Magic Bullet Or Rule Of Thumb: Determining Reasonable Royalties With Corporate Discount Rates Using The Muthoo Model

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Abstract

Damages experts in patent litigation have been applying an economic model based on the work of Dr. Abhinay Muthoo[1] to determine reasonable royalty rates through a profit sharing formula based on relative corporate discount rates.[2] The work of Dr. Muthoo has been oversimplified and misapplied in this context. Attempts to use corporate discount rates as the sole determinative measure of bargaining power in a hypothetical negotiation for a reasonable royalty are fundamentally flawed. This use of the Muthoo Model is nothing more than another unsupported rule of thumb that is unreliable for determining reasonable royalties in patent infringement matters.

I. Introduction

Over the past decade, the courts have paid increasingly close attention to the methods used to determine reasonable royalty rates in patent infringement litigation. This scrutiny has resulted in a fundamental change in the way many experts determine royalty rates. "Rules of thumb" or other generic formula-based approaches have generally been found to be inadmissible because they are not specific to the facts of a given case and do not closely reflect the value or benefit associated with the use of the patented technology.

Nevertheless, some academics and damages experts continue to introduce royalty opinions based on broadly applied formulas derived from aspects of economic bargaining theory. For a brief period, many damages experts offered royalty opinions that relied in part on the *Nash Bargaining Solution*. More recently, some damages experts have used a theory based on the work of Dr. Abhinay Muthoo. Aspects of his work are similar to the *Nash Bargaining Solution*, but use the relative discount rates of the parties to determine how the parties at the hypothetical negotiation would negotiate a split of the profits.

This article discusses the *Muthoo Model*, its inputs, and potential application to determine reasonable royalties in patent infringement matters. Ultimately, we conclude that despite attempts to consider the facts specific to the parties, analyses that rely on discount rates alone to measure the relative bargaining strength of the parties and calculate how an economic surplus would be shared are nothing more than another rule of thumb. As such, they provide little help to courts and juries in providing a reliable basis for determining reasonable royalty rates in patent infringement matters.

II. Reasonable Royalties in Patent Litigation and Rules of Thumb

In general, a patent holder is entitled to no less than a reasonable royalty from the infringer of a valid patent.[3] A common approach to determining the amount of a reasonable royalty is the "hypothetical negotiation" construct established in *Georgia-Pacific v. U.S. Plywood*.[4] However, *Georgia-Pacific* (and the cases that followed) provide no mathematical formula to determine the final royalty rate.[5]

In the absence of a clear and accepted formula, experts have applied professional judgment to the facts and circumstances of each case to determine the results of the "hypothetical negotiation." This subjectivity has led to sometimes conflicting case law on reasonable royalty issues, as well as numerous *Daubert*

1. Muthoo, Abhinay, "Bargaining Theory with Applications," (New York; Cambridge UP, 1999).

2. See for example, "Splitting the Atom: Economic Methodologies for Profit Sharing in Reasonable Royalty Analysis," *les Nouvelles*, Volume LI No. 2, (June 2016) 70-73.

3. *35 U.S.C. § 284*.

4. *Georgia-Pacific Corporation v. United States Plywood Corporation*, 318 F Supp. 1116 (S.D.N.Y. 1970).

challenges on the admissibility of expert opinions on reasonable royalties.

For many years, certain damages experts and their clients looked for simple mathematical formulas to apply to every hypothetical negotiation. The *25% Rule* was such a profit splitting formula, and was widely used by some experts until the Federal Circuit rejected it as an inappropriately broad rule of thumb in 2011.[6]

Other economic and financial models have been developed that attempt to allocate incremental profits among parties in licensing negotiations. For example, Granstrand and Holgersson (2012) describe a model for dealing specifically with standard essential patents subject to FRAND royalty terms based on each contributor's relative level of investment in the technological standard.[7] However, this model has not been frequently applied in the courts and its applicability in a licensing situation that does not include FRAND obligations is not explored in the article.

