Game Theory: A Zooming and Sliding Method for the Determination of Reasonable Royalties in Patent Damages

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Introduction

From 1995 to 2009, reasonable royalties were the basis of damage awards in a majority (approximately 76%) of patent infringement cases. However, reasonable royalty determinations pose major difficulties for litigants and courts in that they are evaluated based on hypothetical negotiations that never took place. Courts utilize the Georgia Pacific factors to address this issue. A lack of framework in the application of the factors often presents more issues as parties only select criteria that favor their best position. Game Theory provides a framework in a holistic and flexible manner, thus providing a more effective and equitable approach in estimating reasonable royalty. The premise of Game Theory is based on Nash’s Bargaining Solution, which is best used to model competition and scenarios where parties bargain for a deal. This paper introduces the zooming and sliding method approach, a flexible framework based on Game Theory and the Georgia Pacific factors, for litigants and courts to utilize in the estimation of reasonable royalty. The framework is consistent with the Supreme Court’s rejection of using rigid models applied by the appellate courts in past patent cases.

The proposed approach classifies the Georgia Pacific factors in two economic based categories, for which the factors suitably map: (1) zooming factors, and (2) sliding factors. The zooming factors provide a framework to establish the effective total profit of either the patentee licensee or the alleged infringer in an arms-length negotiation. In conjunction, the sliding factors

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4 Hanson v. Alpine Valley Ski Area, Inc., 718 F.2d 1075, 1078 (Fed. Cir. 1983).
7 Id. at 247.
provide a framework to offset the total profit based on the relative bargaining power between the parties.

The paper will explore the proposed approach in investigating two differing technology-driven industries. Approaches undertaken by the damage experts within the cases are evaluated in the context of proposed method and subsequent court’s treatment of the testimonies are discussed.

Discussion

I. Background

A. Georgia Pacific factors and the canons for negotiation

The Georgia Pacific Court annunciated fifteen factors that courts have accepted being relevant to the determination of reasonable royalty.\(^9\) The authors classify the factors into three categories: (1) the terms of the negotiations, (2) the business and market factors in the negotiations, and (3) the subject of the negotiations. Factors concerning the terms of negotiations relate to the type of licenses the parties would make, including: the exclusivity of the license or lack of, the restrictions of the license or lack of, and the coverage of the license as it relates to domestic and international markets.\(^10\) Factors concerning the business and market factors in the negotiations relate to the patentee licensor’s dominant position in the market or lack of, and the competitive nature between the patentee licensor and the infringing licensee.\(^11\) Lastly, factors concerning the subject

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\(^9\) Georgia-Pac., supra note 5, at 1120. See Appendix A for a detailed list of the factors.

\(^10\) Georgia-Pac., supra note 5. See factors 1, 2, 3 and 14.

\(^11\) Georgia-Pac., supra note 5. See factors 4, 5, 11, 12 and 15.
of negotiations relate to the commercial success and demand of the technology protected by the patent-in-suit.\textsuperscript{12}

Similar to the \textit{Georgia Pacific} (GP) factors, litigants have used the canons of negotiations to favor their proposed royalty rates and total profits determination. There are some popular canons: innovation\textsuperscript{13}, non-infringing substitutes\textsuperscript{14}, and apportionment\textsuperscript{15}. Attorneys use these canons in conjunction to the GP factors. Although the canons for negotiations are good as a starting spot, they are not complete in absence of a framework.\textsuperscript{16} Nash bargaining equilibrium provides such a framework to quantify the GP factors and the hypothetical negotiations.

\textbf{B. Nash’s Bargaining Solution}

Nobel-Prize winning economic model developed by John F. Nash, Jr. provides a framework to solve a problem concerning two-person bargaining. The problem is solved by developing a set of conditions reasonable to any bargaining situation.

