is "inoperable." Posting of Dennis Crouch to Patent Law Blog (Patently-O), http://patentlyo.com/patent/2006/02/pto_requests_mo.html (Feb. 19, 2006).

124 Under 35 U.S.C.S. § 284, damages for infringement are compensatory and should reach at least the level of a reasonable royalty. Furthermore, the court may increase the compensatory damages up to three-fold. 35 U.S.C.S. § 284 (LexisNexis 2008). In exceptional cases, the court may also award attorneys' fees to the prevailing party. *Id.* § 285.

125 Brief for Fifty-Two Intellectual Property Professors as Amici Curiae Supporting Petitioners, eBay, Inc. v. MercExchange, L.L.C., 547 U.S. 388 (2006) (No. 05-130), at 4, *available at* http://patentlyo.com/eBay/eBayLemley.pdf.

126 MercExchange, L.L.C. v. eBay, Inc., 275 F. Supp. 2d 695 (E.D. Va. 2003), *rev'd in part*, 401 F.3d 1323 (Fed. Cir. 2005), *vacated*, 547 U.S. 388 (2006). In particular, eBay's "Buy-it-Now" feature on its auction website was found to infringe MercExchange's U.S. Patent No. 5,845,265. *Id.* at 698. Thus, the patent covers a software implementation of a method of doing business, or, in other words is a "business method patent." *eBay*, 547 U.S. at 390.

127 *MercExchange*, 275 F. Supp. 2d at 712.

128 *Id.*

129 *Id.*

upheaval over business method patents,[130] and the potential difficulty in enforcing an injunction because of the contentiousness of the litigation.[131]

On appeal, the Court of Appeals for the Federal Circuit (CAFC) reversed, finding that the district court improperly denied the permanent injunction:

> If the injunction gives the patentee additional leverage in licensing, that is a natural consequence of the right to exclude and not an inappropriate reward to a party that does not intend to compete in the marketplace with potential infringers . . . . We therefore see no reason to depart from the general rule that courts will issue permanent injunctions against patent infringement absent exceptional circumstances.[132]

The CAFC dismissed each of the lower court's reasons for denying the injunction, finding that none of them presented "the type of important public need that justifies the unusual step of denying injunctive relief" and reversed the denial of injunctive relief.[133]

The Supreme Court subsequently granted eBay's petition for a writ of certiorari and issued an opinion vacating both the CAFC and district court decisions.[134] Addressing the CAFC, the Court spelled out the traditional four-factor test of equitable relief and announced the test's applicability to patent cases.

> A plaintiff must demonstrate: (1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction . . . . These familiar principles apply with equal force to disputes arising under the Patent Act.[135]

Assessing the district court's decision, the Court concluded that the patentee's "willingness to license its patents" and its failure to commercialize the patented invention do not justify a finding that the patentee would not suffer irreparable injury if an injunction did not issue.[136] The Court held that

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130 *Id.*

131 *Id.*

132 MercExchange, L.L.C. v. eBay, Inc., 401 F.3d 1323, 1339 (Fed. Cir. 2005), *vacated*, 547 U.S. 388 (2006). Regarding the grant of a permanent injunction after a finding of infringement, fifty-two law professors signed on to the amicus brief filed by Professor Mark Lemley, arguing, inter alia, that: "[I]n the last twenty years [the Federal Circuit] has never in fact permitted a district court to deny a permanent injunction on equitable grounds . . . ." Brief for the Petitioners, *supra* note 125, at 2.

133 *MercExchange*, 401 F.3d at 1339.

134 eBay, Inc. v. MercExchange, L.L.C., 547 U.S. 388, 390 (2006).

135 *Id.* at 391.

136 *Id.* at 393 (quoting MercExchange, L.L.C. v. eBay, Inc., 275 F. Supp. 2d 695, 712 (E.D. Va. 2003), *rev'd in part*, 401 F.3d 1323 (Fed. Cir. 2005), *vacated*, 547 U.S. 388 (2006)).

such a "categorical rule . . . cannot be squared with the principles of equity."

B. *Application of the Patent Lottery Model to* eBay v. MercExchange

There are a number of reasons why an injunction is the preferred relief and increases the litigation value of a patent even when compensatory damages can be calculated and are otherwise available. Perhaps, most notably, an injunction allows a patentee to demand a much higher level of hold-up costs compared with what the court would award. The fact that many patents cover just a small portion of a product only exacerbates the hold-up costs, yet an injunction to stop the infringement may force the entire product out of the market.[137]

At a high level, the Supreme Court's *eBay* decision relaxed the general rule so that injunctive relief is now only available to successful patentees on a case-by-case basis. At first glance, the decision appears to lessen the average value of patents by reducing the probability of an injunction. At the same time, however, the decision may benefit the general public by avoiding the extreme market losses associated with forcibly removing a product from the public's domain of choices.[138] The question then arises regarding what impact *eBay* has on the patent lottery effect. Or, in other words, what is the impact of this case on a potential innovator's perception of the low probability of winning a large payout as compared to the cost of innovation? For innovators captured by the bounded rationality of behavioral economics, the arguable answer is that the impact on innovation is likely minimal.

