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An Economic Analysis of Patent Law's Inequitable Conduct Doctrine

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Thomas F. Cotter*

Abstract. In recent years, patent law's inequitable conduct doctrine has attracted considerable attention from judges, legislators, patent lawyers and commentators, culminating most recently in the Federal Circuit's decision to reconsider en banc several aspects of the doctrine in *Therasense, Inc. v. Becton, Dickinson & Co.* Building on the work of other scholars, this Article proposes an instrumental view of the doctrine as, ideally, a tool for inducing patent applicants to disclose the optimal quantity of information relating to the patentability of their inventions; it then presents a formal model of the applicant's choices in deciding how much information to reveal. The model suggests, among other things, that the conditions that trigger a finding of inequitable conduct, both in the doctrine's current form and in various proposed reformulations, are at best only a rough proxy for the conditions that define optimal disclosure. The model also illuminates how current doctrine poorly defines many of the variables affecting a rational applicant's decisionmaking process, and thus potentially encourages risk-averse agents to overdisclose. Although the model neither confirms nor refutes critics' claims that the doctrine routinely induces overdisclosure and excessive administrative costs, the model demonstrates how various doctrinal changes would reduce these reputed consequences. Finally, the model suggests that the need for an inequitable conduct doctrine may be greater in a regime like that of the United States, which lacks an effective system for postgrant oppositions. Conversely, if the United States adopted a postgrant opposition system, it could—and arguably should, to avoid even greater risks of applicant overdisclosure—simultaneously weaken some aspects of the inequitable conduct doctrine.

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Introduction

Over the past thirty years, the inequitable conduct doctrine has emerged from obscurity to become one of the most frequently raised defenses—and most hotly debated topics—in contemporary patent law.¹ The doctrine nevertheless remains surprisingly

¹ Estimates of how often the defense is pleaded vary somewhat. See Christopher A. Cotropia, *Modernizing Patent Law’s Inequitable Conduct Doctrine*, 24 BERKELEY TECH. L.J. 723, 739 (2009) (stating that the defense is asserted in about one-fourth of all patent cases filed); Christian E. Mammen, *Controlling the “Plague”: Reforming the Doctrine of Inequitable Conduct*, 24 BERKELEY TECH. L.J. 1329, 1358 tbl. 2 (2009) (presenting an empirical study concluding that the defense is raised in about 40% of all patent cases filed); Benjamin Brown, Comment, *Inequitable Conduct: A Standard in Motion*, 19 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 593, 605-15 (2009) (reporting, *inter alia*, that from 2000-07 “courts addressed, on average, inequitable conduct in less than 20% of all reported patent cases,” but that “it is almost impossible to ascertain the number of times inequitable conduct was pled”); Kevin Mack, Note, *Reforming Inequitable Conduct to Improve Patent Quality: Cleansing Unclean Hands*, 21 BERKELEY TECH. L.J. 147, 155-56 & tbl. 1 (2006) (reporting that “from 2000 to 2004 . . . an inequitable conduct adjudication appeared in 16% to 35% of all reported patent opinions,” and that “it can be inferred that the percent of patent cases in which a litigant plead [sic] inequitable conduct is substantially higher than these figures”). Some Federal Circuit judges have referred to “the habit of charging inequitable conduct in almost every major patent case” as “an absolute plague,” see *Larson Mfg. Co. v. Aluminart Prods., Ltd.*, 559 F.3d 1317, 1342 (Fed. Cir. 2009) (Linn, J., concurring) (quoting *Kingsdown Med. Consultants, Ltd. v. Hollister Inc.*, 863 F.2d 867, 876 n.15 (Fed. Cir. 1988) (en banc)), but the reference to the doctrine being raised in “almost every major patent case” appears to be something of an overstatement. See Mammen, *supra*, at 1358; Brown, *supra*, at 626.

For a sampling of debate on the doctrine, see, e.g., AM. BAR ASS’N, RECOMMENDATIONS # 107A-D (adopted Aug. 3-4, 2009) (recommending, *inter alia*, that the doctrine be limited to situations in which

undertheorized. Conventionally, the law of inequitable conduct (like its cousin, patent misuse) can be viewed as an outgrowth of the equitable doctrine of unclean hands—in the present context, as a means of preventing patent owners from profiting from having committed fraud on the United States Patent and Trademark Office (USPTO) or, more generally, on the public.² Courts have expanded the doctrine’s reach, however, so that in its present incarnation it encompasses not only misrepresentations and omissions amounting to outright fraud but also to an amorphous category of somewhat lesser sins

fraud resulting the granting of one or more invalid claims), *available at* http://www.abanet.org/leadership/2009/annual/daily_journal/One_Hundred_Seven_A.doc, http://www.abanet.org/leadership/2009/annual/daily_journal/One_Hundred_Seven_B.doc, http://www.abanet.org/leadership/2009/annual/daily_journal/One_Hundred_Seven_C.doc, and http://www.abanet.org/leadership/2009/annual/daily_journal/One_Hundred_Seven_D.doc; FED. TRADE COMM’N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY ch. 5, at 11-13 (2003) (recommending expanded use of relevance statements), *available at* <http://www.ftc.gov/os/2003/10/innovationrpt.pdf>; NAT’L RESEARCH COUNCIL, A PATENT SYSTEM FOR THE 21ST CENTURY 121-23 (Stephen A. Merrill et al. eds. 2004) (proposing abolition of the doctrine, or in the alternative various reforms); S. Rep. No. 110-259, at 31-33 (2008) (discussing proposed changes to the doctrine, including permitting courts to consider sanctions other than unenforceability of the patent in its entirety); *id.* at 59-62 (additional views of Sens. Specter and Hatch on the inequitable conduct defense) (arguing, among other things, that courts need more guidance concerning when to impose “more severe or less severe penalties); Robert A. Armitage, *The Legislative Agenda for the 111th Congress: Inequitable Conduct and Post-Grant Review: Why the Imperative to Eliminate the ‘Inequitable Conduct’ Defense? What Relates Eliminating the Defense to Expanding Post-Grant Review?*, AM. INTELL. PROP. L. ASS’N, at 1-5 (2009), <http://www.aipla.org/html/mw/2009/papers/Armitage-paper.pdf> (arguing in favor of abolition); Cotropia, *supra*, at 737-46, 773-83 (reviewing critiques of current doctrine and proposing reforms); Lisa A. Dolak, *Inequitable Conduct: A Flawed Doctrine Worth Saving*, in 4th ANNUAL PATENT LAW INSTITUTE, at 877, 879, 881-92 (PLI Patents, Copyrights, Trademarks & Literary Prop., Course Handbook Series No. 997, 2010) (reviewing critiques of current doctrine and proposing reforms), *available at* <http://ssrn.com/abstract=1588916>; Robin Feldman, *The Role of the Subconscious in Intellectual Property Law*, 2 HASTINGS SCI. & TECH. L.J. 1, 14-23 (2010) (arguing, *inter alia*, that current doctrine “requires inventors to act against their own interests and in a manner that contradicts their instincts, and then charges them with immoral behavior for an inability to consciously override those instincts”); Hon. Orrin Hatch, *Keynote Address: The Federal Circuit: The National Appellate Court Celebration and Introspective Symposium*, 78 GEO. WASH. L. REV. 513, 517 (2010) (arguing for a narrower definition of materiality); Mammen, *supra*, at 1390-94 (presenting reform proposals); Kate McElhone, *Inequitable Conduct: Shifting Standards for Patent Applicants, Prosecutors, and Litigators*, 17 TEX. INTELL. PROP. L.J. 385, 405-12 (2009) (proposing various reforms and discussing other proposals); Hon. Randall R. Rader, *Always at the Margin: Inequitable Conduct in Flux*, 59 AM. U. L. REV. 777, 785 (2010) (arguing in favor of clearer standards); Melissa Feeney Wasserman, *Limiting the Inequitable Conduct Defense*, 13 VA. J. L. & TECH. 7, 16-22 (2008) (arguing for limiting the doctrine to common-law fraud, and for a range of penalties); Brown, *supra*, at 616-20 (reviewing testimony presented at Patent Reform Act hearings); Mack, *supra*, at 166-75 (proposing various reforms); Nicole M. Murphy, Note, *Inequitable-Conduct Doctrine Reform: Is the Death Penalty for Patents Still Appropriate?*, 93 MINN. L. REV. 2274, 2274-75, 2296-2302 (2009) (reviewing critiques of current doctrine, and proposing guidelines for a range of sanctions); Katherine Nolan-Stevaux, Note, *Inequitable Conduct Claims in the 21st Century: Combating the Plague*, 20 BERKELEY TECH. L.J. 147, 164-72 (2005) (discussing and proposing various reforms); Patent Office Prof’l Ass’n, *The Patent Reform Act Will Hurt, Not Help, the U.S. Patent System* (Sept. 2007), <http://www.popa.org/pdf/misc/reform-popa-04sep2007.pdf> (arguing that proposed Patent Reform Act changes to the doctrine would reduce applicant candor and render the doctrine moot).

² See Cotropia, *supra* note 1, at 728 (noting the conventional understanding of inequitable conduct as a doctrine rooted in equity rather than in utilitarian considerations).

against the USPTO. The Federal Circuit has made clear, for example, that conduct need not rise to the level of fraud that would sustain a *Walker Process* antitrust claim in order to be characterized as inequitable conduct.³ Exactly what inequitable conduct is nevertheless remains something of a mystery, as different judges have defined the key elements of “intent” and “materiality” in ways that are both imprecise and inconsistent.⁴ For practical purposes, the significance of the doctrine resides in the fact that a finding of inequitable conduct results in the unenforceability of all of the claims of the patent at issue (and sometimes even of related patents).⁵ Alarmed at these potential consequences, critics charge that the doctrine has become a death sentence for minor offenses,⁶ while defenders counter that the doctrine deters misconduct and thus contributes to the integrity of patent prosecution and enforcement.⁷ Matters may come to a fore in the near future, as Congress continues to consider changes to the inequitable conduct doctrine as part of a comprehensive system of patent reform,⁸ and as the Federal Circuit prepares for an

³ See *Dippin’ Dots, Inc. v. Mosey*, 476 F.3d 1337, 1346-48 (Fed. Cir. 2007). A *Walker Process* claim is an antitrust claim premised on the theory that the antitrust defendant’s enforcement of a fraudulently procured patent constitutes an act of monopolization or attempted monopolization in violation of Sherman Act § 2. See *Walker Process Equip., Inc. v. Food Mach. & Chem. Corp.*, 382 U.S. 172 (1965); *Nobelpharma AB v. Implant Innovations, Inc.*, 141 F.3d 1059, 1068 (Fed. Cir. 1998).

⁴ See *infra* Part I.

⁵ See *id.*

⁶ See *Murphy*, *supra* note 1, at 2274 (quoting Robert Armitage as likening the penalty to “imposing the death penalty for relatively minor acts of misconduct”); see also *Aventis Pharma S.A. v. Amphastar Pharms., Inc.*, 525 F.3d 1334, 1349 (Fed. Cir. 2008) (Rader, J., dissenting) (referring to the “atomic bomb” remedy of unenforceability), *cert. denied*, 129 S. Ct. 2053 (2009).

⁷ See *Dolak*, *supra* note 1, at 881-86 (though advocating reforms, arguing in favor of retaining the doctrine because “inequitable conduct happens!”); *Brown*, *supra* note 1, at 616-17 (reviewing congressional testimony in favor of retaining the doctrine).

⁸ The most recent action in the Senate was the introduction of an amended version of the Patent Reform Act of 2009. The amended version would reform the inequitable conduct doctrine by allowing patent owners to request supplemental examinations “to consider, reconsider, or correct information believed to be relevant to the patent,” and providing that “a patent shall not be held unenforceable under section 282 on the basis of conduct relating to information that had not been considered, was inadequately considered, or was incorrect in a prior examination of the patent if the information was considered, reconsidered, or corrected during a supplemental examination” concluded before the date on which the patentee files suit for infringement. See Amendment in the Nature of a Substitute to S. 515, 111th Cong., 2d Sess., § 10(a) (introduced Mar. 5, 2010), available at <http://www.patentbaristas.com/archives/2010/03/05/the-patent-reform-act-of-2010-a-substitute-s-515/>. The Patent Reform Acts of 2009 as introduced in the House and as reported out of the Senate Judiciary Committee did not contain provisions relating to inequitable conduct. See S. 515, 111th Cong., 1st Sess. (as reported out of committee Apr. 2, 2009); H.R. 1260, 111th Cong., 1st Sess. (as introduced Mar. 3, 2009). Other bills over the past five years would have addressed the doctrine in various ways. See Patent Reform Act of 2009, S. 610, 111th Cong., § 11 (as introduced by Sen. Kyl Mar. 17, 2009) (providing for administrative proceedings and civil sanctions for misconduct before the USPTO, and otherwise stating that a patent shall not be held invalid or unenforceable on the basis of misconduct before the Office”), available at <http://www.govtrack.us/congress/billtext.xpd?bill=s111-610>; Patent Reform Act of 2007, S. 1145, 110th Cong., 2d Sess., § 12 (as reported in Senate Jan. 24, 2008) (codifying the reasonable examiner standard, among other things, and enabling courts to hold the entire patent unenforceable; only some claims unenforceable; or to allow the patentee to recover reasonable royalties

upcoming en banc rehearing to reconsider various aspects of the doctrine in *Therasense, Inc. v. Becton, Dickinson & Co.*⁹

Some recent scholarship has begun to cast the inequitable conduct doctrine in a more instrumental vein, by focusing attention on the doctrine as (ideally) a tool for encouraging patent applicants to engage in the optimal disclosure of information relevant to their applications.¹⁰ This Article builds upon that work by presenting a formal economic model of the variables a rational applicant would consider in deciding how much information to reveal to the USPTO. The model suggests, among other things, that the conditions that trigger a finding of inequitable conduct, both in the doctrine's current form and in various proposed reformulations, are at best only a rough proxy for the conditions that define optimal disclosure. The model also illuminates how poorly current doctrine defines many of the variables affecting a rational applicant's decisionmaking process, and thus potentially encourages risk-averse agents to overdisclose. Although the model neither confirms nor refutes critics' claims that current doctrine routinely induces overdisclosure and excessive administrative costs, the model demonstrates some ways in which various doctrinal changes, either singly or in combination, might reduce these reputed consequences. Finally, the model suggests that the need for an inequitable conduct doctrine may be greater in a regime like that of the United States, which lacks an effective system for postgrant oppositions. Conversely, if the United States adopted a postgrant opposition system, it could—and arguably should, to avoid even greater risks of

only); Patent Reform Act of 2007, H.R. 1908, 110th Cong., 1st Sess., § 12(b) (as placed on calendar Sept. 11, 2007) (codifying a materiality standard similar to the 1992 version of Rule 56, and allowing courts to consider a range of penalties); Patent Reform Act of 2006, S. 3818, 109th Cong., 2d Sess., § 5(c) (as introduced Aug. 3, 2006) (providing, among other things, that a court may not hold a patent unenforceable by reason of inequitable conduct unless one or more claims are invalid; and that a defendant may not plead the defense until there has been a judgment that the patent is “not invalid in whole and has been infringed”); Patent Reform Act of 2005, H.R. 2795, 109th Cong., 1st Sess., § 5 (introduced June 8, 2005) (providing that a court must refer possible misconduct to the USPTO for investigation, but only if one or more claims have been held invalid; and that it may declare a patent unenforceable only if the USPTO concludes that inequitable conduct occurred).