Following the rejection of the *25% Rule*, some experts began to broadly use a 50/50 profit split formula based on an economic theory developed by John Nash; the *Nash Bargain Solution* (NBS.) However, the general application of the NBS was similarly rejected as a rule of thumb in a 2014 ruling by the Federal Circuit.[8] Specifically, the Federal Circuit found that absent a detailed showing that the underlying assumptions of the economic model would apply to the specific facts and circumstances of the case, the NBS was an unacceptable rule of thumb.

In recent years, some experts have begun using a different mathematical formula for determining the profit split that would result from the hypothetical negotiation. This approach determines the portion of the profit, or economic surplus to award as a royalty based on the relative bargaining power of the parties. While consideration of the relative bargaining power of the parties has been emphasized by the Federal Circuit in many decisions, in this model, the parties' relative bargaining power is based entirely on differences in their discount rates, and specifically, each entity's corporate cost of capital.[9]

III. The *Muthoo Model*

The use of discount rates to determine the relative bargaining strength, and therefore the profit split between parties to a negotiation is largely based on the work of Dr. Abhinay Muthoo, an economics professor at the University of Warwick. In his book, *Bargaining Theory with Applications* (1999), Muthoo theorizes that parties to a negotiation would divide an economic surplus based on their relative bargaining power. The relative bargaining power can be measured, according to Muthoo, by differences in the parties' discount rates.[10] This framework of the *Muthoo Model* has been discussed and applied in subsequent academic research.[11]

In its base form, the *Muthoo Model* asserts that the economic surplus would be split between the negotiating parties based only on their relative discount rates. The model was extended and refined in *Bargaining Theory with Applications* to include other relevant factors that may change the outcome of the negotiation from what the base form alone would suggest. These other factors include the impact of the parties' relative payoffs and aversions to a breakdown of the negotiation, changes in the bargaining procedures, the availability to the parties of other options to negotiation, and information asymmetry at the bargaining table, among other factors. However, the focus of this article is on the model in its base form as that is how it has been applied to determine reasonable royalties in patent litigation.

5. For example, in *Georgia-Pacific*, Judge Tenney described the process of determining a reasonable royalty through the hypothetical negotiation as "…There [are] a multiplicity of interpenetrating factors bearing upon the amount of a reasonable royalty. But there is no formula by which these factors can be rated precisely in the order of their relative importance or by which their economic significance can be automatically transduced into their pecuniary equivalent. In discharging its responsibility as fact finder, the Court has attempted to exercise a discriminating judgment reflecting its ultimate appraisal of all pertinent factors in the context of the credible evidence." The Federal Circuit has also repeatedly "recognized that estimating a reasonable royalty is not an exact science" and that "all approximations involve some degree of uncertainty." See, for example, *Summit 6, LLC v. Samsung Elecs. Co.*, 802 F.3d 1283, 1299 (Fed. Cir. 2015).

6. *USA v. Microsoft Corp.*, 632 F.3d 1292, 1315 (Fed. Cir. 2011).

7. Granstrand, O. and M. Holgersson, "The 25% Rule Revisited and a New Investment-Based Method for Determining FRAND Licensing Royalties." *les Nouvelles* (September 2012) 188-195.

8. *VirnetX, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1337 (Fed. Cir. 2014). The Court did suggest that NBS may be appropriate in circumstances where the expert can show that the specific underlying assumptions of the theorem are met in a given case.

9. See, for example, *Deere & Co. v. Int'l Harvester Co.*, 710 F.2d 1551, 1559 (Fed. Cir. 1983), *Fujifilm Corp. v. Benun*, 605 F.3d 1366, 1372 (Fed. Cir. 2010), *VirnetX, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1331-33 (Fed. Cir. 2014).

10. Muthoo, Abhinay, "Bargaining Theory with Applications." Chapter 3. (New York; Cambridge UP, 1999).

11. See for example, Muthoo, Abhinay, "Bargaining Theory and Royalty Contract Negotiations," *Review of Economic Research on Copyright Issues*, 2006, vol. 3(1), 19-27. For a listing of academic papers, see Mcduff, Deforest. "Splitting the Atom: Economic Methodologies for Profit Sharing in Reasonable Royalty Analysis," *les Nouvelles*, Volume LI No. 2, (June 2016) 70-73.