As mentioned in Part III, the lottery effect is associated with the phenomena of overweighting the size of a potential payout while neglecting to fully consider the actual probability of obtaining the payout.[139] Since injunctive relief is still potentially available, *eBay* did nothing to reduce the maximum size of the potential payout. Rather, the decision reduces the probability of obtaining the maximum payout by adding an additional set of factors.

The Court also explicitly rejects the notion of adhering to any bright-line rules during the injunction decision that would tend to create a sense of

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137 *See* Douglas Gary Lichtman, *Patent Holdouts and the Standard-Setting Process* 1 (John M. Olin Program in Law & Econ. Working Paper Series, Working Paper No. 292, 2006), *available at* http://law.uchicago.edu/lawecon/index.html (stating that a patent holder whose patented technology is revealed after it has gained widespread acceptance can demand a royalty payment greater than the marginal value of the patented technology).

138 Injunctive relief is associated with particularly extreme gauging of social welfare because products are physically forced off the market—absolutely removing competition.

139 *See supra* Part III.

certainty.[140] In fact, the Court gives little real guidance as to which patents and patent holders might warrant injunctive relief.[141] Because the newly revived four-part test for injunctive relief depends on the activities and status of a future infringer as well as the patent owner at the conclusion of an infringement case, it is unlikely that the details of the test will give much *ex ante* certainty to a potential innovator. The impact of *eBay* on innovation decisions deserves even further discounting because the decision to innovate is always made years before a decision on an injunction, which requires a patent first be issued by the PTO and then fully litigated in federal court. In addition, as ALMT show, litigated patents are more likely than others to have been sold or reassigned, adding further uncertainty to the expected down-the-road position of the patent holder.[142]

Finally, *eBay*'s spillover impact on non-lottery motivations for innovation appears quite limited for at least three reasons. First, the decision does not negatively influence non-patent motivations for innovation because those motivations rely neither on patents themselves nor the potential payoff of the patent. Second, other motivations besides innovation for patenting, such as defensive measures, blocking, and signaling, should not be dampened by this decision, as those motivations do not rely directly on a big litigation payoff. Finally, recent evidence shows that major market players using patents to gain a competitive marketplace advantage appear well-positioned to continue to be awarded injunctive relief.[143] For those established players, the erosion of customer base or market share by a competitor will provide evidence of irreparable harm.[144] Thus, the *eBay* decision falls in line with many of the proposed guidelines for tweaking the lottery incentive to reduce the monopoly costs of patenting.[145]

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140 eBay Inc. v. MercExchange, L.L.C., 547 U.S. 388, 394 (2006) (holding that the decision to grant or deny injunctive relief is at the district court's discretion).

141 *See* Jeremy Mulder, Note, *The Aftermath of* eBay*: Predicting When District Courts Will Grant Permanent Injunctions in Patent Cases*, 22 BERKELEY TECH. L.J. 67, 72 (2007) (creating a model of how courts will likely apply the four-factor test); Andrew Beckerman-Rodau, *The Aftermath of* eBay v. MercExchange, 126 S. Ct. 1837 (2006)*: A Review of Subsequent Judicial Decisions*, 89 J. PAT. & TRADEMARK OFF. SOC'Y 631, 633 (2007) (stating that subsequent lower court decisions suggest that the *eBay* opinion did not significantly affect their decision to grant or deny an injunction).

142 Allison et al., *supra* note 63, at 465.

143 *See* Beckerman-Rodau, *supra* note 141.

144 *Id.*

145 *Cf. In re* Seagate Tech., L.L.C., 497 F.3d 1360 (Fed. Cir. 2007) (the en banc decision essentially reduced the probability of obtaining treble damages for willful infringement and can be analyzed as parallel to the *eBay* decision).