⁹ Nos. 2008-1511, 2008-1512, 2008-1513, 2008-1514, 2008-1595, 2010 WL 1655391, at *1 (Fed. Cir. Apr. 26, 2010) (per curiam).

¹⁰ See Cotropia, *supra* note 1, at 746-62 (characterizing the doctrine as a tool for attaining optimal patent quality); Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 668-71 (2002) (suggesting that “[b]y imposing higher costs on patentees who would attempt to take advantage of high observer verification costs by making false statements in the patent, penalties for inequitable conduct make it more costly for dishonest firms to mimic the behavior of honest firms”). The goals of attaining optimal patent quality, or of preserving a patent's function as a signal of firm value, can be subsumed within the broader utilitarian concept of optimal disclosure. As discussed *infra* in Part II, the concept of optimal disclosure assumes that the patent applicant's disclosure of relevant information, properly defined, promotes social welfare when (1) the applicant enjoys a cost advantage over the examiner in discovering and disclosing the information, and (2) the social benefits of additional disclosure outweigh the social costs of information overload. When these conditions are not present, patent quality and signaling may suffer. See Cotropia, *supra* note 1, at 770-73. This instrumental explanation for the doctrine attempts to conform the doctrine to the utilitarian thrust of patent law generally, though it contrasts with the more conventional understanding of the doctrine as promoting the integrity of the patent system as a deontological end in itself. See *id.* at 746-47.

applicant overdisclosure—simultaneously weaken some aspects of the inequitable conduct doctrine.

Part I presents a short overview of the doctrine as it currently exists, as well as some leading criticisms and proposed reforms. Part II presents the formal model and Part III its implications. Part IV concludes.

I. Doctrinal Contours

By many accounts, the inequitable conduct doctrine has its origins in three mid-twentieth century United States Supreme Court decisions in which the Court held that the patents at issue were unenforceable because the patent owners had engaged in some sort of fraudulent conduct in the course of procuring or litigating their patents.¹¹ Lower courts thereafter developed different tests for determining whether the patent owner had engaged in inequitable conduct rendering the patent unenforceable.¹² Independently of these developments, the USPTO in 1977 promulgated Patent Rule 56, which imposed upon patent applicants and persons associated with them a duty to disclose “information they are aware of which is material to the examination of the application.”¹³ Rule 56 defined information as material if “there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent.”¹⁴ The USPTO’s amended version of Rule 56, which went into effect

¹¹ See *Precision Instrument Mfg. Co. v. Automotive Maintenance Mach. Co.*, 324 U.S. 806 (1945) (holding that, where patent owner had every reason to believe that purported inventor had submitted false testimony during the course of an interference proceeding relating to his dates of invention and conception, the resulting patent was rendered unenforceable); *Hazel-Atlas Glass Co. v. Hartford Empire Co.*, 322 U.S. 238 (1944) (setting aside a judgment of patent infringement, where patent owner had caused the publication of a trade journal article authored by its patent attorney but attributed to a “disinterested expert” that falsely touted the subject invention’s advances over the prior art, and had used that article to deceive both the Patent Office and the district court on the issue of patentability); *Keystone Driller Co. v. Gen. Excavator Co.*, 290 U.S. 245 (1933) (affirming dismissal of complaint for patent infringement, where patent owner had corrupted a witness and suppressed evidence of another’s prior use in order to defend against patent invalidity in a prior infringement action involving related patents). As in the patent misuse cases, which the Court was deciding during roughly the same time period, in these three cases the Court drew an analogy to the equitable doctrine of unclean hands.

¹² See, e.g., *Plastic Container Corp. v. Cont’l Plastics, Inc.*, 607 F.2d 885, 899-901 (10th Cir. 1979); *Norton v. Curtiss*, 433 F.2d 779, 791-97 (C.C.P.A. 1970). For discussion of post-*Precision Instrument*, pre-Federal Circuit case law, see Robert J. Goldman, *Evolution of the Inequitable Conduct Defense in Patent Litigation*, 7 HARV. J. L. & TECH. 37, 56-67 (1993); Sean M. O’Connor, *Defusing the “Atomic Bomb” of Patent Litigation: Avoiding and Defending Against Allegations of Inequitable Conduct After McKesson et al.*, 9 J. MARSHALL REV. INTELL. PROP. L. 330, 340-44, 352 (2010); Gerald Sobel, *Reconsidering the Scope of the Inequitable Conduct Doctrine in View of Supreme Court Precedent and Patent Policy*, 18 FED. CIR. B.J. 169, 172-74 (2009).

¹³ See 37 C.F.R. § 1.56 (1977). An earlier version of Rule 56 merely authorized the USPTO to strike an application that was “fraudulently filed or in connection with which any fraud [was] practiced or attempted on the Patent Office.” O’Connor, *supra* note 12, at 338 (quoting 37 C.F.R. § 1.56 (1949)).

¹⁴ 37 C.F.R. § 1.56 (1977).

in 1992, similarly imposes on “[e]ach individual associated with the filing and prosecution of a patent application . . . a duty to disclose to the Office all information known to that individual to be material to patentability,”¹⁵ while providing a more detailed definition of materiality. In particular, the current version of Rule 56 states that information is material if “it is not cumulative to information already of record or being made of record in the application,” and it either “establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim,” or “refutes, or is inconsistent with, a position the applicant takes in . . . [o]pposing an argument of unpatentability relied on by the Office, or . . . [a]sserting an argument of patentability.”¹⁶ Rule 56 further specifies that “no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct.”¹⁷

Since its formation in the early 1980s, the Federal Circuit has drawn on these various sources to fashion its own version of the inequitable conduct doctrine. Under current Federal Circuit law, inequitable conduct encompasses both the intentional submission of materially false information and the failure to disclose material information. More precisely, “[t]he substantive elements of inequitable conduct are: (1) an individual associated with the filing and prosecution of a patent application made an affirmative misrepresentation of a material fact, failed to disclose material information, or submitted false material information; and (2) the individual did so with a specific intent to deceive the PTO.”¹⁸ If the defendant makes the requisite showing of both intent and materiality, the district court then engages in a balancing test to determine whether the patentee committed inequitable conduct.¹⁹ Whether the conduct amounts to inequitable conduct is said to be entrusted to the district court’s equitable discretion, reviewable on

¹⁵ 37 C.F.R. § 1.56 (2009).

¹⁶ *Id.* The rule goes on to state that

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

¹⁷ *Id.*

¹⁸ *Exergen Corp. v. Wal-Mart Stores, Inc.*, 575 F.3d 1312, 1327 n.3 (Fed. Cir. 2009) (citing *Star Scientific, Inc. v. R.J. Reynolds Tobacco Co.*, 537 F.3d 1357, 1365 (Fed. Cir. 2008); *Molins PLC v. Textron, Inc.*, 48 F.3d 1172, 1178, 1181 (Fed. Cir. 1995); 37 C.F.R. § 1.56 (2008)). The defendant must plead the defense with particularity pursuant to Federal Rule of Civil Procedure 9(b), *see Exergen*, 575 F.3d at 1318, and must prove the two elements of intent and materiality by clear and convincing evidence, *see Larson Mfg. Co. v. Aluminart Prods., Ltd.*, 559 F.3d 1317, 1344 (Fed. Cir. 2009) (quoting *Star Scientific*, 537 F.3d at 1366). Put another way, the inference of intent and materiality must be the “single most reasonable inference” to be drawn from the evidence. *Advanced Magnetic Closures, Inc. v. Rome Fastener Corp.*, 607 F.3d 817, 829 (Fed. Cir. 2010) (quoting *Star Scientific*, 537 F.3d at 1366); *Larson Mfg.*, 559 F.3d at 1340 (same).

¹⁹ *See AstraZeneca Pharms. LP. v. Teva Pharms. USA, Inc.*, 583 F.3d 766, 776 (Fed. Cir. 2009).

appeal for abuse of discretion.²⁰ A finding of inequitable conduct renders the entire patent²¹ (and sometimes even related patents)²² unenforceable.

Among the many controversies swirling about the inequitable conduct doctrine in its current judicial formulation is the relationship between the elements of intent and materiality. As for materiality, the Federal Circuit thus far has chosen to retain all five of the standards as reflected in earlier case law, the 1977 version of Rule 56, and the 1992 version of Rule 56. These five standards include (1) an objective but-for test (i.e., the patent *should not* have issued absent the fraud); (2) a subjective but-for standard (the patent *would not* have issued absent the fraud); (3) a but-it-may-have standard (the fraud *may have affected* the issuance of the patent); (4) the reasonable examiner standard as set forth in original Rule 56 (there is a substantial likelihood that a reasonable examiner would have considered the omitted reference important in deciding patentability); and (5) the current Rule 56 standard (the information is material in the sense of establishing a prima facie case of unpatentability, or refuting or being inconsistent with a position the applicant takes regarding patentability before the USPTO).²³ According to one recent panel, however, because the “reasonable examiner” standard is the broadest of these standards, it gradually has become “the sole standard invoked by this court,” though “in no way did it supplant or replace the case law precedent.”²⁴ As for intent, over twenty years ago the en banc Federal Circuit concluded that the defendant must prove specific intent to deceive, not merely gross negligence.²⁵ Moreover, while intent may be inferred from circumstantial evidence, neither gross negligence nor the materiality of the information withheld is, by itself, sufficient evidence of intent.²⁶ At the same time,

²⁰ See, e.g., *Abbott Labs. v. Sandoz, Inc.*, 544 F.3d 1341, 1353 (Fed. Cir. 2008) (quoting *Kingsdown Med. Consultants, Ltd. v. Hollister Inc.*, 863 F.2d 867, 876 (Fed. Cir. 1988) (en banc)).

²¹ See, e.g., *Advanced Magnetic Closures*, 607 F.3d at 829-30; *Star Scientific*, 537 F.3d at 1365-66. In addition, a finding of inequitable conduct can result in a finding that a case is exceptional and therefore that the defendant is entitled to attorney’s fees. See *Aspex Eyewear Inc. v. Clariti Eyewear, Inc.*, 605 F.3d 1305, 1315 (Fed. Cir. 2010); *Taltech Ltd. v. Esquel Enters.*, 604 F.3d 1324, 1328 (Fed. Cir. 2010); *Wedgetail, Ltd. v. Huddleston Deluxe, Inc.*, 576 F.3d 1302, 1304-05 (Fed. Cir. 2009). In contrast to the misuse doctrine, the inequitable conduct doctrine does not envision any way for the patentee to purge its misconduct and thus restore the patent’s enforceability.

²² On the doctrine of “infectious unenforceability,” see *Fox Indus. v. Structural Pres. Sys.*, 922 F.2d 801, 804 (Fed. Cir. 1990) (“a breach of the duty of candor early in the prosecution may render unenforceable all claims which eventually issue from the same or a related application”); compare *Baxter Int’l, Inc. v. McGaw, Inc.*, 149 F.3d 1321, 1332 (Fed. Cir. 1998) (“[W]here the claims are subsequently separated from those tainted by inequitable conduct through a divisional application, and where the issued claims have no relation to the omitted prior art, the patent issued from the divisional application will not also be unenforceable due to inequitable conduct committed in the parent application”).

²³ See *Digital Control Inc. v. Charles Mach. Works*, 437 F.3d 1309, 1314-16 (Fed. Cir. 2006).

²⁴ *Id.* at 1316.

²⁵ See *Kingsdown Med. Consultants, Ltd. v. Hollister Inc.*, 863 F.2d 867, 876 (Fed. Cir. 1988) (en banc).

²⁶ See *Abbott Labs. v. Sandoz, Inc.*, 544 F.3d 1341, 1355-56 (Fed. Cir. 2008).

however, some cases have held that the trier of fact may infer an intent to deceive where the omitted information was highly material; the party who failed to disclose the information knew or should have known of its materiality; and that party offers no credible explanation for failing to disclose it.²⁷ Critics have argued that permitting the inference of intent to deceive under these circumstances cannot be reconciled with the rule that the defendant must prove *intent to deceive*, not merely gross negligence, because the “knew or should have known” standard allows the trier of fact to infer intent in the absence *even* of gross negligence.²⁸ Further compounding the complexity of the doctrine, some decisions have referred to the intent and materiality standards as involving a “sliding scale,” in the sense that a stronger showing of intent will allow a finding of inequitable conduct on a somewhat lower showing of materiality, and vice versa.²⁹

The complexity and confusion that often surrounds the inequitable conduct doctrine has generated intense criticism from some members of the patent community. Critics argue that the multiplicity of possible standards, and the corresponding inconsistencies in the case law, often make it irresistible for defendants to avoid raising the defense.³⁰ In addition, some have noted a risk of “hindsight bias” in determining, at the time of trial, whether omitted information was material at the time of prosecution; explanations raised many years later may not sound convincing.³¹ Others contend that current doctrine may induce patent applicants to disclose far *more* information than is necessary—indeed, more than a patent examiner can be expected to review and comprehend—simply to reduce the probability of a subsequent finding of inequitable

²⁷ See *Praxair, Inc. v. ATMI, Inc.*, 543 F.3d 1306, 1313-14 (Fed. Cir. 2008); *Ferring B.V. v. Barr Labs., Inc.*, 437 F.3d 1181, 1191 (Fed. Cir. 2006); cf. *Optium Corp. v. Emcore Corp.*, 603 F.3d 1313, 1321 (Fed. Cir. 2010) (stating that “consistent precedent has rejected the notion that the materiality of a reference alone can suffice to prove deceptive intent”).