The *Muthoo Model* has been widely studied, and many scholars have attempted to verify its predicted outcomes with experiments or by looking at data from actual negotiations.[12] Muthoo has, however, noted that "this theory cannot be tested by an appeal to experimental or field data."[13] Muthoo concludes that any experimental data or field data would necessarily involve other elements outside the model's parameters, including human irrationality. Muthoo's comments provide instructive context on the admissibility of expert testimony based on the model, as one of the hallmark requirements of admissibility under *Daubert* and its progeny is the ability to test and recreate the results of an analysis.

IV. The *Muthoo Model* Applied to Patent Damages

In the past few years, the *Muthoo Model* has been receiving increasing attention in the context of determining reasonable royalty damages in patent litigation. As was the case with the prior mathematical profit splitting rules, proponents of the *Muthoo Model* have written articles in the licensing literature[14] and the model has been identified in seminars as a key trend in patent damages.[15] So far, it has met with mixed success in overcoming *Daubert* challenges in Court[16] and has been used with increasing frequency by damages experts in patent infringement matters.

It has been argued that the *Muthoo Model* provides academic support for a formula to split the incremental profits earned by the Defendant in proportion to the parties' *Weighted Average Costs of Capital* ("WACC"). Under the *Muthoo Model*, each company's cost of capital is used as a proxy for its bargaining strength. A party with higher capital costs has less bargaining power and would consequently receive a smaller share of the incremental profits than a party with lower capital costs. Thus, to the extent the use of patented technology results in an economic surplus, that surplus would be split at a hypothetical negotiation in accordance with each company's relative cost of capital.

It is easiest to see how the *Muthoo Model* has been applied to determining reasonable royalties with a simple example. Assume that Company A is the patent-owner (Plaintiff) and Company B is the accused infringer (Defendant). The allegedly infringing product is sold by Company B at a price of $1,000 per unit and Company B earns an incremental profit of $200 per unit on each sale. For simplicity in this example, assume the patent-in-suit is fundamental to the accused product, and the inclusion of the patented technology is the underlying driver of its sales and profits.

An application of the simplified *Muthoo Model* would suggest that the parties would have reached an agreement in the hypothetical negotiation to split the $200 of incremental profit per unit based on their relative WACCs. If Company A is a small, privately-held company with a WACC of 20 percent while Company B is a large, well-financed company with a WACC of 10 percent, the model suggests the profit split can be determined by the following formulas:[17]

$$\textit{Profit Split to Company A} = \frac{WACC_B}{(WACC_A + WACC_B)} = \frac{10\%}{(10\% + 20\%)} = 33\%$$

$$\textit{Profit Split to Company B} = \frac{WACC_A}{(WACC_A + WACC_B)} = \frac{20\%}{(10\% + 20\%)} = 67\%$$

This analysis suggests that Company A would receive one-third of the incremental profit as a royalty and Company B would retain two-thirds of the incremental profit from selling the accused product. The result of the hypothetical negotiation would be a $67 per unit royalty (one-third of the $200 incremental profit) paid by Company B (the infringer) to Company A (the patent holder.)[18]

On the surface, this approach to splitting the profits in the hypothetical negotiation looks promising. Bargaining models can provide a structured approach for evaluating the economic benefits generated by a patented technology that would be at issue in a hypothetical negotiation, and properly focus the reasonable royalty determination on those benefits. The *Muthoo Model* also has several enticing features; (1) it provides a simple, objective formula; (2) it is based on a well understood and researched economic theory; and (3) it is tied to information specific to the parties in the case (the infringer's incremental profit and the parties' relative WACCS.) However, reliably determining how any economic surplus should be split is a critical aspect of any bargaining model. As explained below, the *Muthoo Model* falls short in this key area with respect to determining a reasonable royalty.

12. For a list of some of these academic studies, see Deforest Mcduff, "Splitting the Atom: Economic Methodologies for Profit Sharing in Reasonable Royalty Analysis," Convert *les Nouvelles*, Volume LI No. 2 (June 2016) 70-73.