\textsuperscript{12} \textit{Georgia-Pac.}, supra note 5. See factors 6, 7, 8, 9, 10 and 13.
\textsuperscript{13} \textit{Id.} (stating “Innovation” relates to the demand of the technology in the market place and the strength of the patentee in such market place due to such technologies. Patentee licensor would enjoy the fits of a remarkable innovation in the form of higher royalties).
\textsuperscript{14} \textit{See Standard Havens Products, Inc. v. Gencor Industries, Inc.}, 953 F.2d 1360, 1373 (Fed. Cir. 1991) (stating “non-infringing substitutes” relate to the presence or absence of alternatives in the market place for the patentee’s technology. To be a viable alternative, the technology has to contain features motivating the purchaser to make such purchases); \textit{see also Deere & Co. v. International Harvester Co.}, 218 USPQ 403, 407 (C.D. Ill. 1982) (stating the canon may be used by the infringer if non-infringing substitutes are present).
\textsuperscript{15} \textit{See TWM Mfg. Co. v. Dura Corp.}, 789 F.2d 895, 901 (Fed. Cir. 1986) (stating “apportionment of damages” (also known as the “entire market value” rule) relates to the entitlement of the patentee to get only a portion of lost profits from an infringer due to non-patented components in the product. As the most widely used canon, the entire market rule allows for the recovery of damages based on the value of an entire apparatus having more than the patented feature when the patented feature constitutes the basis for customer demand).
\textsuperscript{16} W. Choi and R. Weinstein, \textit{An Analytical Solution to Reasonable Royalty Rate Calculations}, 41 IDEA 49, 51 (2001).
Nash Equilibrium, which is the basis of bargaining solution, can be expressed as:

Profits of Patentee, \[\Pi_p = p + \alpha (\Pi - p - i)\] Equation (1)

Profits of Infringer, \[\Pi_d = d + (1 - \alpha)(\Pi - p - i)\] Equation (2)

, where \(\Pi\) is the profits, \(p\) is the patentee licensor’s disagreement profits, \(i\) is the infringing licensee’s disagreement profits, and \(\alpha\) is the relative bargaining strength of the patentee licensor, wherein \(\alpha\) is less than 1.\(^{17}\) The principle behind this model is that if patentee licensor has more bargaining strength relative to the infringing licensee, then the patentee licensor is entitled to receive more profits and vice versa.

Choi & Weinstein\(^ {18}\) and Jarosz & Chapman\(^ {19}\) applied Nash’s Bargaining Solution (NBS) to the hypothetical negotiation in reasonable royalty calculations. This paper further incorporates the NBS solution and the GP factors into a structured yet flexible framework for the use of litigants, valuation experts, and the courts.

**II. Analysis**

**A. The Proposed Zooming and Sliding Approach**

The proposed zooming and sliding approach provides a framework to estimate reasonable royalty using a deterministic balancing test. The balancing is performed with respect to two factors: the total profits (\(\Pi\)) and the relative bargaining power of the parties (\(\alpha\)). These two factors map with the NBS solution as shown in Equation (1) and Equation (2). Zooming of total profits (\(\Pi\)) and sliding of relative bargaining power (\(\alpha\)) are the two balancing forces in the framework. These two factors provide two degrees of freedom in the determination of royalty

\(^{17}\) Jarosz, *supra* note 6, at 248.
\(^{18}\) Choi, *supra* note 14.
\(^{19}\) Jarosz, *supra* note 6.
calculations, thus providing a more structured yet flexible framework within the limits of economics and law.\textsuperscript{20}

Estimation of total profits may have dispute over issues, such as apportionment; the total profits can be ‘zoomed in’ or ‘zoomed out’ based upon results provided by the parties.

Estimation of the relative bargaining power between the parties is also difficult to assess and is determined based on several GP factors. The GP factors\textit{slide} the royalty rate either towards the patentee licensor or the infringing licensee.

All the GP factors can map to a\textit{zooming} or a\textit{sliding} factor. However, the mapping is not necessarily linear. Most GP factors contribute to either a\textit{zooming} factor or\textit{sliding} factor, but several factors contribute to both\textit{zooming} and\textit{sliding} factors in a hybrid fashion. Mapping of GP factors with the\textit{zooming} and\textit{sliding} factors is shown in the table below as two scenarios: presence of the factor and absence of the factor.