²⁸ See, e.g., *Larson Mfg. Co. v. Aluminart Prods., Ltd.*, 559 F.3d 1317, 1343-44 (Fed. Cir. 2009) (Linn, J., concurring); Mammen, *supra* note 1, at 1391-92. Arguably, the “knew or should have known” standard is an inadvertent throwback to pre-*Kingsdown* law. See, e.g., Erik Puknys & Jared D. Schuettenhelm, *Application of the Inequitable Conduct Doctrine After Kingsdown*, 25 SANTA CLARA COMPUTER & HIGH TECH. L.J. 839, 850-51 (2009) (noting that the Federal Circuit in *Critikon, Inc. v. Becton Dickinson Vascular Access, Inc.*, 120 F.3d 1253, 1256 (Fed. Cir. 1997), cited a pre-*Kingsdown* case, *Driscoll v. Cebalo*, 731 F.2d 878 (Fed. Cir. 1984), for the “knew or should have known” standard); Brett J. Thompsen, *Resolving Inequitable Conduct Claims According to Kingsdown*, 18 TEX. INTELL. PROP. L.J. 269, 275-76 (2010) (same).

²⁹ See, e.g., *Abbott Labs. v. TorPharm, Inc.*, 300 F.3d 1367, 1380 (Fed. Cir. 2002); *Critikon, Inc. v. Becton Dickinson Vascular Access, Inc.*, 120 F.3d 1253, 1256 (Fed. Cir. 1997). Nevertheless, the defendant must prove by clear and convincing evidence that each element meets the minimum threshold of both intent and materiality. See *AstraZeneca*, 583 F.3d at 776. For a helpful visual depiction, see Mammen, *supra* note 1, at 1344.

³⁰ See *Larson Mfg.*, 559 F.3d at 1342 (Linn, J., concurring). See also NAT’L RES. COUNCIL, *supra* note 1, at 122; Cotropia, *supra* note 1, at 739-41; Wasserman, *supra* note 1, at 14-15.

³¹ See Feldman, *supra* note 1, at 17; Murphy, *supra* note 1, at 2274.

conduct.³² Current doctrine therefore may raise the cost of litigation by encouraging accused infringers to conduct fishing expeditions that could support a plausible assertion that the patentee failed to call some arguably relevant piece of information to the attention of the patent examiner.³³ And in the views of numerous critics, the penalty—enforceability of *all* claims, even those unrelated to the alleged fraud and potentially claims of other related patents—is often disproportionate to the magnitude of the offense.³⁴ In some instances, for example, courts have rendered patents unenforceable due to misrepresentations relating to petitions to make special (entitling the applicant to expedited examination) or to a patent owner’s small entity status (rendering the applicant eligible to pay lower examination fees).³⁵ As a consequence, some observers have argued that allowing courts to select from a range of penalties (e.g., partial enforceability, temporary enforceability, awarding damages only, assessing attorney sanctions only) might make sense.³⁶

³² See, e.g., AM. BAR ASS’N, RECOMMENDATION # 107B, *supra* note 1, at 2; FED. TRADE COMM’N, *supra* note 1, at 11-12; S. REP. NO. 110-259, at 32 n.152; Armitage, *supra* note 1, at 2-3; Cotropia, *supra* note 1, at 770-73; Hatch, *supra* note 1, at 516; Brown, *supra* note 1, at 618-20 (describing testimony presented at Patent Reform Act hearings); Murphy, *supra* note 1, at 2293. *But see* Christopher Cotropia et al., *Do Applicant Patent Citations Matter? Implications for the Presumption of Validity*, at 15-16, 19-25 (Aug. 10, 2010) (presenting empirical evidence that examiners tend to ignore applicant-submitted art, even when it is likely to be relevant to patentability), available at <http://ssrn.com/abstract=1656568>.

³³ See AM. BAR ASS’N, RECOMMENDATION # 107B, *supra* note 1, at 2; Armitage, *supra* note 1, at 2.

³⁴ See *New Medium L.L.C. v. Barco N.V.*, 582 F. Supp. 2d 991, 999 (N.D. Ill. 2008) (Posner J., sitting by designation), *vacated by agreement of parties*, No. 05 C 5620, 2009 WL 2385890 (N.D. Ill. May 15, 2009); Armitage, *supra* note 1, at 1; Murphy, *supra* note 1, at 2274; Wasserman, *supra* note 1, at 17-18.

³⁵ See *Scanner Tech. Corp. v. Icos Vision Sys. Corp. N.V.*, 528 F.3d 1365, 1375 (Fed. Cir. 2008) (“When the setting involves a petition to make special . . . a false statement that succeeds in expediting the application is, as a matter of law, material for purposes of assessing the issue of inequitable conduct”); *Nilssen v. Osram Sylvania, Inc.*, 504 F.3d 1223, 1231-32 (Fed. Cir. 2007) (“While a misrepresentation of small entity status is not strictly speaking inequitable conduct in the prosecution of a patent, as the patent has already issued if maintenance fees are payable (excepting an issue fee), it is not beyond the authority of a district court to hold a patent unenforceable for inequitable conduct in misrepresenting one’s status as justifying small entity maintenance payments.”), *cert. denied*, 128 S. Ct. 2938 (2008); *Ulead Sys., Inc. v. Lex Computer & Mgmt. Corp.*, 351 F.3d 1139, 1144 (Fed. Cir. 2003) (“Historically issues of unenforceability have arisen in cases involving inequitable conduct occurring in the prosecution of patents. But, we see no reason why the doctrine should not extend into other contexts, like the present one, where the allegation is that inequitable conduct has occurred after the patent has issued and during the course of establishing and paying the appropriate maintenance fee. In this context, it is equally important that the PTO receive accurate information from those who practice before it.”). The court has also held that failure to disclose related litigation involving a parent patent, as required under § 2001.06(c) of the Manual of Patent Examining Procedure, is material even if the patentee prevailed in that litigation. See *Leviton Mfg. Co. v. Universal Sec. Instruments, Inc.*, 606 F.3d 1353, 1362 (Fed. Cir. 2010); see also *McKesson Info. Solutions, Inc. v. Bridge Med., Inc.*, 487 F.3d 897, 919-26 (Fed. Cir. 2007) (affirming findings of materiality and intent with respect to failures to disclose rejections in copending application, and examiner’s own prior allowance of claims in a related application).

³⁶ See, e.g., S. REP. NO. 110-259, *supra* note 1, at 33; McElhone, *supra* note 1, at 408-09; Murphy, *supra* note 1, at 2296-2302; see also Wasserman, *supra* note 1, at 18-22 (proposing a “second tier of remedies for less offensive behavior”).

As of this writing, the Federal Circuit has recently granted a petition for rehearing en banc to determine whether the current standards for assessing intent and materiality should be revised.³⁷ (Congress also has considered various reform measures in recent years, though it has not yet enacted any.)³⁸ It is therefore possible that some of the confusion currently surrounding the doctrine will be lifted in the coming months or years. For now, though, the picture remains hazy.

II. A Formal Model of the Inequitable Conduct Doctrine

Although a more traditional view would locate the inequitable conduct doctrine in considerations of ethics and (as the name of the doctrine implies) equity, from an economic perspective the doctrine can be thought of as a tool for encouraging patent applicants and their agents to disclose information to the USPTO.³⁹ More precisely, in theory the doctrine could serve the purpose of inducing the efficient disclosure of information that is relevant to patentability (and perhaps other information as well, as discussed below). The doctrine's utility in achieving this purpose could be approached from either of two complementary positions.

First, one could approach the matter by focusing on the cost of disclosing a discrete, relevant⁴⁰ unit of information *I*. (*I* might be a potential prior art reference, for

³⁷ See *Therasense, Inc. v. Becton, Dickinson & Co.*, Nos. 2008-1511, 2008-1512, 2008-1513, 2008-1514, 2008-1595, 2010 WL 1655391, at *1 (Fed. Cir. Apr. 26, 2010) (per curiam) (requesting briefing of the following issues: whether “the materiality-intent-balancing framework for inequitable conduct be modified or replaced”; whether the standard should “be tied directly to fraud or unclean hands,” and if so what the appropriate standard is for application of those doctrines; what the proper standard should be for materiality, including the extent to which the USPTO’s rules should play a role in defining materiality and whether a finding of materiality should “require that but for the alleged misconduct, one or more claims would not have issued”; “[u]nder what circumstances is it proper to infer intent from materiality?; whether the balancing of materiality and intent should be abandoned; and “[w]hether the standards for materiality and intent in other federal agency contexts or at common law shed light on the appropriate standards to be applied in the patent context”).

³⁸ See *supra* note 8.

³⁹ See *Cotropia*, *supra* note 1, at 754.

⁴⁰ As the discussion below indicates, deciding what type of information should be deemed “relevant” for purposes of the inequitable conduct doctrine—formally, what information comprises the set ζ discussed in the text above—is not easy. The 1992 version of Patent Rule 56 adopts a fairly narrow definition of relevance, for example, whereas the “reasonable examiner” standard adopts a much broader one. Cf. FED. R. EVID. 401 (defining relevant evidence as “evidence having any tendency to make the existence of any fact that is of consequence . . . more probable or less probable than it would be without the evidence”); FED. R. EVID. 403 (authorizing courts to exclude relevant evidence “if its probative value is substantially outweighed by . . . considerations of undue delay, waste of time, or needless presentation of cumulative evidence”); FED. R. CIV. P. 26(b)(1) (generally authorizing the discovery of relevant evidence, even if not admissible at trial, if its “discovery appears reasonably calculated to lead to the discovery of admissible evidence”). Analogously, one could define the universe of information within set ζ as including, for example, all information that renders the patentability of the invention even slightly more or less probable,

example, or information that could assist in enabling a person of skill in the art to make or use the invention or to practice the inventor's best mode.) From this perspective, the inequitable conduct doctrine would serve a useful instrumental purpose if it induced the applicant to reveal I whenever it would be less costly for the applicant to do so than it would be for the USPTO to discover the information on its own.⁴¹ Formally, then, the goal would be to design a standard that would induce Applicant to reveal information I at time t_I whenever

$$P_E[I \in S] \geq x \quad (1)$$

and

$$C_A < C_E, \quad (2)$$

where t_I is the date of filing; $P_E[I \in S]$ is the probability the examiner would conclude that I falls into set S ; C_A is Applicant's cost of disclosing I ; and C_E is the examiner's cost of discovering I .⁴² Three obvious questions—which I will merely note for now, but which will also be relevant to the inequitable conduct doctrine's definition of materiality, as presented below⁴³—are (1) whether P_E should refer to the probability assigned by the actual examiner or by some hypothetical examiner; (2) what sort of information comprises S ; and (3) the value of x .

One matter to consider at this stage is whether the law would be improved if the standard for inequitable conduct simply mirrored these criteria, properly defined.⁴⁴ Some version of Expression (1), as discussed below, already constitutes part of the materiality inquiry under current law.⁴⁵ Incorporating Expression (2) as a doctrinal requirement, however, seems impracticable. Taken literally, Expression (2) would require the applicant to disclose I whenever it would be cheaper for the applicant to disclose I than for the examiner to discover I ; presumably this would include some instances in which the applicant was not initially aware of I but, through the exercise of reasonable effort,

or only information that is likely to affect patentability; one could include information that reasonably could lead to the discovery of such information, or exclude information that is cumulative; and so on.

⁴¹ See Cotropia, *supra* note 1, at 754, 756.

⁴² Disclosure may take the form of inclusion of I in the application's written description (e.g., an enabling or best mode disclosure) or in an Information Disclosure Statement (IDS) pursuant to 37 C.F.R. §§ 1.97, 1.98 (2009). The latter may include information on possibly relevant prior art, inventorship, or other matters affecting patentability. Finally, as I use the term above, disclosure may mean not misrepresenting or concealing facts relating to one's entitlement to certain privileges such as small entity status or expedited examination (a petition to make special).

⁴³ See *infra* notes 63-68 and accompanying text.

⁴⁴ That is, one would still need to specify from whose point of view, and at what time, P_E would be determined; the content of S ; and the value of x .

⁴⁵ See *infra* notes 63-68 and accompanying text.

could have discovered (and disclosed) *I* more cheaply than the examiner could have discovered it on his own. As such, Expression (2) would contravene patent law's traditional reluctance to impose upon applicants a duty to search for prior art of which they are not aware. Whether imposing a duty to search would be desirable is debatable;⁴⁶ but for the foreseeable future the creation of such a duty would seem to be an unlikely development in patent law.⁴⁷ Second, even if it were possible to implement a duty to search, determining whether the applicant or the examiner was the lower-cost discoverer of information of which the applicant was not initially aware would also surely be quite difficult to determine in many cases. From a practical standpoint, such a standard may not be much of an improvement over existing doctrine, at least as far as certainty and predictability are concerned.

To overcome these problems, one might instead define C_A as the cost to the applicant of disclosing relevant information *of which she is aware*; in such a case, one would expect the applicant to be the lower-cost information provider.⁴⁸ Invoking the inequitable conduct doctrine whenever Expression (1) and (as reinterpreted) Expression (2) are satisfied therefore might be viewed as the best *attainable* means of inducing the lower-cost party to disclose relevant information, even if such a standard falls short of the hypothetical ideal. This standard would likely fall even shorter of the ideal, however, given the difficulty and ambiguity (in some cases) of determining whether the applicant *was* aware of information *I*. Depending on how the term “knowledge” is defined, such a standard could generate substantial administrative costs and thus undermine the proposed cost-saving rationale.⁴⁹ Perhaps more problematically, a requirement that applicants

⁴⁶ See, e.g., FED TRADE COMM’N, *supra* note 1, ch. 5, at 11 (reviewing competing views, and deciding not to recommend imposing such a duty); Cotropia, *supra* note 1, at 779-81 (arguing against imposing such a duty).

⁴⁷ See FED TRADE COMM’N, *supra* note 1, ch. 5, at 11 (noting commentators’ skepticism over proposals to impose a duty to search). Although the 2007 Patent Reform bills would have authorized the USPTO to impose a duty to search, the more recent bills would not create such a duty; and to my knowledge no foreign patent system imposes such a duty on applicants either. Moreover, as Cotropia notes, the imposition of a duty to search is hard to reconcile with other proposals designed to make the inequitable conduct doctrine less costly in its implementation. See Cotropia, *supra* note 1, at 744-46.