C. *Application of the Patent Lottery Model to Other Cases*

1. Changing the Standard of Obviousness

The patent lottery model also applies to the Supreme Court's 2007 decision in *KSR International Co. v. Teleflex Inc.*[146] In *KSR*, the Supreme Court expanded the number of patents that may be invalidated as obvious under 35 U.S.C. § 103(a).[147] In patent lottery terms, *KSR* reduces the probability of obtaining a successful patent, but leaves the potential ultimate payout unchanged. In an even more pronounced way than the *eBay* decision, *KSR* provides very little guidance to potential innovators as to how to apply the new rules of obviousness beyond the suggestions of "common sense" and "flexibility."[148]

There are, however, several important differences between *KSR* and *eBay* that impact the analysis of the lottery effect in each case. First, the issue of obviousness is less likely to be neglected during the innovation process than is the potential for injunctive relief. Obviousness is *the* major question of patentability and is often the first issue that arises in patent prosecution. On the other hand, the *eBay* injunction issue would not arise until after a patent has issued and has been fully litigated. Both the earlier timing and central importance of the obviousness question arguably make the policy choices of *KSR* less subject to the patent lottery effect. Second, the *KSR* decision is unlikely to be cabined to a select group of cases involving small entity innovators. Rather, the issues of obviousness decided in *KSR* permeate throughout all levels of patent applicants. Thus, *KSR* has the complicating feature of greater spillover impact into the non-lottery motivations for innovation.

2. Changing the Standard of Patentable Subject Matter

The final example involves statutory subject matter under § 101 of the Patent Act.[149] Section 101 limits the type of inventions patentable to any "process, machine, manufacture, or composition."[150] Numerous challenges

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146 127 S. Ct. 1727 (2007).

147 *Id.* at 1739. Under the patent laws, an invention must be new, useful, nonobvious, and fall within one of the statutory classes of inventions in order to be eligible for patent protection. 35 U.S.C.S. §§ 101-03 (LexisNexis 2008).

148 *See* Tun-Jen Chiang, *A Cost-Benefit Approach to Patent Obviousness*, 82 ST. JOHN'S L. REV. 39, 53-54 (2008) (arguing that the problem with the Supreme Court's "flexible" approach to obviousness is that "[w]hether something is implicitly motivated and obvious is nothing more than a subjective, inscrutable judgment call").

149 35 U.S.C.S. § 101 (LexisNexis 2008).

150 *Id.*

have been mounted to the common interpretation of this statute by both innovators hoping to expand the scope of patentable subject matter and by the PTO and accused infringers hoping to narrow the scope.[151] These cases generally involve attempts to eliminate an entire swath of innovations from coverage under the patent laws.[152] The problem with eliminating a particular area of technological innovation from patent coverage is that it pushes the probability of creating a valuable patent all the way to zero. As discussed in Part III, the patent lottery effect will only operate when the perceived probability of success is non-zero and positive. Thus, technological innovation not protected by patent coverage will not be able to take advantage of the patent lottery effect.

CONCLUSION

The lottery analogy provides a useful construct for examining a subset of innovative incentives that may not conform to traditional expected utility theory. Rather than correcting for innovator's bounded rationality, I propose that the over-optimism of entrepreneurs and inventors be harnessed to produce positive effects in social policy. Evidence suggests that many potential innovators overweight the potential value of a successful innovation but tend to ignore the low probability chance of reaching that success. This skewed perception, the so-called patent lottery effect, allows for differential application of various policy levers to increase the incentive to innovate while avoiding some monopoly costs associated with granting patent rights. By taking advantage of the lottery effect, policymakers can increase social welfare.

There is a need for more empirical research in this area. We need a better understanding of the social costs and benefits of patent incentives, as well as the various incentives to innovate and how they interoperate. In addition, the interesting results emerging from the field of behavioral economics have not been applied to the field of innovation in any depth. This Article suggests one approach for such a study.

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151 One particular case, *In re Bilski*, No. 2007-1130, 2008 U.S. App. LEXIS 3246, at *1 (Fed Cir. Feb. 15, 2008) (en banc), is now pending before an en banc panel of the Court of Appeals for the Federal Circuit. That case involves the patentability of so-called "mental processes" that are not tied to any particular machine or result in any physical transformation of a physical article. Posting of Dennis Crouch to Patent Law Blog (Patently-O), http://www.patentlyo.com/patent/2008/02/bilski-full-caf.html (Feb. 15, 2008).

152 Some famous historical patentable subject matter cases include, inter alia, *Diamond v. Diehr*, 450 U.S. 175, 178-79 (1981) (patentability of computer implemented inventions), *Diamond v. Chakrabarty*, 447 U.S. 303, 316-17 (1980) (patentability of a living organism), *Parker v. Flook*, 437 U.S. 584, 586-88 (1978) (patentability of a mathematical algorithm), and *State St. Bank & Trust Co. v. Signature Fin. Group*, 149 F.3d 1368, 1370 (Fed. Cir. 1998) (patentability of a data processing system).