\textbf{Table 1: Mapping GP factors with proposed Zooming and Sliding factors}

<table>
<thead>
<tr>
<th>Factor No.</th>
<th>Georgia Pacific factors</th>
<th>Presence of the factor</th>
<th>Absence of the factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sliding (Royalty Rate)</td>
<td>Zooming (Total Profit)</td>
<td>Sliding (Royalty Rate)</td>
</tr>
<tr>
<td>1</td>
<td>Royalty rates by patentee for licensing the patent-in-suit</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Rate paid by licensee for use of other patents comparable to patent-in-suit</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Nature of the License</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>Exclusive License</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td>Larger geographic area</td>
<td>↑</td>
<td>↓</td>
</tr>
</tbody>
</table>

\textsuperscript{20} See Appendix B for an illustrated example.
<table>
<thead>
<tr>
<th></th>
<th>Licensor’s established policy to maintain monopoly/not license technology</th>
<th>↑</th>
<th>↓</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Competitive relationship between licensor and licensee</td>
<td>↑</td>
<td>✓</td>
</tr>
<tr>
<td>6</td>
<td>Non Patented Items, Convoyed Sales</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>7</td>
<td>Long Duration of Patent</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td>Longer License Period</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>8</td>
<td>Commercial success, popularity of patented invention</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td>More profitable</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>9</td>
<td>More utility and advantage of patent property over old products</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>10</td>
<td>Nature of patented invention</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>11</td>
<td>Large Extent of Infringer’s Use</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>12</td>
<td>Large portion of profit or selling price customary in particular or comparable business</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>13</td>
<td>Large portion of profit credited to invention</td>
<td>↑</td>
<td>↓</td>
</tr>
</tbody>
</table>

✓ - Either Royalty Rate or Total Profit will be affected by the facts presented.

↑ - Increase.

↓ - Decrease.

These scenarios presented map with the GP factors. GP factors are generally expressed qualitatively. Methods, such as ranking and rating mechanism, can be utilized to quantify qualitative parameters. In the ranking and rating mechanism, the factors are ranked, for example, in categories of low, moderate, and high importance. The categories are then ranked in a
predetermined scaling of tiers, for example: low (1), moderate (3), and high (5). The GP factors are multiplied by the quantified tiers of the corresponding categories and then summed together.

An improvement to this method comprises mapping the ranked and rated result to a database of quantified data. The database provides a reference that further acts as boundary conditions for which, the ranked and rated GP factors can be normalized. The normalization will result in a royalty rate determination that would be in the same order of magnitude as a fair hypothetical negotiation.

B. Case Study

The proposed zooming and sliding method is investigated on two recent patent damage cases litigated in the United States Court of Appeal for the Federal Circuit (CAFC). The first investigation is conducted on a case dealing with proactive scanning technology while second deals with the server workstations. The study consists of applying the zooming and sliding method to expert reports and testimonies from two federal circuit cases in the prescribed industry. An investigation of the life science/pharmaceutical industry will not be conducted because litigants in such industry primarily seek non-monetary relief instead of patent damages. The result shows different styles on approaching to a reasonable royalty and illustrates the need of a framework.

1. Finjan Software v. Secure Computing Corp\textsuperscript{21}

Finjan accused Secure Computing of infringing Finjan’s patents in selling Secure’s proactive scanning software (“Webwasher”) and hardware (“CyberGuard TSP”) products. Finjan’s expert concluded that Finjan was entitled to 18% royalty for their software and 8% royalty for their hardware products; while Secure Computing’s expert posited a 4% royalty rate

\textsuperscript{21} Finjan Software Ltd. v. Secure Computing Corp., 626 F.3d 1197 (Fed. Cir. 2010).
all infringing products.\textsuperscript{22} The jury held in favor of Finjan and awarded $9.18 million as compensatory damages based on a 16\% royalty rate on software products and an 8\% royalty rate on hardware products.\textsuperscript{23} The CAFC affirmed the royalty rate determination, but reversed and directed the district court to assess post-judgment, pre-injunction damages, and exclude government sales from the infringing sales calculations.\textsuperscript{24}