⁴⁸ See Cotropia, *supra* note 1, at 754; *but see* Feldman, *supra* note 1, at 23 (arguing that “[p]erhaps the burden of providing extensive prior art information rests too heavily on the shoulders of the patent applicant, who is not in the best position psychologically to bear that burden,” and that the “solution may lie in finding others in the system who are better situated to provide that perspective, either by allowing earlier intervention from adversaries or beefing up the resources of the administrative experts”).

⁴⁹ For example, would knowledge on the part of a low-ranking corporate employee constitute knowledge on the part of the corporate assignee? Would an employee’s mere exposure to an existing patent impute constructive knowledge, on the part of the employer, of the patent as prior art? In practice, the Rule 56 duty of candor extends only to “*individual[s]* associated with the filing and prosecution of a patent application,” 37 C.F.R. § 1.56 (2009) (emphasis added); even so, questions do arise from time to time concerning whether the duty of disclosure extended to the person who allegedly violated it. See, e.g., *Avid Identification Sys., Inc. v. Crystal Imp. Corp.*, 603 F.3d 967, 973-77 (Fed. Cir. 2010) (affirming finding that company president was “substantively involved” in prosecution and therefore subject to the duty of candor). For somewhat differing perspectives on the question of who should be subject to the duty, compare Mack, *supra* note 1, at 160-61, 173-74 (arguing in favor of retaining rule under which knowledge

disclose any relevant information of which they are aware could discourage some applicants from exposing themselves to potential prior art. Analogous problems once arose in connection with the law of enhanced damages, where until recently an accused infringer's mere pre-infringement exposure to the patent at issue potentially rendered the defendant liable for treble damages.⁵⁰ Partly in response to criticism that this standard discouraged firms from reading patents, the Federal Circuit in 2007 held that patentees must prove both objective and subjective recklessness as a precondition to a damages enhancement.⁵¹ In the present context, requiring the defendant to prove more than mere knowledge on the part of the patentee as a precondition to a finding of inequitable conduct similarly might be viewed as a means for reducing the risk of abuse (though in this case, on the part of defendants and not patentees), though at the cost of moving yet further away from any clear relationship to the policy of inducing the lower-cost party to disclose.

A second approach would be to consider the matter from a broader social welfare perspective. From this standpoint, the relevant inquiry can be illustrated graphically as in Figure 1. The x -axis denotes the quantity of relevant⁵² information of which the applicant is aware,⁵³ and the y -axis some unit of value. Curve U_S illustrates the social utility of disclosure. Initially, the disclosure of additional units of relevant information increases U_S , but the marginal social benefits of disclosure outpace the marginal social costs only up to Q^* ; as additional units of information are disclosed, social utility declines as the

on the part of the patent owner's representatives is imputed to the patent owner), *with* Armitage, *supra* note 1, at 2-3 (lamenting that, under current doctrine, innocent patent assignees sometimes wind up suffering for applicants' misdeeds).

⁵⁰ See Thomas F. Cotter, *An Economic Analysis of Enhanced Damages and Attorneys' Fees for Willful Patent Infringement*, 14 FED. CIR. B.J. 291, 299-300 (2004) (noting that "some commentators have suggested that the [then-existing] rules might make some companies reluctant to permit their employees to review patents").

⁵¹ See *In re Seagate Tech., LLC*, 497 F.3d 1360, 1371 (Fed. Cir. 2007) (en banc). *But see* *SEB S.A. v. Montgomery Ward & Co.*, 594 F.3d 1360, 1375-78 (Fed. Cir. 2010) (holding that "deliberate indifference" to the existence of a patent can satisfy the state of mind requirement for inducement liability under 35 U.S.C. § 271(b) (2006), notwithstanding the court's decision in *DSU Medical Corp. v. JMS Co.*, 471 F.3d 1293, 1304 (Fed. Cir. 2006) (en banc), requiring knowledge of the patent).

⁵² More precisely, as one moves along the x -axis, the information remains relevant in the Federal Rules of Evidence sense, *see supra* note 41, but its relevance diminishes and/or the information becomes increasingly cumulative.

⁵³ Alternatively, one could consider the social utility attributable to the disclosure of information whether the applicant is initially aware of the information or not; this would enable modeling of a duty to search. As discussed above, however, in my view the imposition of a duty to search appears to be an unlikely legal development. *But see* Doug Lichtman & Mark A. Lemley, *Rethinking Patent Law's Presumption of Validity*, 60 STAN. L. REV. 45, 61-62 (2007) (proposing a voluntary, supplementary review process that would allow applicants to submit their own prior art searches in return for a stronger presumption of validity).

marginal costs begin to outweigh the benefits.⁵⁴ From the applicant's private perspective, however, disclosure makes sense as long as the marginal benefits to the applicant⁵⁵ outweigh the applicant's marginal costs. The applicant therefore will disclose up to Q^{**} , the point at which the applicant's utility from disclosure (U_A) is at a maximum (that is, the surplus of private benefits over private costs is at a maximum). The region in between Q^* and Q^{**} denotes information the disclosure of which maximizes the applicant's expected private utility but detracts from social utility; its disclosure, in other words, is socially inefficient. Ideally, the inequitable conduct doctrine would reduce the difference between Q^* and Q^{**} to 0 by aligning the private and social costs and benefits of disclosure.⁵⁶ Put another way, the goal of the inequitable conduct doctrine would be to ensure that

$$dU_S/dQ = 0. \quad (3)$$

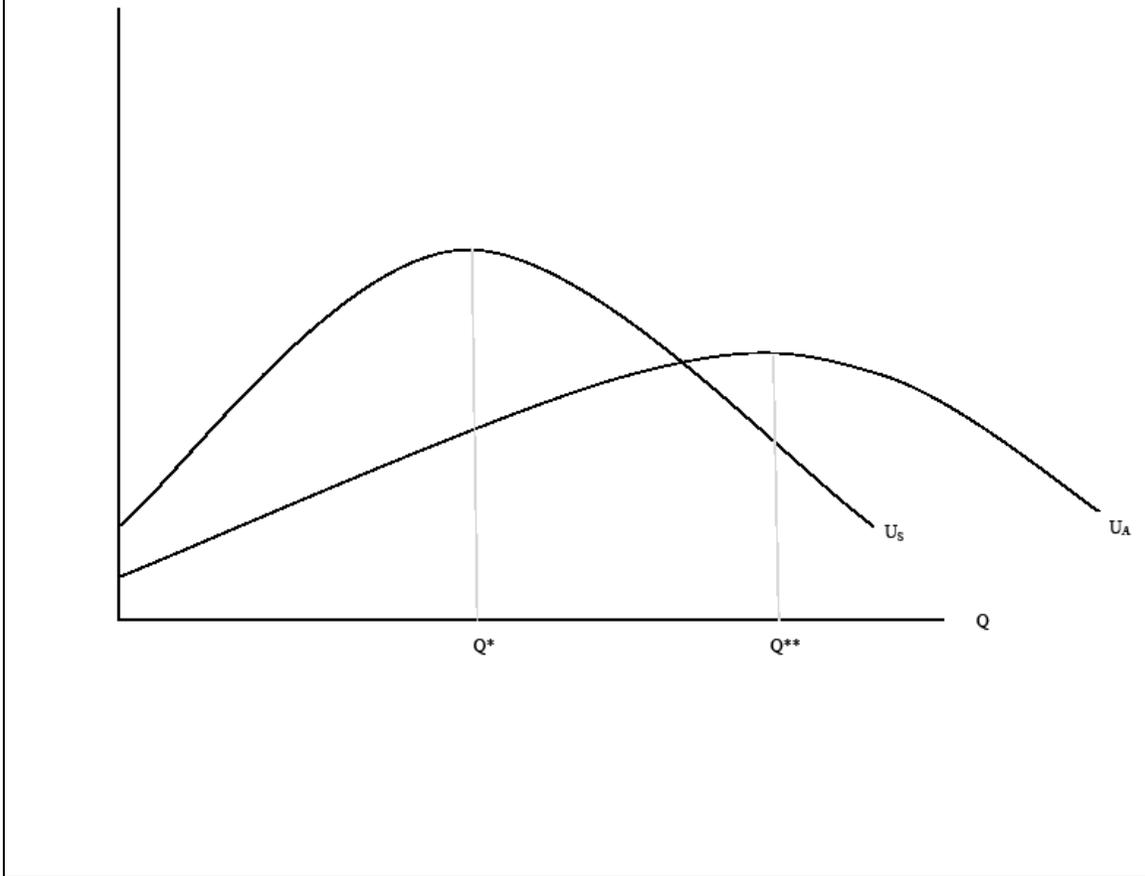
As with the cost comparison approach above, however, it is probably not feasible to attempt to estimate the relevant variable (here, dU_S/dQ). The analysis nevertheless suggests a way of thinking about the relevant policy issue that underlies the inequitable conduct doctrine; it also further illustrates the gap between the policy ideal and what may practically attainable.

⁵⁴ These costs include both the private cost to the applicant and any cost incurred by the examiner or third parties in processing the additional information. As noted above, however, one recent study casts doubt on the proposition that examiners are suffering from the effects of "information overload"; on average, they appear not to devote substantial attention to applicant-submitted prior art even when there is reason to believe it may be relevant. See Cotropia et al., *supra* note 32.

⁵⁵ These marginal benefits include whatever additional revenue the applicant is likely to derive from disclosure, as modeled in the text above.

⁵⁶ Much of the criticism of contemporary inequitable conduct doctrine is premised on the belief that that difference is, at present, often substantial. See *supra* notes 32-33 and accompanying text.

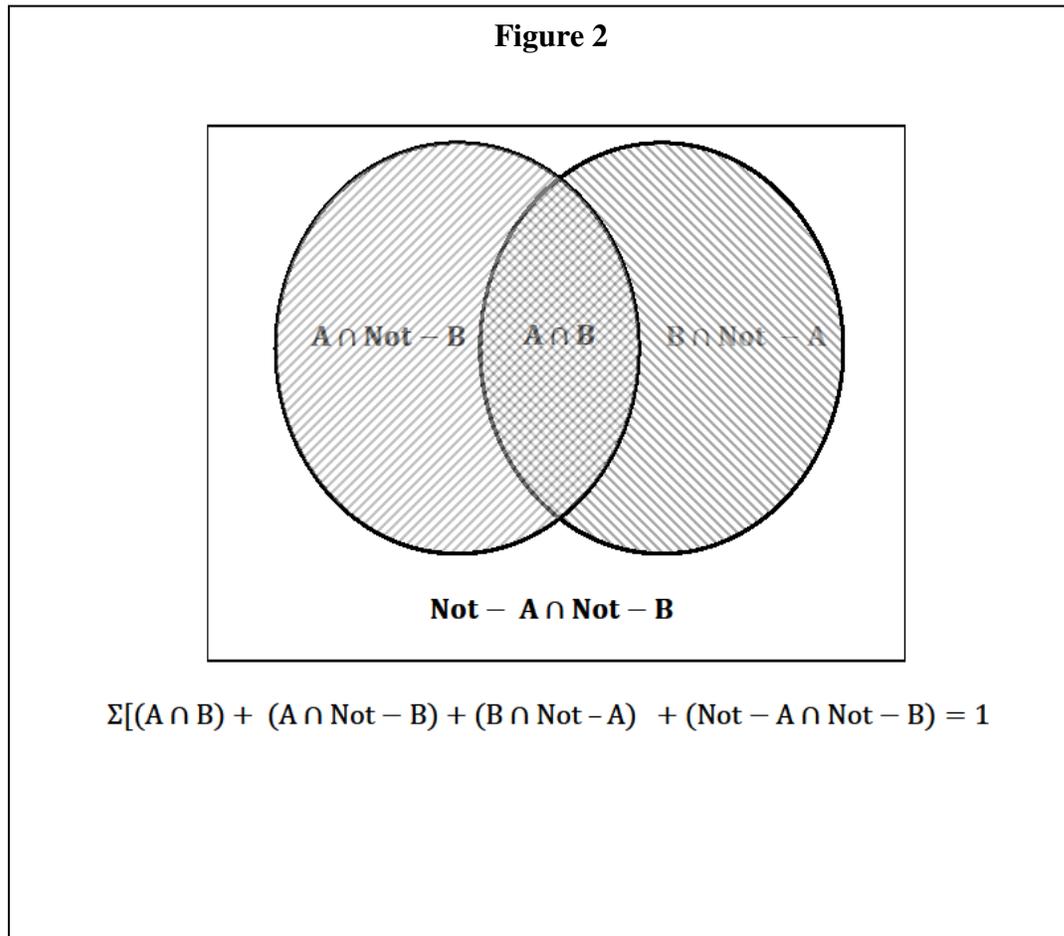
Figure 1



From a more pragmatic perspective, in deciding whether to reveal a discrete unit of information I at t_I , Applicant will consider her expected return from patenting if she discloses I versus her expected return if she does not. A rational applicant's decisionmaking process will depend on several considerations.⁵⁷ One set of factors to consider is Applicant's subjective probability that the existence of I affects the validity of one or more of Applicant's desired claims, as well as the probability that Applicant's nondisclosure of I amounts to inequitable conduct under the governing legal standard. More precisely, we can define $P(A)$ as Applicant's subjective probability that I , if disclosed or discovered, would affect the validity of one or more of her desired claims

⁵⁷ In reality, the lawyers and agents that draft patent applications may not consciously take all of the variables discussed above into account in deciding whether to disclose a given piece of information to the USPTO; and they may rely on "best practices" concerning *types* of information to disclose rather than making individualized judgments about each and every I (though individual judgment may be brought to bear with respect to whether to provide less commonly encountered types of references). Nevertheless, one would expect agents' decisions at least implicitly to reflect their understanding of the consequences, as modeled above, of disclosing or not disclosing certain individual references or categories of references, and to adjust over time with changes in the governing case law. I thank Dennis Crouch and John Golden for bringing this point to my attention.

(and thus $P(\text{Not-A}) = 1 - P(A)$ = Applicant's subjective probability that I would not affect the validity of any of her desired claims), and $P(B)$ as Applicant's subjective probability that her failure to disclose I , if such failure were discovered, would constitute inequitable conduct (and thus $P(\text{Not-B}) = 1 - P(B)$ = Applicant's subjective probability that the failure to disclose I would not constitute inequitable conduct).⁵⁸ Figure 2 illustrates the relationships between these variables.