13. Abhinay Muthoo, "Bargaining Theory with Applications," (New York; Cambridge UP, 1999) 341.

14. Ibid.

15. Williams, Danielle and Chris Marchese, "Patent Damages Theories," *Fish & Richardson Webinar*, (December 1, 2016). *http://www.fr.com/events/webinar-patent-damages-theories.*

16. For example; this approach survived a *Daubert* challenge in *ContentGuard Holdings, Inc. v. Amazon.com*, 2:13-cv-01112-JRG (E.D. Tex. Aug. 6, 2015) (Doc. No. 825) but failed a *Daubert* challenge in *Omega Patents, LLC v. CalAmp Corp.*, 6:13-cv-1950 (M.D. Fla. Dec. 23, 2015) (Doc. No. 117).

17. Abhinay Muthoo, "Bargaining Theory with Applications," (New York; Cambridge UP, 1999) 46.

18. The royalty could also be equivalently expressed as a 6.7 percent of revenue ($67 royalty for each unit with a $1,000 price).

V. Criticisms of Applying the *Muthoo Model* to Reasonable Royalty Determinations

Careful consideration of the *Muthoo Model* and its application to the analysis of how the incremental profits associated with a patented technology would be shared at the hypothetical negotiation identifies many issues that suggest that it is nothing more than a more detailed version of the NBS, and its application to patent damages is another rule of thumb. Muthoo himself described the base variant of this economic model as "identical to an asymmetric *Nash Bargaining Solution* of an appropriately defined bargaining problem."[19] The key difference between the previously rejected NBS and the *Muthoo Model* is its reliance on the parties' corporate discount rates to measure each party's bargaining strength, rather than assuming equal bargaining strength.

The main issues with applying the *Muthoo Model* (in its base form) to patent litigation are: (1) the economic theory does not fit the specific construct of the hypothetical negotiation; (2) the sole reliance on corporate discount rates to measure relative bargaining strength is inappropriate; (3) the model ignores many factors long considered relevant to the determination of reasonable royalties; and (4) the model implicitly includes factors long considered irrelevant to the determination of reasonable royalties in patent litigation.

A. The Economic Model Does Not Fit the Hypothetical Negotiation Construct

The *Muthoo Model* is based on many implicit and explicit assumptions. Many of these assumptions are so limiting that they do not broadly apply to the construct of a hypothetical negotiation in a patent litigation, and are often divergent from real-world licensing negotiations. For example:

- The *Muthoo Model* assumes a positive economic surplus. In other words, the model assumes that there is some benefit to both parties from entering the transaction. This is not always the case in a hypothetical negotiation in a patent litigation. For example, there may be no benefit to be had by a highly-profitable patent holder licensing a valid patent to a less-profitable infringer who is a direct competitor. Also, the profits earned by some infringers may be limited for reasons unrelated to the profit-producing capabilities of the patented technology. This may cause the size of the shared economic surplus to be understated. The Federal Circuit has warned that the profits of an "inefficient infringer" need not cap the measure of the damages caused to the patent holder.[20]

  Additionally, in many cases where the patent is a small feature of a larger complex product, issues of apportionment can make it difficult to accurately identify the defendant's incremental profits from using the specific patented technology. Such patents may still have significant value even if incremental profits cannot be cleanly identified.

- The *Muthoo Model* implicitly assumes exclusivity. The bargaining problem is often described as how two parties will split a cake sitting on the table between them. The same piece of cake cannot be given to multiple people—each piece must be exclusively given to only one person. However, most reasonable royalty analyses in patent litigation assume the hypothetical license would be non-exclusive. Unlike a cake, one could grant many parties non-exclusive licenses to the same patent. Granting a non-exclusive license to one player in an industry may impact licensing revenues the patent holder would receive from prior licensees, and it may even impact profits that the patent holder would itself earn on products incorporating the patented technology. The impact of the non-exclusive nature of certain intellectual property assets is not addressed in the *Muthoo Model* as it has been applied in reasonable royalty analyses.
- The *Muthoo Model* accounts for the ability of the parties not to reach an agreement. Muthoo identifies that payoffs for the negotiating parties "when (and if) negotiations breakdown and their respective degrees of risk aversion are crucial determinants of the bargaining outcome."[21] However, in the hypothetical negotiation construct, the parties must reach an agreement.
- Muthoo extends the model by altering the equations to account for inside and outside options.[22] In patent litigation, these inside and outside options would be analogous to the availability of non-infringing alternative technology. The existence of inside and outside options impacts the negotiation outcome and may cause the result to differ from the simple relative weighting of the parties' relative discount rates. A profit split based solely on the relative WACC of the parties inappropriately ignores these complications. Applying the base form of the *Muthoo Model* ignores the impact of non-infringing alternatives at the hypothetical negotiation, unless any such alternatives have already been accounted for in the economic surplus being considered by the parties.
- The *Muthoo Model* is based on a very specific set of bargaining procedures. In the alternating-offer bidding

