

Expert Analysis

The Misunderstood Nash Solution For Reasonable Royalties

By **Marianne Ley Hayek** April 4, 2018, 12:07 PM EDT

In remarks describing the [U.S. Department of Justice](#)'s newly formed "Jackson-Nash Address" series in February, Assistant Attorney General Machan Delrahim said that both Justice Robert Jackson and Nobel Prize-winning economist John Nash "have a lasting influence on modern legal and economic thinking."^[1] Citing Jackson's "visionary understanding of the consequences of applying economics to legal analysis," and Nash's "seminal innovations that have become essential tools for economists," Delrahim emphasized how innovative economic analysis is vital to effective antitrust enforcement.^[2] In particular, bargaining theory — John Nash's seminal contribution to economics — has long been used in merger analysis to evaluate the potential of the merged firm to extract increased profits due to enhanced bargaining power.^[3]



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Despite decades of acceptance in academic circles and antitrust courts' reliance on bargaining theory, patent courts (in particular the Federal Circuit) have dismissed recent applications of the so-called "Nash bargaining solution" to determine reasonable royalty damages. This article explains what the NBS is and how it can be a viable (and judicially accepted) method to calculate a reasonable royalty rate in patent infringement cases. Specifically, the NBS can support and enhance the [Georgia-Pacific](#) analysis by providing a sound economic methodology and a quantitative approach determining the royalty rate that would emerge from the hypothetical negotiation.

Reasonable Royalty Damages

Damages from the infringement of a utility patent must be "adequate to compensate for the infringement but in no event less than a reasonable royalty."^[4] Royalty damages are typically calculated using an adjudicated royalty rate multiplied by a base that is the infringing sales.^[5] For decades, courts have used the 15 factors depicted in the Georgia-

Pacific v. United States Plywood Corp. decision to guide the determination of the reasonable royalty rate.[6] While scholars (and some courts) have tried to dismiss the Georgia-Pacific construct as arbitrary and subjective,[7] most patent damages experts adopt the template and pay particular attention to factor 15, the hypothetical negotiation. The 15th and arguably the most important Georgia-Pacific factor frames the reasonable royalty rate as the “amount that a licensor (such as the patentee) and a licensee (such as the infringer) would have agreed upon (at the time the infringement began) if both had been reasonably and voluntarily trying to reach an agreement.”[8] This is precisely the type of “bargaining problem” that John Nash’s scholarship described, earning Nash rock-star status in the branch of economics known as game theory.[9]

The Hypothetical Negotiation as a Game

With his 1950 treatise "The Bargaining Problem," John Nash demonstrated that, under certain conditions, the result of a negotiation (such as the hypothetical negotiation to determine a reasonable royalty rate) depends on each parties' best alternatives should the negotiations fail as well as the total benefits generated from a cooperative agreement.[10] With these elements identified, Nash’s theorem provides equations that describe the expected outcome of the negotiation. The solution (the NBS) divides the excess profits from licensing equally between the parties. In game theory parlance, “disagreement payoff” refers to the profits earned if the negotiation fails (the best alternative to a negotiated outcome) and the “cooperative payoff” from agreement is the total profits (for both parties) from a successful negotiation. The “bargaining solution” is the difference between the cooperative payoff and the sum of the disagreement payoffs. As long as the negotiation results in a total payoff that is greater than the sum of the disagreement payoffs, the NBS predicts that the bargaining surplus (which is the difference between the total payoff and the sum of the disagreement payoffs) is distributed equally between the parties.

It is important to note that the bargaining surplus subject to the 50/50 split is not the defendant’s profit or expected profit. The bargaining surplus (the additional total profit from a licensing agreement) can be interpreted as the “gains from trade” from a license between the patent holder and the licensee. The bargaining surplus also reflects the overall value of the patented technology compared to noninfringing alternatives. The NBS-supported royalty rate is one that results in each party receiving its disagreement payoff plus one-half of the bargaining surplus.