⁵⁸ $P(\text{Not-A} \cap \text{Not-B}) = P(\text{Not-A}) \times P(\text{Not-B}|\text{Not-A})$ therefore is Applicant's subjective probability that I does not affect validity *and* that the failure to disclose I does not constitute inequitable conduct. $P(\text{Not-A} \cap B) = P(\text{Not-A}) \times P(B|\text{Not-A})$ is Applicant's subjective probability that I does not affect validity but that the failure to disclose I constitutes inequitable conduct. $P(A \cap \text{Not-B}) = P(A) \times P(\text{Not-B}|A)$ is Applicant's subjective probability that I affects validity but that failure to disclose I does not constitute inequitable conduct.

Applicant's decisionmaking process also must take into account, however, the probabilities that, if she does not disclose I , a third party (the examiner, an accused infringer, a potential licensee, or some other interested third party) subsequently will discover (1) I 's existence, and (2) Applicant's intentional nondisclosure of I . Formally, we can define $P(d_E)$ as Applicant's subjective probability that a third party subsequently (i.e., at time t_{I+n}) will discover I 's existence, and $P(d_{ND})$ as Applicant's subjective probability that a third party subsequently will discover that Applicant intentionally failed to disclose I .⁵⁹ Applicant then can estimate the present value of revenue R to be gained under each possible combination of $P(A)$, $P(B)$, $P(d_E)$, and $P(d_{ND})$.⁶⁰ For present purposes, let us assume that Applicant expects to earn R_I if either of the following two conditions are satisfied:

(1) Applicant voluntarily discloses I but I ultimately has no effect on the validity or enforceability of any of Applicant's desired claims; or

(2) Applicant intentionally fails to disclose I ; a third party subsequently discovers I 's existence; I nevertheless ultimately has no effect on the validity of any of Applicant's desired claims; and Applicant's failure to disclose I does not result in a finding of inequitable conduct, either because the third party does not discover that Applicant intentionally failed to disclose I or because a court concludes that Applicant's conduct did not amount to inequitable conduct.

Assume further that Applicant expects to earn R_2 if either of the following two conditions are satisfied:

(1) Applicant voluntarily discloses I and I ultimately does affect the validity of one or more of her desired claims; or

(2) Applicant intentionally fails to disclose I ; a third party subsequently discovers I 's existence; I ultimately affects the validity of one or more of Applicant's desired claims; but Applicant's failure to disclose I does not result in a finding of inequitable conduct, either because the third party does not discover that Applicant intentionally failed to disclose I or because a court concludes that Applicant's conduct did not amount to inequitable conduct.

Note that $R_2 = 0$ if the patent is wholly invalid, but it may be greater than zero if I does not affect all of Applicant's claims. Finally, assume that Applicant expects to earn R_3 if she intentionally fails to disclose I ; a third party subsequently discovers I 's existence and Applicant's intentional failure to disclose; and the failure to disclose I ultimately results

⁵⁹ Conceivably, $P(d_E)$ could be related to the amount of information disclosed. That is, if Q^{**} in Figure 1 exceeds some critical value, perhaps $P(d_E)$ goes down due to some sort of "needle in a haystack" effect. See *infra* note 62. If examiners typically pay little attention to applicant-submitted prior art, however, regardless of its quantity or quality, this effect may be minimal.

⁶⁰ With four variables to consider, the various combinations cannot be illustrated in a two-dimensional Venn diagram as in Figure 2 above.

in a finding of inequitable conduct. Although $R_3 = 0$ under current law, it could be greater than zero under some of the proposed reforms. The universe of possible outcomes can then be summarized as follows:

Table 1

<u>Validity</u>	<u>Enforceability</u>	<u>Discovery of I's existence</u>	<u>Discovery of Applicant's intentional nondisclosure</u>	<u>Applicant's expected revenue if Applicant voluntarily discloses I</u>	<u>Applicant's expected revenue if Applicant does not disclose I</u>
(A = at least one desired claim would be invalid if third party discovered I's existence)	(B = patent would be unenforceable if third party discovered that Applicant intentionally failed to disclose I)	(d_E = third party would discover I's existence)	(d_{ND} = third party would discover that Applicant intentionally failed to disclose I)		
A	B	d_E	d_{ND}	R_2	R_3
A	Not-B	d_E	d_{ND}	R_2	R_2
A	B	Not- d_E	d_{ND}	-	-
A	B	d_E	Not- d_{ND}	R_2	R_2
A	Not-B	Not- d_E	d_{ND}	-	-
A	Not-B	d_E	Not- d_{ND}	R_2	R_2
A	Not-B	Not- d_E	Not- d_{ND}	R_2	R_1
A	B	Not- d_E	Not- d_{ND}	R_2	R_1
Not-A	B	d_E	d_{ND}	R_1	R_3
Not-A	Not-B	d_E	d_{ND}	R_1	R_1
Not-A	B	Not- d_E	d_{ND}	-	-
Not-A	B	d_E	Not- d_{ND}	R_1	R_1
Not-A	Not-B	Not- d_E	d_{ND}	-	-
Not-A	Not-B	d_E	Not- d_{ND}	R_1	R_1
Not-A	B	Not- d_E	Not- d_{ND}	R_1	R_1
Not-A	Not-B	Not- d_E	Not- d_{ND}	R_1	R_1

Note that Applicant's intentional failure to disclose I cannot be discovered unless I's existence is discovered (d_{ND} is a subset of d_E , in other words), so $(\text{Not} - d_E) \cap d_{ND}$ is an empty set.

Next, let us define F_D as the cost (legal fees) of prosecution and enforcement, net of the cost of disclosure (C_A), if Applicant discloses I; and F_{ND} as Applicant's expected

cost of prosecuting and enforcing the patent if she does not disclose.⁶¹ $F_D = f(A, \dots)$ and $\partial F_D / \partial f(A) > 0$, reflecting an increased cost of prosecution and enforcement the greater the likelihood that I raises questions about the patentability of one or more claims. $F_{ND} = f(A, B, d_E, d_{ND}, \dots)$, where the partial derivative of F_{ND} with respect to all four variables is positive, reflecting the fact that Applicant's expected cost of prosecution and enforcement correlates positively with (1) Applicant's subjective probability that I will be detected and will raise problems with respect to validity; and (2) Applicant's failure to disclose I will be detected and will raise problems with respect to enforceability.

We are now ready to state Applicant's expected revenue if she discloses and if she does not. If Applicant discloses, her expected revenue $E(R)_D$ is

$$E(R)_D = R_1P(\text{Not-}A) + R_2P(A) - C_A - F_D. \quad (4)$$

The intuition is straightforward. Applicant expects to receive R_1 if I does not invalidate any claims and R_2 if it does.⁶² The direct cost of disclosure (e.g., drafting an IDS) is C_A , and Applicant's expected legal fees (not including the direct costs of disclosure) are F_D .

If Applicant does not disclose, her expected revenue $E(R)_{ND}$ is

$$\begin{aligned} E(R)_{ND} = & R_1P(A \cap \text{Not-}B \cap \text{Not-}d_E \cap \text{Not-}d_{ND}) + R_1P(A \cap B \cap \text{Not-}d_E \cap \text{Not-}d_{ND}) + \\ & R_1P(\text{Not-}A \cap \text{Not-}B \cap d_E \cap d_{ND}) + R_1P(\text{Not-}A \cap B \cap d_E \cap \text{Not-}d_{ND}) + R_1P(\text{Not-}A \cap \text{Not-} \\ & B \cap d_E \cap \text{Not-}d_{ND}) + R_1P(\text{Not-}A \cap B \cap \text{Not-}d_E \cap \text{Not-}d_{ND}) + R_1P(\text{Not-}A \cap \text{Not-}B \cap \text{Not-} \\ & d_E \cap \text{Not-}d_{ND}) + R_2P(A \cap \text{Not-}B \cap d_E \cap d_{ND}) + R_2P(A \cap B \cap d_E \cap \text{Not-}d_{ND}) + R_2P(A \cap \\ & \text{Not-}B \cap d_E \cap \text{Not-}d_{ND}) + R_3P(A \cap B \cap d_E \cap d_{ND}) + R_3P(\text{Not-}A \cap B \cap d_E \cap d_{ND}) - F_{ND}. \end{aligned} \quad (5)$$

Simplifying terms, Expression (5) can be restated as

$$\begin{aligned} E(R)_{ND} = & R_1P(\text{Not-}A \cap \text{Not-}B \cap d_E) + R_1P(\text{Not-}A \cap B \cap d_E \cap \text{Not-}d_{ND}) + R_1P(\text{Not-}d_E) + \\ & R_2P(A \cap \text{Not-}B \cap d_E) + R_2P(A \cap B \cap d_E \cap \text{Not-}d_{ND}) + R_3P(B \cap d_E \cap d_{ND}) - F_{ND}. \end{aligned} \quad (6)$$

⁶¹ To the extent a finding of inequitable conduct risks rendering other, related patents unenforceable, *see supra* note 22, and puts the patentee at some risk of having to pay the defendant's attorneys' fees, *see supra* note 21, these potential costs would be subsumed within F_{ND} .

⁶² The analysis therefore elides the possibility that Applicant could disclose I in such a manner that would still leave open the possibility of a finding of inequitable conduct, e.g., by indiscriminately disclosing I among thousands of other pieces of information. The trend in the case law has been away from holding indiscriminate disclosure to constitute inequitable conduct. *See Molins PLC v. Textron, Inc.*, 48 F.3d 1172, 1182-84 (Fed. Cir. 1995); *but see* Feldman, *supra* note 1, at 15 & n.55 (noting the possibility that excessive disclosure could subject the patent attorney "to discipline for breach of ethics" under 37 C.F.R. § 11.18(b)). To the extent this remains a possibility, however, the analysis above should be understood as assuming that Applicant has engaged in *meaningful* disclosure.

A rational, risk-neutral Applicant therefore will choose disclosure over nondisclosure whenever

$$R_1P(\text{Not-}A) + R_2P(A) - C_A - F_D > R_1P(\text{Not-}A \cap \text{Not-}B \cap d_E) + R_1P(\text{Not-}A \cap B \cap d_E \cap \text{Not-}d_{ND}) + R_1P(\text{Not-}d_E) + R_2P(A \cap \text{Not-}B \cap d_E) + R_2P(A \cap B \cap d_E \cap \text{Not-}d_{ND}) + R_3P(B \cap d_E \cap d_{ND}) - F_{ND}, \quad (7)$$

and

$$E(R)_D = R_1P(\text{Not-}A) + R_2P(A) - C_A - F_D > 0. \quad (8)$$

This last condition is necessary because if the cost of proceeding with the application is too high, Applicant's preferred strategy is to abandon the application (and not reveal I) even if $E(R)_D > E(R)_{ND}$. Expression (7) can be further simplified by combining terms where possible, as follows:

$$R_1P(\text{Not-}A \cap B \cap d_E \cap d_{ND}) + R_2P(A \cap B \cap d_E \cap d_{ND}) + (F_{ND} - C_A - F_D) > (R_1 - R_2)P(A \cap \text{Not-}d_E) + R_3P(B \cap d_E \cap d_{ND}). \quad (9)$$

Note that $(F_{ND} - C_A - F_D)$ is Applicant's net expected cost saving attributable to disclosure. It could be either positive or negative, depending on the magnitude of C_A and the difference between Applicant's expected legal fees net of C_A when she discloses versus when she does not. In the limiting case in which $P(d_E) = 0$ (that is, Applicant believes that I would never be discovered unless she disclosed it), the first two terms on the left-hand side are 0 and the third term is negative because $F_{ND} \leq F_D$. Since $R_1 \geq R_2$, the right-hand term $(R_1 - R_2)P(A \cap \text{Not-}d_E)$ must be ≥ 0 , and thus a purely self-interested applicant would never voluntarily disclose under these circumstances.

The values of $P(B)$ and $P(\text{Not-}B)$ will depend on Applicant's understanding of the standard for a finding of inequitable conduct. Under current law, as noted above, a finding of inequitable conduct depends on three factors—materiality, intent, and balancing—which can be modeled as follows. First, using Expression (1) above, we can define I as material if

$$P_E[I \in S] \geq x. \quad (1)$$

In other words, I is material if the probability that the relevant examiner would conclude that I falls within set S is greater than or equal to some value x . As suggested above, however, the meaning of this expression will vary depending on the identity of the relevant examiner, the content of set S , and the value of x . In particular, P_E could stand for the probability from the standpoint of the actual examiner assigned to the application, or from the standpoint of a hypothetical "reasonable" examiner, or from the standpoint of an ideal examiner who perfectly applies the law to the facts. Moreover, in theory P_E could be determined at different time periods, including not only t_1 (the date of application) but alternatively t_2 (the date of issuance) or t_3 (the date of judgment)—or

perhaps even some other time, such as the date Applicant offers a license or the date on which infringement begins. In addition, *S* can be defined to include any or all of the following subsets of information:

Subset 1. Information of such a nature that, if Applicant did not disclose it and the patent nevertheless issued at t_2 , one or more claims would be invalid; but if Applicant did disclose the information, Applicant would still obtain⁶³ a patent of the desired claim scope at t_2 . Examples would be disclosures necessary to satisfy Patent Act § 112 and disclosures of the names of coinventors.

Subset 2. Information that would preclude Applicant from obtaining a patent of the desired claim scope, but not necessarily from obtaining a patent of narrower scope. Examples would be information that either solely or in combination with other information demonstrates (at least until rebutted) that one or more of the Applicant's desired claims lack novelty or are obvious.

Subset 3. Information that some other rule of patent law requires the Applicant truthfully to disclose, but that is not of a type that would lead to invalidation if not disclosed. Examples would include information relating to small entity status or to the Applicant's entitlement to a petition to make special.

Subset 4. Information the disclosure of which would lead to the discovery of information falling into one of the other categories. Subset 4 could be further broken down into smaller subsets—for example, information that would *necessarily* lead to the discovery of information falling into Subset 1 only, or information that would not necessarily lead to the discovery of information falling into one of the other subsets but rather would only increase the probability of the discovery of such information by some amount q .

Finally, the value of x in Expression (1) depends on how strict the materiality requirement is. In theory, x could fall anywhere along the spectrum of $0 < x \leq 1$, though the closer x is to 1 the more likely a consensus would exist that the information is material.

The differences among the existing and proposed standards of materiality therefore can be compared as follows:

⁶³ Depending on the identity of the relevant examiner, “would still obtain” could mean that Applicant would be entitled to a patent of the desired claim scope at t_2 , or that Applicant would in fact obtain a patent of the desired claim scope at t_2 . Note that the actual examiner is not allowed to testify on these matters. See MANUAL OF PATENT EXAMINING PROCEDURE § 1701.01 (8th ed., rev. 2010).