The position taken by Finjan’s expert was reflected in the jury verdict, thereby the expert’s testimony is crucial to analyze. During trial, Finjan’s expert explained the effects of all the GP factors, but fell short of describing the methodology to calculate the final damage based on the discussed GP factors. After determining the profits from infringing sales, Finjan’s expert used a method, customary in business, called “profit-split rule of thumb”. According to the method, a key or fundamental technology entitles the patentee licensor to royalty rates ranging from one-fourth to one-third of the total profits (“25\% Rule of Thumb”).\textsuperscript{25} The expert weighted evidence of convoyed sale (GP 6) to reach a royalty rate of one-third based of the total profits.\textsuperscript{26}

The \textit{Finjan} case illustrates the bias introduced in royalty rate determination due to shopping of the GP factors as described. Although the CAFC acknowledged flaws in the damage theory presented, the expert testimony was allowed nevertheless with the jury being tasked to weigh the evidence based on the credibility of the witnesses.\textsuperscript{27} As previously mentioned, the CAFC is abandoning the generalized 25\% Rule of Thumb and is seeking a more fact driven determination to calculate patent damages.\textsuperscript{28} The \textit{Finjan} court’s acknowledgment\textsuperscript{29}

\textsuperscript{22} \textit{Id}. at 1208.
\textsuperscript{23} \textit{Id}.
\textsuperscript{24} \textit{Finjan}, supra note 21.
\textsuperscript{26} \textit{Id}.
\textsuperscript{27} \textit{Finjan}, supra note 21, at 1212.
\textsuperscript{28} \textit{Uniloc USA}, supra note 8.
of flaws in Finjan’s damage theory and the *Uniloc* court’s rejection\(^\text{30}\) of the 25% Rule of Thumb hint that the Courts are open to a systematic yet flexible framework for calculating reasonable royalty.

In the summary of assessing the GP factors, Finjan’s expert stated that “[i]t’s not every single [factors], but it is [the] important factor that the parties would know [during the negotiations]”.\(^\text{31}\) According to the expert, the important factors are: policies to maintain a monopoly (GP factor 4), competition among the parties (GP factor 5), profits and convoyed sales (GP factor 6), and the nature of the invention (GP factor 10).\(^\text{32}\) Additionally, the Finjan’s expert asserts that these factors moderately favor Finjan, particularly GP factors 7-9.\(^\text{33}\)

In applying the *sliding* and *zooming* approach, the evidence presented by Finjan’s expert can be used to estimate the bargaining power of the parties. The relative importance of each GP factor is unknown to conclude the bargaining power. The proposed framework can be utilized to rank and rate the factors as presented by Finjan’s expert to present the methodology of determining the royalty rate calculation.

2. **Cornell v. Hewlett-Packard Co.**\(^\text{34}\)

Patentee Licensor Cornell accused Hewlett-Packard, a competitor, of infringing its patents on instruction-issuing mechanism for computer processors having multiple functional units.\(^\text{35}\) At trial, the jury rendered a verdict for Cornell, awarding reasonable royalty damages in

\(^{29}\) *Finjan*, supra note 21, at 1212.
\(^{30}\) *Uniloc USA*, supra note 8, at *5, 22.
\(^{31}\) *Finjan*, supra note 25.
\(^{32}\) *Id.*
\(^{33}\) *Id.*
\(^{35}\) *Id.* at 283.
excess of $184M. The jury arrived at this award by applying a 0.8% royalty rate to a $23.0B of total profits. During post-jury determination, the court rejected the entire market value assessment used to determine total profits and granted HP’s motion for judgment as a matter of law. Judge Radar rejected the entire market value determination due to the inclusions of Cornell’s expert testimony, which were non-compliant with the court’s exclusionary order during trial. This scenario highlights two points: first, patent damages are determined by expert testimonies, thus the substantive law on damage calculation interplays with the procedures on the admissibility of expert testimony and second, courts are not opposed to the usage of sophisticated methods to determine patent damage calculations, so long as they are reasonable and founded.