19. Abhinay Muthoo, "Bargaining Theory with Applications," (New York; Cambridge UP, 1999) 42.

20. See Aqua Shield v. Inter Pool Cover Team, et al., 774 F.3d 766, 770 (Fed. Cir. 2014).

21. Abhinay Muthoo, "Bargaining Theory with Applications," (New York; Cambridge UP, 1999) Chapter 4, specifically 73.

22. Abhinay Muthoo, "Bargaining Theory with Applications," (New York; Cambridge UP, 1999) Chapters 5 and 6.

procedure, party A makes an offer, and party B then accepts it or issues a counteroffer.[23] In the real-world, bargaining procedures are often ambiguous or ill-defined. Parties can make offers in any order and parties can ignore offers without issuing a counter offer.

For example, if party A makes repeated offers and party B accepts or rejects those offers without countering, Muthoo indicates that the discount rates of the parties have no impact whatsoever on the bargaining outcome.[24] Since there is no reason to assume that the hypothetical negotiation would always perfectly follow the alternating-offers bidding procedure required for the *Muthoo Model*, it is inappropriate to assume it broadly applies.

For these reasons, the economic theory underlying the *Muthoo Model* does not map to the specific circumstance of a hypothetical negotiation to determine a reasonable royalty for the use of a patent.

B. Corporate WACCs Are Not Relevant Discount Rates

The portion of the profit received by the patent holder as a royalty under the applied *Muthoo Model* is largely dependent on the parties' weighted average costs of capital. This is a measure of the average cost of a company's equity and debt. As such, it is a company-wide statistic.

1. WACC as a Concept May Not Be Relevant to All Litigants

The concept of WACC is generally applied in finance to operating companies. There are many patent litigations that involve parties where the concept of WACC may not be as applicable. For example, it is not clear what discount rate one should use in the *Muthoo Model* if one of the parties is a non-practicing entitiy (NPE), a not-for-profit research institution (*i.e.*, a university or a research hospital), or an individual inventor.

2. WACC Is Biased by Corporate Financing Decisions

In operating companies, WACC is influenced by corporate financing decisions. Generally, the after-tax cost of debt is less than the cost of equity. A decision by a company to change its relative level of debt and equity will likely change the company's WACC. Under the *Muthoo Model*, these corporate financing decisions would have a direct impact on the final royalty determination that results from the hypothetical negotiation. Specifically, a company could improve (or weaken) its bargaining position in the hypothetical negotiation by issuing debt (or equity). There is no reason to believe that such a corporate financing decision made by a patent holder or alleged infringer significantly impacts the "the value of the use of the patented technology" that the Federal Circuit and Supreme Court have said "measures the reasonable royalty."[25]

3. Overall Corporate Capital Costs May Not Be Relevant

The WACC of an entire company is not usually the metric that would be considered to evaluate an investment in an individual product or project. This is because the risk of a specific corporate project differs from those associated with the operation of an entire company that may have a diverse product line. For example, after a corporate acquisition a company's overall WACC may change but the risk profile associated with individual product lines may be unaffected. Thus, a company-wide WACC may not be the appropriate measure to evaluate a single project or product that may be allegedly infringing and the focus of the hypothetical negotiation.