Table 2

Standard	Relevant examiner	Time when P_E is determined	Contents of ζ	$x =$
Objective but-for	Ideal	t_1	Subsets 1, 2; 4?	1
Subjective but-for	Actual	t_1	Subsets 1, 2; 4?	1
“But it may have”	Actual? Reasonable?	t_1	1, 2, 4	?
Rule 56, 1977 version	Reasonable	t_1	1, 2, 3, 4	?
Rule 56, 1992 version	Ideal?	t_1	1, 2	1?
Proposed standard under which no inequitable conduct unless at least one claim is rendered invalid as a result	Ideal	t_3	1, 2	1

Viewed in this format, the differences among the standards—and the areas with respect to which the value of the relevant variables is uncertain or ambiguous—become apparent. First, the identity of the relevant examiner varies, not surprisingly, depending on the standard used. (Indeed, with respect to two of the existing standards, the case law thus far has never clearly stated the identity of the relevant examiner.) Second, the relevant time frame for all five of the existing standards would appear to be t_1 . By contrast, with respect to a proposed standard under which a finding of inequitable conduct is contingent on the invalidity of at least one claim, the relevant time frame is arguably t_3 , the date of judgment. Third, the content of the relevant information set varies depending on the test employed, though once again the precise content is unclear with respect to at least two of the standards. Fourth, and perhaps most significant, x is presumably some amount less than 1 under the but-it-may-have and reasonable examiner standards (and maybe under the 1992 version of Rule 56); just how much less, however, is unspecified. Given these uncertainties, the fact that the decisions on inequitable conduct strike many observers as inconsistent is not surprising.

As for the second relevant factor, we can define Applicant as having the requisite deceptive intent if

$$P_A[I \in S] \geq y, \tag{10}$$

that is, if Applicant's subjective probability at t_I that the information falls within set S is greater than some value y . Put another way, does Applicant believe at t_I that I may be material, and if so how strongly does Applicant believe this?⁶⁴ On this analysis, an applicant who is not aware of the information would (as under current law) lack deceptive intent altogether. Similarly, an applicant who is aware of the information but who does not grasp its significance also would (as under current law) lack deceptive intent, even if the applicant's failure to grasp its significance can be characterized as simple or gross negligence. Presumably, then, y must be substantially higher than 0. How high it must be nevertheless remains unclear. Must it be close to 1? Only greater than 0.5? Further compounding the uncertainty is the question of how an accused infringer may go about proving that y exceeds the relevant threshold. As noted in Part I, some cases have held that an inference of deceptive intent is appropriate if I is highly material, the applicant knew or should have known of its materiality, and the applicant cannot offer a convincing explanation for withholding the information.⁶⁵ From a purely evidentiary standpoint, this might not seem problematic; all other things being equal, the information's actual materiality is likely to correlate to some degree > 0 with the applicant's subjective belief as to its materiality. As discussed above, however, critics contend that the "should have known" standard tends to conflate intent with materiality, or to permit an inference of intent on the basis of mere negligence;⁶⁶ and the analysis above arguably provides some support for this view. One way of thinking about the "should have known" standard is that it substitutes a hypothetical reasonable applicant's estimate of the probability of materiality for the *actual* applicant's subjective estimate of the probability of materiality—in much the same way that the reasonable examiner

⁶⁴ By focusing on the applicant's state of mind, rather than on the state of mind of the examiner or some hypothetical entity, Expression (10) distinguishes deceptive intent from materiality as modeled in Expression (1). Perhaps a more complete definition of deceptive intent would be $P_A[P_E[I \in S] \geq x] \geq y$, meaning that Applicant has deceptive intent if she believes that the probability is greater than or equal to y that the probability the relevant examiner would find I to fall within S is greater than or equal to x . This would reflect a possible feedback effect between materiality and intent, but it would also make an already complex analysis yet more complex without necessarily adding much to the model's predictive value. Note also that, if S is defined to include, say, only Subsets 1 and 2, an intent to deceive as to one's small entity status (for example), though deceptive, would not count as deceptive intent for purposes of the inequitable conduct doctrine.

At least one commentator has argued that deceptive intent should incorporate another factor—specifically, that no deceptive intent should be found where the examiner should have discovered the information at issue by following the examination protocols set forth in the *Manual of Patent Examining and Procedure*. See Brief of Amicus Curiae Dolby Labs., Inc. in Support of Neither Party, *Therasense, Inc. v. Becton, Dickinson & Co.*, Nos. 2008-1511, -1512, -1513, -1514, -1595, 2010 WL 2861896 (Fed. Cir. June 30, 2010). The analysis above avoids this additional complicating factor; if added, however, Expression (10) could be revised to state $(P_A[I \in S]) \geq y \cap (P_A(d_E) \geq y')$, where y' presumably would be at or near 1.

⁶⁵ See *supra* text accompanying note 27.

⁶⁶ See *supra* text accompanying note 28. Another, related, critique might be that the focus on the applicant's inability to offer a convincing explanation conflicts with the requirement that intent (and materiality) be proven by clear and convincing evidence.

standard substitutes a hypothetical reasonable examiner’s probability estimate for the actual examiner’s estimate. To the extent a hypothetical reasonable examiner and a hypothetical reasonable applicant are likely to have similar probability estimates, therefore, the critics may be right in arguing that the “should have known” standard conflates intent with a (high degree of) materiality, at least where materiality is determined under the reasonable examiner standard.

The third relevant factor, balancing, means that even if the threshold levels of materiality and intent are present, the court must balance the equities to determine if a finding of inequitable conduct is appropriate.⁶⁷ Furthermore, as noted above, on occasion the Federal Circuit has approved the use of a sliding scale under which a higher degree of materiality may compensate for a lesser (but still above-the-threshold) degree of intent, and vice versa.⁶⁸ Mathematically, then, one might represent the three requirements for inequitable conduct in the following manner. Inequitable conduct is present if:

$$P_E[I \in S] \geq x, \tag{1}$$

$$P_A[I \in S] \geq y, \tag{10}$$

and

$$\alpha(x, y) \geq z, \tag{11}$$

where α is an operator applied to x and y . It remains unclear, however, exactly what that operator is (addition? multiplication? something more complex?); similarly unspecified is the requisite value of z .

On the basis of this analysis, we may define $P(B)$ in the following manner:

$$P(B) = P^*[(P_E[I \in S] \geq x) \cap (P_A[I \in S] \geq y) \cap (\alpha(x, y) \geq z)], \tag{12}$$

where P^* = Applicant’s subjective probability at time t_1 that a court at time t_3 would view the three conditions set forth in Expressions (1), (10), and (11) as satisfied.

III. Implications of the Preceding Analysis

Scholarly discussion of the inequitable conduct doctrine to date has centered on aspects of the doctrine that critics view as dysfunctional—among them, the multiplicity and inconsistency of the relevant standards for determining materiality and intent; the resulting compliance and adjudication costs; and the perceived disconnect, in some cases, between the gravity of the offense and resulting penalty.⁶⁹ The debate would benefit,

⁶⁷ See *supra* text accompanying note 19.

⁶⁸ See *supra* text accompanying note 29.

⁶⁹ See *supra* notes 30-36 and accompanying text.

however, from additional efforts both to ground the doctrine in a deeper theoretical framework and to subject its real-world impact to rigorous empirical analysis. This Article has attempted to advance matters on the theoretical front by restating, with as much precision as possible, both the conditions under which the doctrine would advance the public interest and the factors that would influence a rational applicant in deciding how much information to disclose. This Part discusses the implications of the theoretical analysis presented above. In particular, it highlights the imperfect nature of the inequitable conduct doctrine as a means for inducing optimal disclosure, and it provides some basis for predicting the effects (alone or in combination) of various proposed reforms.

A. The Gap Between Theory and Practice

Perhaps the most striking implication of the theoretical analysis presented above is the gap between the inequitable conduct doctrine (either its current form or as modified by any of the leading reform proposals) and the proposed underlying purpose of inducing optimal disclosure. Part II proposed that the ideal inequitable conduct standard would induce disclosure when:

$$P_E[I \in S] \geq x, \quad (1)$$

$$C_A < C_E, \quad (2)$$

and

$$dU_S/dQ = 0. \quad (3)$$

As suggested, however, while it might be tempting to consider simply adopting these criteria themselves as the conditions under which a failure to disclose constitutes inequitable conduct, attempts to measure dU_S/dQ or to compare C_A with C_E are probably impracticable. At best, then, the inequitable conduct doctrine can provide only a rough proxy for these ideal conditions; although Expression (1) embodies some version of a materiality standard, neither of the other conditions shares any obvious connection with the deceptive intent element or with balancing.

A second implication arises from Part II's analysis of the factors that would induce a rational, risk-neutral applicant to choose disclosure over nondisclosure. As above, those conditions are:

$$E(R)_D = R_1P(\text{Not-A}) + R_2P(A) - C_A - F_D > 0, \quad (8)$$

and

$$R_1P(\text{Not-A} \cap B \cap d_E \cap d_{ND}) + R_2P(A \cap B \cap d_E \cap d_{ND}) + (F_{ND} - C_A - F_D) > (R_1 - R_2)P(A \cap \text{Not-}d_E) + R_3P(B \cap d_E \cap d_{ND}). \quad (9)$$

where

$$P(B) = P^*[(P_E[I \in S] \geq x) \cap (P_A[I \in S] \geq y) \cap (\alpha(x, y) \geq z)]. \quad (12)$$

As we have seen, many of these variables are either inherently difficult to estimate (for example, F_{ND}) or poorly defined (for example, just about everything that goes into $P(B)$). Whether current law comes close to inducing disclosure to the extent that it would occur under ideal conditions (1), (2), and (3) is therefore doubly indeterminate. Conceivably, the existing standards could induce departures from the ideal in either direction (i.e., too much or too little disclosure, in comparison with the ideal), depending on the case. In some other areas of the law such as antitrust, a method of dealing with analogous risks of error is by crafting standards that attempt to minimize the total cost of “false positives” (wrongly finding violations where none exist), “false negatives” (wrongly exonerating violative conduct), and enforcement and other administrative costs.⁷⁰ The cost of false positives and false negatives, in turn, is a function of both their frequency and magnitude.⁷¹ How might such an approach play out in the context of the inequitable conduct doctrine?

On the one hand, one might argue that the cost of false negatives should be of greater concern than the cost of false positives, on the theory that more information is generally better than less. All other things being equal, a broad (that is, defendant-friendly) standard of inequitable conduct should induce more disclosure of information that might relate to patentability (or otherwise implicate the integrity of the patent system); in turn, the disclosure of such information may help to weed out invalid claims that otherwise would have evaded successful challenge. Moreover, one might argue, applicants can avoid the cost of false positives simply by following a policy of “when in doubt, disclose.”⁷² On this view, any effort to weaken the inequitable conduct doctrine would lead to less disclosure and more fraud, to the detriment of the public. (Note, however, that the magnitude of the harm resulting from a false negative will be mitigated

⁷⁰ See, e.g., Thomas F. Cotter, *The Procompetitive Interest in Intellectual Property Law*, 48 WM. & MARY L. REV. 483, 490-91 & n.17 (2006) (discussing the use of error costs analysis in antitrust and intellectual property law).

⁷¹ See *id.* at 493 n.24, 526.

⁷² See *Therasense, Inc. v. Becton, Dickinson & Co.*, 593 F.3d 1289, 1305 (Fed. Cir. 2010) (stating that “if this could be regarded as a close case, which it is not, we have repeatedly emphasized that the duty of disclosure requires that the material in question be submitted to the examiner rather than withheld by the applicant”), *vacated and ordered reheard en banc*, Nos. 2008-1511, 2008-1512, 2008-1513, 2008-1514, 2008-1595, 2010 WL 1655391, at *1 (Fed. Cir. Apr. 26, 2010) (per curiam). Further, the consequences of a false negative surely could be present in some cases—for example, when the misconduct wouldn’t come to light otherwise because the defendant wouldn’t have had an incentive to raise the issue otherwise. Moreover, patentees who have failed to disclose may be able to extract unwarranted rents from risk-averse licensees. See Cotropia, *supra* note 1, at 751-52.

if d_E and d_{ND} are sufficiently high or C_E sufficiently low. If, on the other hand, d_E and d_{ND} are low⁷³ or C_E high, the cost of a false negative will be relatively higher.)

The problem with this view is that it ignores the cost of both false positives and enforcement. As for false positives, it may be true that the private cost of disclosing one additional piece of information in an IDS is small; but the cost of disclosing hundreds of references in order to avoid a false positive may add up significantly. To be sure, the disclosure burden imposed by the inequitable conduct may not price many applicants out of the market, but at the margin there is some risk that, in terms of Expression (8), if C_A is too high $E(R)_D < 0$ and the applicant's better strategy is abandoning the application.⁷⁴ More is not always better, particularly if the disclosed information is of little social value.⁷⁵ In short, the threat of false positives encourages overcompliance with patent law's disclosure requirements, in ways that may (at times) be at best pointless and at worse counterproductive—though whether, under current law, those costs generally outweigh the costs of false negatives cannot be determined by theory alone.

⁷³ See Long, *supra* note 10, at 669 (suggesting that applicants may choose to conceal information they do not expect others to uncover).

⁷⁴ Moreover, too much indiscriminate disclosure may actually impede others' ability to process the disclosed information in any meaningful way, see Cotropia, *supra* note 1, at 773, though the empirical evidence on this point is not strong, see Cotropia et al., *supra* note 32.

To be sure, the fewer patents there are, the smaller the risk of the associated social costs of patenting, including occasional monopolistic pricing. The same could be said for the inequitable conduct as applied in litigation. Even when a court incorrectly determines that a patentee engaged in inequitable conduct, the social cost of the false positive is not entirely a "cost" because the public gains free access to the invention. Taken to its logical conclusion, however, this reasoning would undermine the whole point of having a patent system. Put another way, this reasoning ignores the potential dynamic efficiency costs from arbitrarily undercutting the patent incentive, encouraging inventors to rely more heavily on trade secret protection over patent protection, and so on.