The determination of patent damages in Cornell v. HP is consistent with certain aspects to the methodology disclosed in this paper. In Cornell v. HP, the litigants’ expert determined patent damages by determining a royalty rate and a total profit. The combination of these two facts established the damages awarded. Interestingly, within Game Theory, particularly NBS, the reasonable royalty is a function of total profit from the transaction and the bargaining power of the licensor and licensee.

36 Id. at 282.
37 Id.
38 Id.
39 Id. at 284-285.
41 See e.g., Cornell Univ. v. Hewlett-Packard Co., Expert Testimony of Marion B. Stewart, No. 01CV01974, 2008 WL 7928076 (N.D.N.Y. June 10, 2008); see also, e.g., Cornell University v. Hewlett-Packard Co., Expert Testimony of Marion B. Stewart, No. 01CV01974, 2008 WL 7928081 (N.D.N.Y. June 10, 2008); see also, e.g., Cornell Univ. v. Hewlett-Packard Co., Expert Testimony of John Osterndorf, No. 01CV01974, 2001 WL 36251278 (N.D.N.Y. 2001).
42 Cornell, 609 F. Supp.2d, supra note 34, at 282.
The determination of total profit and royalty rate in *Cornell v. HP* was made at two separate instances. The jury decided on the total profit and the reasonable royalty based on evidence presented during trial. However, in Judge Radar’s opinion on the JMOL motion, he remitted the total profit decided on by the jury. The jury had erred in relying on the testimony of Cornell’s expert, deemed to have been excluded, thus the total profit was amended to a different amount based on the testimony of HP’s expert.

The determination of total profit and royalty rate evidence as presented by the litigants will be discussed in greater detail herein. HP’s expert posited that the royalty rate should be less than 1 percent since the contribution of the infringed patent represents a small physical portion of the processor and the commercial success of the infringed product is contributed by other patented inventions owned by HP. The method proposed by HP’s expert is not a suitable criterion in this instance; the determination of royalty base upon physical dimensions of a microprocessor is not an adequate metric to determine the functional value of the product. Ultimately, the jury determined a royalty rate of 0.8%47, which suggests that the jury sided with HP’s expert.

Cornell’s expert posited that the royalty rate should be around 2.5% based upon the royalty from HP’s previous license agreements and the effects of the GP factors.48

The Authors assert that the royalty rate as presented by Cornell’s Expert is a more structured approach. Assessing value based on physical dimension does not reflect the value profited from a given technology. In *Cornell v. HP*, Cornell’s expert posited a starting point of

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43 *Id.*
44 *Id.*
45 *Id.* at 289-90.
48 Cornell, 2008 WL 7928081, *supra* note 34 (expert testimony of Marion B. Stewart).
3% based on HP’s previous licensing agreements. Cornell’s expert asserted that GP factors 2, 4, 5, and 7 were in favor of the licensor/patentee and lead to a higher royalty rate, but GP factors 8, 9, 10, 11, and 13 were in favor of the licensee infringer and lead to a lower royalty rate. The evidences were ranked in the magnitude of their effects. However, the final royalty rate determination was made by subjectively grouping the various factors together. Cornell’s expert deduced that the factors shift towards the licensee infringer, thus reducing the 3.0% starting point to a 2.5% royalty rate. This example demonstrates estimation of the sliding factor using ranking and rating of the GP factors. Cornell’s expert started on a structured path. By employing the ranking and rating method with the zooming and sliding factors, a structured method to determine whether the royalty rate should be discounted or increased can be determined.

Subsequently, HP successfully moved for a judgment as a matter of law (JMOL) to reduce the patent damages to $53.5M. Assuming that the jury adopted a structured system to determine patent damages, Cornell v. HP is an exemplary illustration of court’s willingness to adopt a structured approach to the determination of patent damages. In fact, the arguments presented, and accepted by the Court, are consistent, if not mirrors, with the proposed framework presented herein.

The Authors posit that using the above methodology is sufficiently demonstrative to present a structured approach in front of the court or jury. Thus, the authors propose that there is a need of a systematic and flexible framework for reasonable royalty calculations rather than relying merely on GP factors.