4. Product Specific Capital Costs May Not Be Appropriate Either

Product specific costs of capital or discount rates may be no more appropriate to the analysis of bargaining power than general corporate discount rates. A company can finance a new product launch from retained earnings (an equity cost of capital), through the issuance of new debt (a debt cost of capital) or some combination of the two (a blended cost of capital). If a company makes a significant capital investment to launch an infringing product line, that company's bargaining position at the hypothetical negotiation should not be impacted by how the company financed that product launch. Therefore, it would be inappropriate to use a product level cost of capital in the *Muthoo Model* (even if one was calculable based on information in the litigation record).

Additionally, when developing new product lines, many companies perform detailed financial analyses that may include product specific discount rates applied to expected future cash flows. These management determined discount rates can be hurdle rates for the entire business, or they can be subjectively determined for the specific project. There are many situations where these management determined discount rates may diverge from the corporate costs of capital. For example, management may set higher hurdle rates than its cost of capital in situations of

23. A. Rubinstein, "Perfect Equilibrium in a Bargaining Model," *Econometrica*, 50: 97-110 (1982). The alternating-offer bidding procedure is referred to as the *Rubenstein Model*.

24. Abhinay Muthoo, "Bargaining Theory with Applications," (New York; Cambridge UP, 1999) Chapter 7, specifically 190.

25. *Aqua Shield v. Inter Pool Cover Team, et al.*, 774 F.3d 766 (Fed. Cir. 2014), citing *Dowagiac Mfg. Co. v. Minn. Moline Plow Co.* 235 U.S 641 (1915) at 648.

capital scarcity when evaluating competing alternative projects or to develop more conservative business plans. There is no reason to inherently assume that the product specific discount rates that may be used by management are related to the company's bargaining power in a hypothetical negotiation.

5. Conclusion on Capital Costs

In determining a reasonable royalty, corporate WACCs have been used in the *Muthoo Model* as a proxy for the relative bargaining strength of the parties. In fact, the party-specific nature of these discount rates is one of the primary reasons proponents of the *Muthoo Model* argue that it succeeds where the NBS failed in the eyes of the Federal Circuit: that it considers and accounts for the specific facts of a case. However, use of an overall company's cost of capital provides little more than a thin veneer of party-specific facts over the base NBS theorem whose blind application has been rejected by the Federal Circuit.

Further, while it is well established that the cost of capital for individual companies is relevant for financial valuation, there are many reasons why the cost of capital of a company may not accurately reflect the bargaining strength of a party in the hypothetical negotiation construct. For example, corporate level WACCs are biased by corporate financing decisions and not necessarily related to the bargaining power of a company at a hypothetical negotiation for rights to a patented technology. More specific product level costs of capital or discount rates may also not reflect the bargaining power of a party to a hypothetical negotiation.

The above demonstrates that there are numerous external factors which affect a company's cost of capital. Many of these factors are unrelated to how a corporation uses the patented technology, or the benefits that are provided by that use. The patent damages statute defines a reasonable royalty as reflecting "the use made of the invention by the infringer."[26] Further, one of the fundamental requirements that has repeatedly been emphasized by the Federal Circuit in recent years is that royalties "must reflect the value attributable to the infringing features of the product, and no more."[27] In fact, the Federal Circuit has cautioned that "any evidence unrelated to the claimed invention" should not be given substantive weight in determining a reasonable royalty.[28] Accordingly, not only does the use of relative capital costs likely fail to provide a realistic, reliable measure of the parties' relative bargaining strength, it results in precisely what the Federal Circuit has warned against: it bases royalties on factors unrelated to the patented technology.

C. Ignores Relevant Factors

The *Muthoo Model* ignores other factors that courts often consider to be important that can influence the final royalty determination. For example:

- The level of competition between the parties is ignored in the *Muthoo Model* as it has been applied. When the profit split between the parties to the litigation is based solely on their relative WACCs, whether the parties are direct competitors is an irrelevant fact. However, the commercial relationship of the patent holder and alleged infringer is often considered (see *Georgia-Pacific* Factor 5) and it is generally accepted that, all other things being equal, the presence of direct competition would increase the final royalty rate.

- The *Muthoo Model* ignores all licensing indicia, including the prior licenses for the patent-in-suit, and licenses for similar technology either by the parties or in the industry. The licensing history of the parties and the patent holder's established licensing policy, if any, have long been considered relevant facts to the outcome of a hypothetical negotiation. (see *Georgia-Pacific* Factors 1, 2, 4 and 12.)