⁷⁵ See *id.* at 770-73. Suppose, for example, that an applicant intentionally fails to disclose some piece of information that arguably could be deemed relevant to carrying out her best mode of practicing the invention; but that (ultimately) the defendant is unable to prove a best mode violation by the requisite clear and convincing evidence. Because compliance with the best mode requirement is a necessary precondition to a valid patent, intentionally withholding one's best mode *can* constitute a material omission and thus qualify as inequitable conduct. See *Consol. Aluminum Corp. v. Foseco Int'l Ltd.*, 910 F.2d 804 (Fed. Cir. 1990). And while the failure to disclose in the preceding hypothetical would not be deemed material under an objective but-for test or, most likely, under the 1992 version of Rule 56, the question could be close enough that the examiner would have rejected the application, had she known the facts; failure to disclose *may* have affected issuance of the patent; and a reasonable examiner *might* have considered the omitted information "important." Thus, it is possible that the omission might constitute inequitable conduct, even if there is no *actual* best mode violation (and even though questions of compliance with the best mode requirement rarely arise during patent prosecution). Given the criticism that some observers have leveled against the best mode doctrine generally (for example, that the penalty of invalidity is often disproportionate to the value of the withheld information, given that the inventor's best mode as of the date of filing may have little relevance to the practice of the invention many years later, and the absence of a best mode doctrine in any other country's patent system, see NAT'L RESEARCH COUNCIL, *supra* note 1, at 120-21), one might question whether it makes sense to allow accused infringers to leverage unsuccessful best mode defenses into successful inequitable conduct defenses.

As for enforcement costs, it seems clear that the easier it is to plead inequitable conduct, and the more complex the legal standards themselves are, the higher these costs will be. These costs may be borne in a number of ways. To the extent the examiner must wade through numerous references of marginal relevance, the already-backlogged patent examination system risks incurring additional delays. To the extent the examiner ignores all or most of the references, the cost of processing them is merely deferred to the time, if any, at which the patent is litigated. At that point, an expansive inequitable conduct doctrine raises the (already quite high) costs of patent litigation, not only because of the doctrine's complexity but also because of the additional discovery burden imposed on the patentee.⁷⁶ The system therefore risks imposing a vicious circle, insofar as the higher F_{ND} is in Expression (9) above, the more the prudent applicant will choose to disclose, all other things being equal; the more she discloses, the higher the ensuing litigation costs. At the margin, a feedback loop⁷⁷ may come into existence, as more and more disclosure is seen as routine, thus influencing courts' and parties' expectations of the data that reasonably should be viewed as falling within S .

B. Predicting the Effects of Various Proposed Reforms

Many of the reform proposals put forward in recent years rest upon the premise that current law induces applicants to overdisclose information of only marginal relevance.⁷⁸ The analysis presented in Part II provides a tool for predicting the effects of various reform proposals in countering this purported effect of current law. It also may assist in imagining other possible reforms, and in predicting the effects on disclosure of proposals intended to reform other aspects of the patent system.

1. Some Commonly Suggested Reforms

As stated above, a rational, risk-neutral applicant would prefer disclosure to nondisclosure if disclosure promises a positive return, and if

⁷⁶ For example, the attorney who drafted the application is typically deposed. Attorney-client privilege issues often arise. Satellite litigation over inequitable conduct can become a serious problem. *See* Cotropia, *supra* note 1, at 740. As for the expense of patent litigation, see AM. INTELL. PROP. L. ASS'N, 2009 REPORT OF THE ECONOMIC SURVEY 29 (reporting median litigation costs of \$650,000 to \$5.5 million, depending on the amount at risk).

⁷⁷ *Cf.* James Gibson, *Risk Aversion and Rights Accretion in Intellectual Property Law*, 116 YALE L.J. 883, 898-900 (2007) (arguing that risk-averse users' decisions to license rather than to assert fair use rights creates a similar sort of feedback effect). In the case of inequitable conduct, a feedback loop might result from courts coming to expect more disclosure, and hence being more apt to find omissions both material and intentionally deceptive.

⁷⁸ *See supra* note 32 and accompanying text.

$$R_1P(\text{Not-}A \cap B \cap d_E \cap d_{ND}) + R_2P(A \cap B \cap d_E \cap d_{ND}) + (F_{ND} - C_A - F_D) > \\ (R_1 - R_2)P(A \cap \text{Not-}d_E) + R_3P(B \cap d_E \cap d_{ND}).$$

(9)

We can also use Expression (9) to consider some of the reforms that critics of existing doctrine have proposed. One set of reform proposals would aim to reduce $P(B)$ by, for example, adopting a relatively narrow definition of materiality⁷⁹ or deceptive intent,⁸⁰ or by clarifying (or eliminating) the balancing inquiry modeled above in Expression (11).⁸¹ All other things being equal, a reduction in $P(B)$ reduces the three terms on the left-hand side of Expression (9) while leaving the first term on the right-hand side unchanged. (The R_3 term, under current law, equals zero). A predicted, and intended, result of reducing $P(B)$ therefore would be to reduce disclosure on the part of the applicant. To illustrate, consider the proposal to condition a finding of inequitable conduct upon a finding at t_3 that I renders one or more claims invalid.⁸² Anecdotally, the case law discloses several instances under current law in which information that the patentee withheld did not affect patentability but nevertheless did result in a finding of inequitable conduct.⁸³ In terms of the analysis above, this reform (as row 6 of Table 2 indicates) would in effect adopt an “ideal examiner” standard of materiality (because the court would be asking whether I should have affected claim validity from the court’s own, ideal, perspective as of t_3); would limit S to Subsets 1 and 2; and would equate x with 1. As a result, $P(B)$ would be on average lower than under current law, where S may include all four subsets and the value of x is indeterminate; and F_{ND} would be lower as well, reflecting a smaller expected

⁷⁹ See Dolak, *supra* note 1, at 887-88 (arguing that material misconduct should be defined as acts which “undermine the *substantive* examination function of the USPTO”); Mammen, *supra* note 1, at 1391 (arguing for adoption of the 1992 materiality standard).

⁸⁰ See Cotropia, *supra* note 1, at 775-77 (arguing in favor of “a specific, independent standard for intent”); Dolak, *supra* note 1, at 888-90 (arguing that courts should apply a more rigorous definition of intent); Mammen, *supra* note 1, at 1391-92 (similar).

⁸¹ See Dolak, *supra* note 1, at 890-91 (arguing that courts should abandon the balancing inquiry because “it exacerbates the problem of lax application of the intent standard”); Mammen, *supra* note 1, at 1391 (arguing for clarifying and codifying the balancing requirement).

⁸² Some of the Patent Reform Act proposals would have imposed a but-for requirement. See *supra* note 8; see also Brown, *supra* note 1, at 618 (discussing testimony presented at Patent Reform Act hearings in support of a but-for rule); McElhone, *supra* note 1, at 407-08.

⁸³ See, e.g., *Avid Identification Sys. v. Crystal Import Corp.*, 603 F.3d 967, 973 (Fed. Cir. 2010) (affirming judgment of unenforceability due to inequitable conduct, where company president failed to disclose a trade show demonstration that, “while not invalidating, reflected the closest prior art, and thus was highly material to patentability”); *Nilssen v. Osram Sylvania, Inc.*, 504 F.3d 1223 (Fed. Cir. 2007) (affirming judgment of unenforceability due to inequitable conduct; district court and Court of Appeals did not address validity), *cert. denied*, 128 S. Ct. 2938 (2008); *McKesson Info. Solutions, Inc. v. Bridge Med., Inc.*, 487 F.3d 897 (Fed. Cir. 2007) (affirming judgment of unenforceability of ’716 patent due to inequitable conduct; district court and Court of Appeals did not address validity); *Cargill, Inc. v. Canbra Foods, Ltd.*, 476 F.3d 1359 (Fed. Cir. 2007) (affirming judgment of unenforceability of ’169 and ’145 patents due to inequitable conduct; district court and Court of Appeals did not address the validity of these two patents).

litigation cost from nondisclosure. (The marginal decrease in uncertainty would also ameliorate risk aversion to some extent, as discussed in Part III.B.2 below.) In addition, because $P(\text{Not-}A \cap B)$ would be 0, the R_1 term on the left-hand side would equal zero and the left-hand R_2 term also would decrease. As expected, then, the proposal would reduce the amount of disclosure—perhaps significantly, because of the multiple consequences for the left-hand side.

To be sure, the model cannot predict the amount by which a reduction in $P(B)$ would decrease aggregate disclosure. Moreover, even if current law results in systematic overdisclosure, at some point further reductions in $P(B)$ (for example, eliminating the doctrine altogether, such that $P(B) = 0$) risk overshooting the mark (in terms of Figure 1, of moving Q^{**} to the left of Q^*).⁸⁴ In the example above, if the set S were defined too narrowly applicants might choose to conceal information falling within Subsets 3 or 4 above, or information the truth about which might have led the examiner to consider the evidence in a different light.⁸⁵ It is at least arguable, however, that the inequitable conduct doctrine need not be invoked in such circumstances. Opposing counsel who uncovers evidence that, for example, the applicant misrepresented its small inventor status could instigate disciplinary proceedings against the offending attorney.⁸⁶

⁸⁴ More precisely, eliminating the inequitable conduct doctrine altogether would mean, *ceteris paribus*, that disclosure would occur only when

$$(F_{ND} - C_A - F_D) > (R_1 - R_2)P(A \cap \text{Not-}d_E). \quad (13)$$

Given that $R_1 \geq R_2$, the right-hand term is positive and applicants would disclose only for sufficiently high values of $(F_{ND} - C_A - F_D)$. This is not an impossible condition; if $P(d_E)$ is sufficiently high, Applicant might conclude that her revenue would be higher if she disclosed, accepted the resulting consequences if any, and reduced to some extent the risk of a potentially costly validity challenge thereafter. For low values of $P(d_E)$, however, Applicant may choose not to disclose I . (Recall that as $P(d_E) \rightarrow 0$, $(F_{ND} - C_A - F_D)$ can become negative. See *supra* p.21.) In such a case, the existence of some form of inequitable conduct doctrine may make the difference between applicant disclosure and nondisclosure.

⁸⁵ An example can be drawn from the facts of *New Medium*, where Judge Posner concluded that the applicant intentionally failed to disclose an expert’s previous connections with—and thus possible bias in favor of—the applicant. See *New Medium LLC v. Barco N.V.*, 582 F. Supp. 2d 991, 998 (N.D. Ill. 2008) (Posner, J., sitting by designation), *vacated by agreement of parties*, No. 05 C 5620, 2009 WL 2385890 (N.D. Ill. May 15, 2009); see also *Ferring B.V. v. Barr Labs., Inc.*, 437 F.3d 1181, 1188 (Fed. Cir. 2006) (stating that “a declarant’s past relationships with the applicant are material if (1) the declarant’s views on the underlying issue are material and (2) the past relationship to the applicant was a significant one”). Whether the truth would have made a difference or not is hard to tell. In terms of the Table 2 above, a materiality standard that requires proof that $x = 1$ might eliminate the incentive to disclose information of this type.

⁸⁶ See Brief & Appendix of the Am. Bar Ass’n as Amicus Curiae at 17 & n.6, Nos. 2008-1511, -1512, -1513, -1514, -1595, 2010 WL 2751537 (Fed. Cir. June 17, 2010) (discussing USPTO’s power to sanction patent attorneys); cf. *Cotropia*, *supra* note 1, at 766 (noting the various ways in which the failure to comply with the inequitable conduct doctrine can result in disciplinary action against the offending attorney). One piece of anecdotal evidence suggesting that opposing counsel would still be motivated to bring such lesser misconduct to the attention of a court, the USPTO, or another disciplinary authority, as appropriate, can be found in the context of Rule 11 sanctions. Rule 11 sanctions are generally less consequential than the penalties for inequitable conduct. See FED. R. CIV. P. 11(c)(4) (stating that sanctions “must be limited to what suffices to deter repetition of the conduct or comparable conduct by others similarly situated,” and

Alternatively, one could retain a broad definition of S while reforming the doctrine in other ways—for instance, by instituting a more nuanced system of penalties as discussed below, or by defining other $P(B)$ -related variables such as α and x with more precision.

A second set of reform proposals involves modifying the penalty for inequitable conduct in some manner. Under current law, a finding of inequitable conduct results in the patent being rendered unenforceable in its entirety; as noted above, however, some reformers have suggested an administrative penalty alone, or a range of penalties from which a court could select, based on the seriousness of the offense.⁸⁷ In terms of Expression (9), any increase in the value of R_3 above its current value of 0 would increase the right-hand side of the Expression and thus make disclosure somewhat less likely, all other considerations being equal; it would also tend to mitigate, to some extent, any risk aversion⁸⁸ arising from uncertainty over the values of B , d_E , and d_{ND} . Moreover, to the extent R_3 is tailored to the egregiousness of the offense—that is, $R_3 = f(P(B))$ and $dR_3/d(P(B)) < 0$ —disclosure will decrease further as $P(B)$ decreases. How much less disclosure will occur depends on the magnitude of R_3 , holding everything else constant. At the same time, any such reform could marginally increase F_{ND} and C_E by adding yet another layer of complexity (selecting the right penalty) to the inequitable conduct doctrine, though this additional complexity could be mitigated by adopting guidelines along the lines advocated by Murphy.⁸⁹

A related reform would be to render unenforceable only those claims that are directly affected by the inequitable conduct.⁹⁰ Presumably this reform would still allow

“may include nonmonetary directives; an order to pay a penalty into court; or . . . an order directing payment to the movant of part or all of the reasonable attorney’s fees and other expenses directly resulting from the violation”). As noted above, inequitable conduct results in unenforceability of the patent, and sometimes payment of attorneys’ fees as well. *See supra* note 21 and accompanying text. Nevertheless, it appears that attorneys still file Rule 11 motions when the evidence so warrants. While hardly dispositive, a Westlaw search of (motion /s (“frcp” “fed. r. civ. p.” “fed. r. civ. proc.” “federal rule of civil procedure” “federal civil procedure rule”) +1 11) & da(aft 12-31-2008)) in the allfeds database yields 247 cites. *See also* Charles Yablon, *Hindsight, Regret and Safe Harbors in Rule 11 Litigation*, 37 LOY. L.A. L. REV. 599, 614-15 (2004) (presenting results of “quick and dirty empirical research” to the effect that motions for Rule 11 sanctions decreased, as intended, after 1993 amendment to the rule, but still appear to number in the hundreds every year).

⁸⁷ *See supra* text accompanying note 36.

⁸⁸ *See infra* Part III.B.2.