49 Cornell, 2008 WL 7928076, supra note 34 (expert testimony of Marion B. Stewart).
50 Id.
51 Cornell, 609 F. Supp.2d, supra note 34, at 282.
Scope for Further Research

The proposed framework can be utilized as an analytical tool in conjunction with real life negotiation to analyze the GP factors presented during litigation. A database, developed from this proposed framework, of real world patent licensing negotiations can be used as important evidentiary information. The structured comparison between real life negotiations and hypothetical negotiation can be used to reach a royalty rate systematically.

Additionally, advances in economics, particularly in simulations and modeling, within the framework of Game Theory could be incorporated using the translation from this body of work.

Conclusion

Litigants use limited GP factors, which are in their favor, for calculation of reasonable royalty. This unsystematic approach creates bias in the system. A new framework for determining reasonable royalty incorporating Georgia Pacific factors in the Nash Bargaining Solution is proposed. This proposed framework is flexible in nature, having two degrees of freedom – zooming and sliding factors. These factors map with the GP factors. Quantifying a cumulative set of qualitative GP factors can be carried out by using a ranking and rating mechanism.
Appendix A – *Georgia Pacific* factors


1. The royalties received by the patentee for the licensing of the patent in suit, proving or tending to prove an established royalty.

2. The rates paid by the licensee for the use of other patents comparable to the patent in suit.

3. The nature and scope of the license, as exclusive or non-exclusive; or as restricted or non-restricted in terms of territory or with respect to whom the manufactured product may be sold.

4. The licensor's established policy and marketing program to maintain his patent monopoly by not licensing others to use the invention or by granting licenses under special conditions designed to preserve that monopoly.

5. The commercial relationship between the licensor and licensee, such as, whether they are competitors in the same territory in the same line of business; or whether they are inventor and promoter.

6. The effect of selling the patented specialty in promoting sales of other products of the licensee; that 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. The duration of the patent and the term of the license.

8. The established profitability of the product made under the patent; its commercial success; and its current popularity.

9. The utility and advantages of the patent property over the old modes or devices, if any, that had been used for working out similar results.

10. The nature of the patented invention; the character of the commercial embodiment of it as owned and produced by the licensor; and the benefits to those who have used the invention.
11. The extent to which the infringer has made use of the invention; and any evidence probative of the value of that use.
12. The portion of the profit or of the selling price that may be customary in the particular business or in comparable businesses to allow for the use of the invention or analogous inventions.
13. The portion of the realizable profit that should be credited to the invention as distinguished from non-patented elements, the manufacturing process, business risks, or significant features or improvements added by the infringer.
14. The opinion testimony of qualified experts.
15. 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; that is, the amount which a prudent licensee- who desired, as a business proposition, to obtain a license to manufacture and sell a particular article embodying the patented invention- would have been willing to pay as a royalty and yet be able to make a reasonable profit and which amount would have been acceptable by a prudent patentee who was willing to grant a license.
Appendix B – Zooming and Sliding Illustration

Zooming factors affects the total profits in the negotiation. An illustration of the changing zooming factor is shown below.

\[
\begin{array}{c|c|c}
\Pi_p & \Pi_d \\
\hline
\Pi_1 & $1\ M & $2\ M \\
\Pi_{1'} & $2\ M & $4\ M \\
\end{array}
\]

(after zooming)

\[
\Pi_2 = \Pi_1 \times \text{Zooming factor}
\]

Zooming Factor (Sliding factor is fixed in proportion of 2:1)

Sliding factors affects the relative bargaining power in the negotiation. An illustration of the changing sliding factor is shown below.

\[
\begin{array}{c|c|c}
\Pi_p & \Pi_d \\
\hline
\Pi_1 & $2\ M & $2\ M \\
\Pi_{1'} & $1\ M & $3\ M \\
\end{array}
\]

\[
\begin{array}{c|c|c}
\Pi_{p'} & \Pi_{d'} \\
\hline
\alpha = 0.25 & \text{(after sliding)} \\
\end{array}
\]

Sliding Factors (zooming factor is fixed, sliding at 1:1 and 1:3)