- As discussed above, the *Muthoo Model* does not account for the non-exclusive nature of the license assumed in most hypothetical negotiations in patent infringement litigations. (see *Georgia-Pacific* Factor 3.)

- The time remaining on the patent term is ignored. A patent that expires soon is likely to garner lower royalties than a patent with a long remaining life, all other things being equal. If the patent's remaining term is very short, the accused infringer would be expected to consider waiting out the patent term and launching the accused product after expiration. (see *Georgia-Pacific* Factor 7.)

- The *Muthoo Model* ignores the profitability of the product as made by the patent owner. The profits the patent owner can make in the absence of granting a license, and relatedly, what fraction of those profits are put at risk by granting a license, can be highly relevant to the royalty the patent owner would be willing to accept from a potential competitor. The *Muthoo Model* looks only at the incremental profit of the infringer as the economic surplus to be divided. This approach completely ignores the profits made by the patent owner. (see *Georgia-Pacific* Factor 8.)

26. *35 U.S.C. § 284* states, "Upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court."

27. *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1226 (Fed. Cir. 2014).

28. *ResQNet.com, Inc. v. Lansa, Inc.*, 594 F.3d 860, 869 (Fed. Cir. 2010).

- Again, as discussed above, the base form of the *Muthoo Model* ignores the specific technological improvements of the patented invention, and the availability of non-infringing alternatives. The technical importance of a patented technology and the availability of acceptable non-infringing alternatives may have a significant impact on the bargaining strength and negotiating position of an alleged infringer. (see *Georgia-Pacific* Factors 9 & 10.)

Application of the *Muthoo Model* to determining a reasonable royalty ignores these factors that have long been held to be relevant to the hypothetical negotiation. This calls into serious question the applicability and reliability of the *Muthoo Model* to the specific analysis of determining reasonable royalty damages.

D. Includes Irrelevant Factors Implicitly

The *Muthoo Model*, either directly or indirectly, includes factors that have been appropriately considered to be irrelevant in a reasonable royalty analysis. For example, in the most common application of the *Muthoo Model*, the profit split is determined by the parties' relative WACCs. However, a company's WACC is influenced by the risk and profitability of all the company's products, not just the patented or infringing product. It has been long understood that the hypothetical negotiation in a patent infringement litigation should not be influenced by the fact that either (or both) the Plaintiff or Defendant may (or may not) have profitable products that are completely unrelated to the patent-in-suit.

In 2006, Muthoo published an article in the *Review of Economic Research on Copyright Issues* specifically discussing the application of his prior work to the context of royalty negotiations.[29] This work has been cited to support the acceptance of the applicability of the *Muthoo Model* to the determination of reasonable royalties. In this paper, Muthoo uses the example of a musician named Paul negotiating with a record label over the rights to a specific song Paul has written. Muthoo concludes that "the larger Paul's wealth, the lower his haggling cost, and thus, the greater his bargaining power." Muthoo further suggests that if Paul, the musician, had a second job with a decent source of income he could improve his relative bargaining power in negotiations with the record label.[30]

Applying this analysis to a patent infringement litigation would suggest that the wealthier party should always make out better in the hypothetical negotiation, and receive a more favorable damages outcome. This may or may not be true in a real-world negotiation scenario, but its application to the hypothetical negotiation construct used to determine damages for infringement would appear to be inappropriate. For example, if the record company took Paul's song and used it to make millions of dollars, the amount Paul should receive in damages from that infringement should not at all be related to whether Paul had a side-job waiting tables. Rather, the damages should be tied to the value of the property that was taken, and the use that was made of that property. Thus, there appears to be normative issues involved with the tension between the application of the *Muthoo Model* and public policy concerns of protecting the property rights of inventors regardless of their personal or corporate wealth.

VI. Just Another Rule of Thumb

The *Muthoo Model* is a complex mathematical theory. That complexity is what some experts may like and, not coincidentally, is also what makes it difficult for opposing counsel to challenge effectively. Despite its complexity, it appears to allow for a reasonable royalty based on a simple objective calculation based on party-specific information, not a subjective opinion. Yet, the application of the model to the determination of reasonable royalties can result in illogical and unreliable conclusions.