⁸⁹ *See* Murphy, *supra* note 1, at 2296-2302. Both Cotropia and Mammen argue against allowing courts discretion to choose among a range of penalties, however, on the ground that such discretion would increase uncertainty, *see* Cotropia, *supra* note 1, at 775, or encourage weak assertions of the defense, *see* Mammen, *supra* note 1, at 1392-93.

⁹⁰ *See* Cotropia, *supra* note 1, at 775; Mammen, *supra* note 1, at 1392. If information is material only if it would have affected patent validity at t_3 this rule would render the inequitable conduct doctrine moot. *See* Patent Office Prof’l Ass’n, *supra* note 1, at 1. If information can be material even though it does not affect validity at t_3 , however (for example, because a reasonable examiner would have considered it important), inequitable conduct would still have an independent, though limited, role to play even if only some of the patent’s claims are unenforceable. *See* Cotropia, *supra* note 1, at 779; Mammen, *supra* note 1, at 1392.

inequitable conduct to play a role independent of invalidity; a claim might not be rendered invalid by virtue of I , for example, but if I posed a sufficiently serious risk of invalidating a particular claim, the applicant's failure to disclose I would be grounds for rendering that claim (but not the entire patent) unenforceable. In addition to the reduction in effects resulting from risk aversion that this latter change would entail, the proposal would increase R_3 and decrease F_{ND} ; in combination, these effects would reduce disclosure in some amount, though perhaps less so than would a substantial reduction in $P(B)$.

2. The Effect of Risk Aversion

Thus far, the analysis has assumed a rational, risk-neutral applicant, but a more realistic assumption might be that the applicant (or her agent) is to some degree risk-averse. A risk-averse applicant, "when faced with a choice between two gambles with the same expected value, will usually choose the one with a smaller variability of return."⁹¹ In the present context, this means that a risk-averse applicant will sometimes choose disclosure over nondisclosure even when $E(R)_D < E(R)_{ND}$ —in effect, incurring the cost of a risk premium to avoid some degree of risk associated with nondisclosure.⁹² As a general matter, the greater the variance associated with $E(R)_{ND}$, the higher the risk premium a risk-averse applicant would be willing to incur. In the present context, the effect of risk aversion may be important, for two reasons.

The first is that risk aversion could play a significant role in determining how much information applicants disclose. To be sure, the applicant itself may be not the individual inventor, but rather a corporate assignee; and corporations may be less prone to risk aversion than are individuals.⁹³ But even if the assignee is not risk-averse, the

⁹¹ WALTER NICHOLSON, MICROECONOMIC THEORY 538 (9th ed. 2005); see also ROBERT S. PINDYCK & DANIEL L. RUBINFELD, MICROECONOMICS 158 (5th ed. 2001).

⁹² Suppose, for example, that $E(R)_D = \$100,000$ and $E(R)_{ND} = \$125,000$. Depending on her degree of risk aversion, a risk-averse applicant might prefer $E(R)_D$ to $E(R)_{ND}$ if the variance around the mean associated with nondisclosure is much larger than the variance associated with disclosure. To use the simplest possible example, if $E(R)_D$ were sure to equal \$100,000, whereas $E(R)_{ND}$ were sure to equal \$0 50% of the time and \$250,000 50% of the time, a moderately risk-averse applicant might choose the certain payoff associated with $E(R)_D$ to the less certain, though actuarially higher value, payoff associated with $E(R)_{ND}$.

⁹³ A common assumption among economists is that individuals tend to be risk-averse, while institutions tend to be risk-neutral. See, e.g., PINDYCK & RUBINFELD, *supra* note 91, at 157; RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW § 1.2, at 11 (7th ed. 2007). Even so, corporate agents (like the patent attorneys discussed in the text above) may be risk-averse and, absent effective monitoring, act accordingly (thus imposing an agency cost on their corporate principals). Whether individual inventors are likely risk-averse is unclear. See F.M. Scherer, *The Innovation Lottery*, in EXPANDING THE BOUNDARIES OF INTELLECTUAL PROPERTY: INNOVATION POLICY FOR THE KNOWLEDGE SOCIETY 3, 19-21 (Rochelle Cooper Dreyfuss et al. eds., 2001) (discussing the possibility of a "lottery effect," whereby some inventors and creators are motivated by the small ex ante probability of earning vast rewards from their creations); Cotter, *supra* note 70, at 529 n.192 (suggesting that "In many institutional settings, however, managers may be more risk-averse than the risk-loving individuals considered by Scherer").

individual patent attorney (like individuals generally) may exhibit some degree of risk aversion. As Cotropia notes, the consequences for an attorney accused of inequitable conduct can include reputational harm, disciplinary action, and opportunity costs associated with having to assist with discovery requests (including submitting to a deposition).⁹⁴ As a result, patent applicants may incur an agency cost resulting from the disparity between the applicant's and the attorney's tolerance for risk. To the extent legal services exhibit credence characteristics,⁹⁵ there may be no simple or direct way for applicants to constrain these costs.

The second is that, to the extent the applicant or her agent is risk averse, the many uncertainties inherent to the inequitable conduct doctrine may induce the applicant or her agent to disclose even when the left-hand side of Expression (9) is smaller than the right-hand side. Under current law, many of the considerations that a rational applicant would take into account in deciding whether to disclose are likely to exhibit high variability. In particular, the value of $P(B)$, which in turn informs the value of $E(R)_{ND}$, is dependent on the values of S , x , y , α , and z , and on the identity of the relevant examiner. As we have seen, none of these variables are clearly defined in the case law. A legal standard that reduces the uncertainty surrounding $P(B)$ —perhaps by adopting some version of an objective but-for test and by clarifying the meaning, and relation to materiality, of the deceptive intent element—would alleviate this problem to some extent (although substantial uncertainty still might surround other variables such as d_E and d_{ND} , and because it is a function in part of these variables, F_{ND}). Of course, the effect of such a change might also be to reduce the value of $P(B)$ as well, with the results as predicted in Part III.B.1 above. Clarifying the standard for materiality or intent, in other words, would likely have a compound effect on the applicant's incentive to disclose by both decreasing the left-hand side of Expression (9) and by reducing the impact, if any, of applicant risk aversion.

3. Some Less Obvious Reforms

To the extent overdisclosure is a problem under current law, a less obvious means for reducing that problem would be to raise C_A such that some amount of disclosure Applicant would find cost-effective under current law would become cost-ineffective. The USPTO's proposed rule requiring applicants to explain the relevance of information disclosed in an IDS⁹⁶ could have this effect, though it could have other consequences as

⁹⁴ See Cotropia, *supra* note 1, at 765-66.

⁹⁵ A credence good or service is one the quality of which the buyer has difficulty evaluating even after she has consumed it. See Michael R. Darby & Edi Karni, *Free Competition and the Optimal Amount of Fraud*, 16 J.L. & ECON. 67, 68-69 (1973).

⁹⁶ See Changes to Information Disclosure Statement Requirements and Other Related Matters, 71 Fed. Reg. 38808 (July 10, 2006); see also FED. TRADE COMM'N, *supra* note 1, ch. 5, at 12-13 (recommending greater use of relevance statements); Cotropia, *supra* note 1, at 777-78 (arguing in favor of prohibiting the submission of cumulative and nonmaterial prior art); Nolan-Stevaux, *supra* note 1, at 171-72 (arguing in favor of relevance statements).

well. In terms of Expression (8), raising C_A could result in more cases in which $E(R)_D = R_1P(\text{Not-}A) + R_2P(A) - C_A - F_D < 0$, with the result that the applicant might prefer abandoning the application to disclosing. On the other hand, to the extent an improved IDS would make it easier for the examiner to focus on relevant information, the number of erroneous grants should decrease, thus reducing the costs that invalid patents impose on potential licensees and accused infringers. In terms of the overall purpose of the inequitable conduct doctrine, however, requiring such disclosure makes sense only if (as Expression (2) proposes) $C_A < C_E$. In terms of Figure 1 above, the effect of such a move would be to shift U_A to the left; the disparity Figure 1 assumes between Q^* and Q^{**} likely would decrease.

Another possibility would be to raise the cost to defendants of asserting the defense. As noted above, defendants already must plead the defense with particularity and must prove materiality and intent by clear and convincing evidence.⁹⁷ Some commentators nevertheless have argued that the defense is often raised for its nuisance value, and have argued that courts or Congress should consider reforms that would target such abuses, such as more frequently awarding prevailing plaintiffs the attorneys' fees they incur in responding to the defense.⁹⁸ The model presented above does not directly capture the effects of the defense on defendant behavior; but reforms that would make the defense potentially more costly to assert presumably would reduce the frequency with which the defense is asserted and thus lower F_{ND} , thus in turn reducing the quantity of information applicants disclose purely for defensive purposes.

Another possible reform that, on its face, has nothing to do with the inequitable conduct doctrine nevertheless likely would impact the doctrine indirectly. The reform at issue is the adoption of a postgrant opposition process similar to that which other nations have in place.⁹⁹ The purpose of introducing postgrant oppositions would be to provide a

⁹⁷ See *supra* note 18.

⁹⁸ See NAT'L RESEARCH COUNCIL, *supra* note 1, at 123 (arguing in favor of fee-shifting); Dolak, *supra* note 1, at 892 (arguing that "it may make sense to implement a fee-shifting provision in favor of patentees who prevail on the issue [of inequitable conduct], for example, an automatic award of inequitable conduct-related attorney fees to a plaintiff who prevails on inequitable conduct, regardless of whether the patentee wins on infringement and validity"); Brown, *supra* note 1, at 627-28 (arguing for fee shifting when a court awards summary judgment to the patentee on the issue of inequitable conduct); Mack, *supra* note 1, at 172 (proposing fee shifting); Nolan-Stevaux, *supra* note 1, at 167-69 (arguing for fee shifting when a court awards summary judgment to the patentee on the issue of inequitable conduct).

⁹⁹ The various proposed Patent Reform Acts also have included provisions that would enable third parties to submit prior art to the USPTO before the issuance of the patent, though not to commence opposition proceedings at that time. See, e.g., See S. 515, 111th Cong., 1st Sess., §§ 5, 7 (as reported out of committee Apr. 2, 2009); H.R. 1260, 111th Cong., 1st Sess., §§ 6, 9 (as introduced Mar. 3, 2009). Some other commentators have suggested a relationship between inequitable conduct and third party submissions/oppositions. See NAT'L RESEARCH COUNCIL, *supra* note 1, at 123 (arguing that the doctrine would be unnecessary in light of such reforms); Armitage, *supra* note 1, at 6 (arguing that "commercially motivated competitors would likely assure that the information on which patent validity depends would be put before the Office" if Congress enacted legislation requiring publication of all applications at filing, permitting postapplication submissions, and permitting postgrant oppositions); Wasserman, *supra* note 1, at 26.

method, speedier and more effective than current reexamination procedures, for interested parties to challenge potentially invalid patents shortly after grant, before the issue is likely to arise in litigation.¹⁰⁰ Assuming the reform has the intended consequence of bringing more invalidating prior art to the attention of the USPTO, the reform would tend to increase d_E .¹⁰¹ The effect would likely be to increase disclosure, because an increase in d_E increases all three variables from the left-hand side of Expression (9) ($R_1P(\text{Not-}A \cap B \cap d_E \cap d_{ND})$, $R_2P(A \cap B \cap d_E \cap d_{ND})$, and F_{ND}) and decreases the first term on the right. (Increasing d_E also increases the R_3 term on the right, but as long as this term remains at or near zero the effect will be minimal.) To the extent the current system already induces overdisclosure, then, introduction of an opposition system into U.S. law could aggravate the problem at least in some cases. The reform nevertheless might be desirable, if it has the intended effect of weeding out invalid patents (and thus reducing their social costs) at a relatively early stage. Moreover, one might speculate that reforming the inequitable conduct doctrine, coupled with the adoption of an opposition system, would tend to cancel out any risk of encouraging yet more overdisclosure. The fact that other countries have oppositions and not an inequitable conduct doctrine is suggestive of the possibility that disclosure is adequate under such a combination, though of course no definitive inferences can be drawn merely from possibilities. Alternatively, the lack of an inequitable conduct doctrine in other countries may help to explain why oppositions *are* an important part of foreign patent systems. Either way, the analysis provides some reason for concern that eliminating the inequitable conduct doctrine altogether, without adopting oppositions or other measures designed to increase d_E , would be ill-advised.

IV. Conclusion

At the end of the day, the formal analysis presented above leaves open many questions concerning the optimal contours of a doctrine of inequitable doctrine. The analysis nevertheless does suggest several practical implications, among them that the doctrine is at best an imperfect means of inducing optimal disclosure; that existing doctrine leaves many key concepts without any precise definition; that the resulting uncertainties in the operation of existing doctrine likely would induce risk-averse agents to overdisclose; that, if overdisclosure is a pressing problem under current doctrine, any of a number of reforms would reduce its significance, with adoption of a but-for standard of materiality probably having the greatest potential payoff; and that the social benefits of an inequitable conduct doctrine are likely to be greater in a system like the United States' in which opportunities for postgrant oppositions are constrained (conversely, the benefits of an expansive inequitable conduct doctrine may be small or negative in a system in which postgrant oppositions are common). Future work might fruitfully explore ways to test some of these conclusions empirically, for example, by investigating whether foreign

¹⁰⁰ See S. REP. NO. 110-259, *supra* note 1, at 18-23; see also NAT'L RESEARCH COUNCIL, *supra* note 1, at 95-103.

¹⁰¹ To be sure, some such prior art would have been discovered later on, in litigation or elsewhere. But some of it might have escaped the attention of the infringement defendant.

patent regimes suffer from a greater incidence of fraud-related harms in the licensing and enforcement of patents. It also may be worth noting that, while the optimal amount of fraud in the absence of error and enforcement costs may be zero,¹⁰² in the presence of such costs attempts to reduce false negatives to zero not only will be costly to enforce but may dilute the value of truthful information to some degree.¹⁰³ As courts and Congress struggle to develop a better framework, they would do well to consider the tradeoffs and imperfections inherent in any system designed to reduce the incidence of fraud.

¹⁰² See *Ackerman v. Schwartz*, 947 F.2d 841, 847 (7th Cir. 1991) (Easterbrook, J.).

¹⁰³ See *Cotropia*, *supra* note 1, at 773; compare Richard Craswell, *Interpreting Deceptive Advertising*, 65 B.U. L. REV. 657, 688-92 (1985) (arguing that overregulation of false advertising can be counterproductive, to the extent it chills advertisers from making truthful statements as well).