The disagreement payoffs are an important component of the NBS allocation and are often considered representative of the parties' relative bargaining positions. Let's say the patent holder is a manufacturer and the patented technology is a crucial component of a very popular, profitable consumer product. Because the patent holder's disagreement profits are high (she can forgo licensing the technology and earn profits from selling the product exclusively), the royalty rate from the hypothetical negotiation must be high. It must be high enough to cover the patent holder's opportunity costs plus allocate one-half of the bargaining surplus. Similarly, if there are alternative noninfringing technologies readily available to the potential licensee, his disagreement payoff is large (he can easily design around the patented technology) and the Nash solution (with its royalty rate that covers each party's disagreement payoff plus a 50/50 split of the bargaining surplus) results in a low negotiated royalty rate. By focusing on the opportunity costs to each party, as well as the value of the patented technology as reflected in the bargaining surplus, the NBS provides the proper analytical framework for the hypothetical negotiation.

Court's Reaction to the NBS

While district courts have had mixed reactions to the NBS in patent damages cases,[11] the Federal Circuit soundly admonished its application the 2014 *Virnetx v. Cisco* decision.[12] The *Virnetx* court said that it "agree[d] with the [lower] courts that have rejected invocations of the Nash theorem without sufficiently establishing that the premises of the theorem actually apply to the facts of the case at hand." [13] As noted above, the NBS is based on a set of assumptions; the *Virnetx* court made clear that experts who use the NBS to support their reasonable royalty rate opinion must evaluate these premises and tie them to the specific facts of the case under consideration.

Premises of the NBS

The NBS is based on a reasonable set of assumptions; experts should carefully evaluate each condition and demonstrate that they are satisfied by the facts of the case at hand. First, the solution must satisfy what economists call "Pareto efficiency." There can be no alternative reasonable royalty rate that is better for one party (for example, the licensor would prefer an alternative royalty rate) while not making the other party worse off (the licensee must be made worse off by this alternative). In addition, the total payoff from the cooperative solution must be greater than the sum of the disagreement payoffs. Second, the Nash solution assumes agents behave rationally; neither party will accept a negotiated

outcome that is less than what they could earn without an agreement. Rationality also assumes that the numeric specification of the payoffs (dollars vs. yen, for example) is irrelevant and eliminating alternatives other than the disagreement profits (the best outcome from non-negotiation) does not affect the solution.

These are the premises of the NBS that the Virnetx court warned must be applicable to the circumstances, saying that “[a]nyone seeking to invoke the theorem as applicable to a particular situation must establish that fit, because the 50/50 profit-split result is proven by the theorem only on those premises.”^[14] Once your expert establishes that the NBS premises fit the facts of the case at hand, the NBS can be used as a precise and impartial methodology to evaluate Georgia-Pacific factor 15, the hypothetical negotiation.

Georgia-Pacific Factors

Establishing the fit between the NBS axioms and the facts of the case can be accomplished with an evaluation of the remaining Georgia-Pacific factors. Factors 1, 6, 8, 11 and 13, for example, relate to the profitability of the patented technology which is a factor in determining if the total cooperative payoff is Pareto-efficient. Georgia-Pacific factors 2, 3, 4, 5 and 12 address the nature of the license, the rates paid for use of comparable technology, the licensor’s established policy of licensing the technology and the level of competition between the patent holder and the infringer; all factors that affect the relative bargaining positions of the patent-holder and the licensee. Finally, assessing the importance of the patented technology (Georgia-Pacific factors 7, 9 and 10) is crucial to satisfying the rationality condition of the NBS solution.

Conclusion

While antitrust analysis has embraced bargaining theory and John Nash’s contribution to competitive analysis, patent courts’ apparent disdain for the NBS has been misunderstood: Proper application of Nash’s theorem, in the context of the Georgia-Pacific framework, provides an unambiguous and defensible analysis of the hypothetical negotiation and the resulting reasonable royalty rate.