Proponents of using the *Muthoo Model* argue that by using the relative discount rates from the parties to the litigation, this approach uses enough party-specific information to succeed where the generalized application of the NBS failed in the eyes of the Federal Circuit. However, just because the formula uses some information specific to the case should not be enough to clear the hurdle of admissibility and reliability. To clear that hurdle, an analysis should appropriately use all the relevant case-specific data—not just the parties' discount rates.

Further, there are several problems with the party-specific discount rates typically used in applying the *Muthoo Model*. Several factors affect a company's cost of capital, many of which should not weigh heavily in determining the bargaining strength under the hypothetical negotiation construct. The *Muthoo Model* also ignores many types of case-specific information that, based on long and widely-held belief and case-law precedent, are likely to influence the determination of reasonable royalties.

The use of the *Muthoo Model* to determine reasonable royalties in patent litigation is nothing more than a slightly evolved rule of thumb. It should be viewed with the same level of skepticism as the rules of thumb that came before it, like the *25% Rule* and blind application of the NBS. The *Muthoo Model* fails to provide

29. Abhinay Muthoo, "Bargaining Theory and Royalty Contract Negotiations," *Review of Economic Research on Copyright Issues*, 2006, vol. 3(1), 19-27.

30. Ibid., 23.

a reliable basis for determining a reasonable royalty for the same reasons set forth by the Federal Circuit with respect to the NBS and the *25% Rule*: the general theorem can rarely, if ever, be accurately applied to the facts of a given case.[31]

VII. Going Forward

This application of the *Muthoo Model* is another attempt to find the magic bullet of a simple, universally applicable mathematical formula for determining a reasonable royalty rate. Unfortunately, no such magic bullet exists. Where does the rejection of the *Muthoo Model* for determining reasonable royalties leave us?

Economic models based on bargaining theory and financial models based on other factors are useful and informative to a reasonable royalty analysis, and can serve to ground a potentially subjective exercise in objective reality.[32] We welcome the objective, analytical rigor such models provide to the analysis of a reasonable royalty. However, no single model has yet been developed that in all fact patterns, industries and situations appropriately accounts for the complexity of the issues in determining a reasonable royalty in a real-world litigation.

The broad application of the *Muthoo Model* to determine reasonable royalties is not the magic bullet some have claimed it to be. In the absence of a one size fits all approach, professionals must still make determinations based on their experience and the financial and economic models that best fit the specific facts and circumstance of the situation being analyzed. This can be a very challenging exercise that necessarily requires some level of subjectivity on the part of the expert and the courts.

While the *Muthoo Model* fails to provide a reliable basis from which to discern how parties to a hypothetical negotiation would split an economic surplus, it does begin with the proper focus: measuring the incremental profits specifically related to the patented technology at issue. While some subjectivity may be unavoidable in determining a reasonable royalty, a strong opinion should be grounded in the facts of a given case and well-reasoned, situation specific economic and financial analysis that determines the "footprint" of the patented technology in the marketplace.[33] ■

Available at Social Science Research Network *(SSRN): https://ssrn.com/abstract=3009421*

31. Further, the courts have viewed rules of thumb as inappropriate starting points for any subjective analysis. Therefore, it is also not reasonable to use the *Muthoo Model* as an appropriate starting point for the hypothetical negotiation and modify the result up or down to account for factors not considered directly by the model. This approach was found to be invalid as prior rules of thumb were found to be inappropriate starting points for a *Georgia-Pacific* analysis.

32. The Federal Circuit has noted, perhaps fittingly, that "[d] etermining a fair and reasonable royalty is often…a difficult judicial chore, seeming often to involve more the talents of a conjurer than those of a judge." See *Fromson v. Western Litho. Plate and Supply Co.*, 853 F.2d 1568, 1574 (Fed. Cir. 1988).

33. *ResQNet.com, Inc. v. Lansa, Inc.*, 594 F.3d 860 (Fed. Cir. 2010).