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[1] Assistant Attorney General Makan Delrahim Delivers Remarks for the Inaugural Jackson-Nash Address, Washington, DC Monday, February 26, 2018.

[2] *Id.*

[3] See, for example, *FTC v. OSF Healthcare Sys.*, 852 F.Supp.2d 1069, 1084 (N.D. Ill. 2012) and U.S. Department of Justice & [Federal Trade Commission Commentary](#) on the Horizontal Merger Guidelines (Mar. 2006) at p. 34. “The Agencies have used bargaining theory to analyze the effects of hospital mergers on the prices they charge managed care organizations (“MCOs”).”

[4] 35 USC Section 284.

[5] A recent exception is [Finjan, Inc. v. Blue Coat Sys., Inc.](#), No. 2016-2520 (Fed. Cir. Jan. 10, 2018). The Federal Circuit ruled that apportionment is required even when damages are based on a per-unit royalty.

[6] *Georgia-Pacific Corp. v. U.S. Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970). The factors are: 1. Royalties patentee receives for licensing the patent in suit 2. Rates licensee pays for use of other comparable to the patent in suit 3. Nature and scope of license in terms of exclusivity and territory / customer restrictions 4. Licensor’s established policy and marketing program to maintain patent monopoly by not licensing others to use the invention 5. Commercial relationship between licensor and licensee, such as whether they are competitors or inventor and promoter 6. Effect of selling the patented specialty in promoting sales of other products of the licensee; the existing value of the invention to the licensor as a generator of sales of his non-patented items; and the extent of such derivative or convoyed sales 7. Duration of patent and term of license 8. Established profitability of the products made under the patent, its commercial success and its current popularity 9. Utility

and advantages of patent property over old modes and devices 10. The nature of the patented invention; the character of the commercial embodiment of it as owned and produced by the licensor; and the benefit of those who have used the invention 11. The extent to which the infringer has made use of the invention and the value of such use 12. The portion of profit or selling price customarily allowed for the use of the invention 13. The portion of realizable profit attributable to the invention as distinguished from non patented elements, significant features / improvements added by the infringer, the manufacturing process or business risks 14. Opinion testimony of qualified experts 15. Outcome from hypothetical arm's length negotiation at the time of infringement began.

[7] See "The Evolving IP Marketplace: Aligning Patent Notice and Remedies with Competition (March 2011)." The FTC suggests that the Georgia-Pacific approach "permits the patentee to introduce or emphasize information that leads the jury away from an economically grounded analysis." (at p. 182). See also *Fromson v. W.Litho. Plate & Suplly Co.*, 853 F.2d 1568, 1574 (Fed. Cir. 1988). The Georgia-Pacific analysis is "a difficult judicial chore, seeming often to involve more the talents of a conjurer than those of a judge."

[8] *Id* at 1120.

[9] John Nash and his "beautiful mind" were even the subject of a 2001 movie directed by Ron Howard and starring Russell Crow.

[10] John F. Nash, Jr., *The Bargaining Problem*, 18 *ECONOMETRICA* 155 (1950).

[11] In *Oracle Am., Inc. v. Google Inc.*, 798 F. Supp. 2d 1111 at 1119, (N.D. Cal. 2011), the court said that the expert "glossed over the axioms underlying the Nash solution without citing any evidence to show that those assumptions were warranted in the present case." However, other courts have allowed use of the NBS to support a reasonable royalty rate. See *Summit 6 LLC v. Research in Motion Corp.*, No. 3:11-cv-367-O, 2013 U.S. Dist. LEXIS 95164 at *32 (N.D. Tex. June 26, 2013) and *Mformation Techs., Inc. v. Research in Motion Ltd.*, no. C-08-04990 JW, 2012 U.S. Dist. LEXIS 56784.

[12] *Virnetx, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1332 (Fed. Cir. 2014).

[13] *Id* at 1312.

[14] *Id.* at 1333. As discussed, however, the NBS suggests a 50/50 split of the bargaining surplus, not the profits of either the patent-holder or the licensee.